

DATA-READY

Empowering Education through Data Literacy
Integration in Compulsory Education



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D2.1 Study “Data literacy strategies in Compulsory education”



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Executive Summary

DATA-READY (Empowering Education through Data Literacy Integration in Compulsory Education) is a transnational initiative co-funded by the European Commission, aimed at improving/enhancing/strengthening the integration Data Literacy (DL) into primary and lower secondary education.

DL, defined as the ability to understand, analyze, interpret, and communicate data effectively, emerges as progressively more critical literacy/ is emerging as an important literacy for preparing students to navigate a data-driven world.

Recognizing its essential role, DATA-READY seeks to develop a **European framework for DL** and equip teachers with the competencies to deliver it effectively. The project responds to the growing demand for data-related and digital skills, as outlined in the Digital Education Action Plan 2021–2027, the DigComp 2.2 framework, and broader EU educational goals.

Deliverable “**D2.1 Study Data literacy strategies in Compulsory education**”, part of Work Package “**WP2 Analysis and Identification of best practices**”, provides foundational research for the project by:

- **Analyzing** DL strategies across five European countries: Greece, Poland, Germany, Portugal, and Cyprus.
- **Identifying** gaps, challenges, and existing practices.
- **Providing** the basis for a European Data Literacy Framework (DLF) and informed policy recommendations.

The research design followed a mixed-methods cross-country comparative approach, involving:

- **Literature reviews** on curricula and policies.
- **Surveys** across education stakeholders (teachers, school leaders, authorities).
- **Case studies** highlighting real-life DL practices.
- **Focus groups** for qualitative insight into educators’ attitudes, challenges, and readiness.

These methods enabled triangulation and cross-validation of findings, offering both breadth and depth of understanding.

The table below summarizes the core findings across four strategic areas:

● = Strong or Emerging | ● = Partial/Fragmented | ● = Lacking

Country	DL in Curriculum	Teacher Training	Resources/Materials	Policy Awareness
Greece	● Limited, ICT-focused	● Mostly absent	● Few DL-specific resources	● Partial policy engagement
Poland	● Sporadic, no strategy	● Educator confidence low	● Tech/resource constraints	● Awareness remains low
Germany	● ICT/math-based	● Few DL-specific TPD programs	● Limited DL tool use	● Fragmented due to federalism
Portugal	● Not standardized	● TPD lacks DL focus	● Resource shortage	● Inconsistent national recognition
Cyprus	● Not integrated	● DL not included in training	● Severe resource shortages	● No centralized policy or strategy

Conceptualization

- DL is **not uniformly defined** across countries. It is often misunderstood as part of digital literacy or statistics.
- There is **limited understanding** of DL's interdisciplinary nature, its ethical dimensions, and its real-world applications.

Main Challenges and Gaps

- **Lack of standardized curricula:** DL is rarely a core component in curricula in compulsory education.
- **Insufficient teacher training:** Most teachers have never received professional development specifically focused on DL.
- **Inadequate resources:** Schools lack tools, educational resources and support for the teaching of DL.
- **Policy fragmentation:** No national strategies dedicated specifically to DL in education in any of the five countries.

Key Recommendations

For Policymakers:

- **Develop a unified, structured DL framework** at the national and European levels, aligned with DigComp and AI ethics guidelines.
- **Integrate DL systematically** into primary and secondary curricula across all subjects, not just math or ICT.
- **Invest in teacher training:** Include DL in both pre-service and in-service education.
- **Provide funding and support** for DL-specific materials, lesson plans, and open educational resources (OERs).

For Educational Institutions:

- Encourage **cross-disciplinary teaching approaches** (e.g., STEAME, project-based learning) to make DL relevant and applicable.
- Facilitate **professional learning communities** and peer-learning among teachers focused on DL.
- Promote **data-informed school culture:** Support teachers in using educational data for decision-making.

For Teachers:

- Engage in **continuous professional development** on data ethics, visualization, interpretation, and application.
- Leverage existing technologies and platforms for integrating DL in everyday lessons.
- Focus on real-world data projects to **enhance student engagement and critical thinking**.

Deliverable D2.1 confirms that while **data literacy is widely acknowledged as essential**, its integration in compulsory education remains **underdeveloped, uneven, and unsupported**. The DATA-READY project aims at providing a roadmap toward a more systematic inclusion of DL in education through the development of a comprehensive framework, educator training, and evidence-based policy advocacy.



1. Introduction

1.1 The project

The project DATA-READY (Empowering Education through Data Literacy Integration in Compulsory Education) arises from the increasing recognition of the critical role data literacy plays in modern education. In a world where data influences nearly every aspect of daily life, the ability to understand, analyse, and use data effectively has become an essential skill.

Data Literacy (DL), the ability to derive meaningful information from data, is now considered a crucial component of overall literacy, alongside reading, writing, and numeracy skills. DL encompasses a broad range of skills, including data collection, analysis, interpretation, visualization, and ethical use. These skills enable individuals to make informed decisions, solve problems, and communicate their findings effectively. Moreover, DL represents a new dynamic scientific field, closely related to developments in ICT, Computational Thinking and STEAME and is recognized as a fundamental component of digital literacy, as it encompasses the ability to understand, analyze, interpret, and communicate data effectively.

In an era marked by rapid technological advancements and an explosion of data, these competencies are crucial for both personal and professional development. Recent studies and educational frameworks, such as the European Commission's DigComp 2.2 and the Digital Skills Indicator 2.0, highlight the need for comprehensive digital competencies, including DL, to prepare students for the demands of the 21st century.

However, despite its importance, DL is not yet systematically integrated into the curricula of compulsory education across many European countries. Traditional curricula often focus on basic literacy and numeracy, leaving a significant gap in the teaching of data-related skills.

Recognizing the importance of DL, several international organizations and educational bodies have emphasized the need to incorporate data literacy into curricula and teacher training programs. However, the implementation of DL education remains fragmented and inconsistent across different countries and educational systems.

The DATA-READY project aims to address this gap by developing a comprehensive framework for DL in compulsory education (primary and low secondary) and enhancing the capacity of teachers to cultivate these skills in their students. By focusing on the foundational years of education, the project seeks to equip future generations with the necessary competencies to navigate the data-rich world they will encounter, addressing also the priorities set out by the Digital Education Action Plan 2021-2027.

The project is grounded in the belief that fostering DL from an early age can have far-reaching benefits. It can nurture critical thinking, problem-solving, and decision-making abilities in students, empowering them to make informed choices in their personal and professional lives. Moreover, data-literate citizens are better equipped to participate in democratic processes, understand complex issues, and contribute to evidence-based policymaking.

By developing a comprehensive framework, the project aims to provide a structured approach to DL education, ensuring consistency and coherence across different educational systems. The framework will identify key domains, learning outcomes, and progressions, enabling teachers to effectively integrate data literacy concepts into their classrooms.

Furthermore, the project recognizes the crucial role of teachers in facilitating DL education. By enhancing teacher training programs and providing professional development opportunities, the project aims to build the capacity of educators to effectively teach DL skills and incorporate them into their pedagogical practices.

Through a collaborative and transnational approach, the DATA-READY project seeks to foster mutual learning, share best practices, and promote evidence-based policymaking in the field of DL education. By addressing this critical need, the project has the potential to contribute significantly to the development of a data-literate society, capable of navigating the complexities of the modern world and making informed decisions for personal and societal well-being.

In this context, the DATA-READY project aims to develop, implement and test a new policy approach to enhancing DL skills of students in compulsory education (primary and early secondary). The DATA-READY will design and pilot a comprehensive and innovative European framework for DL skills in education and in parallel develop and effectively deliver capacity building training programs for teachers, following a specific methodology, as outlined below:

- During the project, partners will conduct a comprehensive mapping of existing DL strategies, policies, and practices in national curricula across partner countries.
- Based on this analysis, the project will develop the European-wide framework defining domains, learning outcomes, and progressions for DL skills in compulsory education. The DL Framework (DLF) will provide a comprehensive, structured approach to developing core DL competencies among primary and secondary school students. It will outline essential skills, proficiency levels, performance indicators, and implementation guidelines for utilizing DL into curricula. DLF will also include supporting resources for educator training, evaluation methods, and governance structures to ensure its relevance and sustainability.
- Next step will be the capacity building of teachers and the experimentation phase with students.
- Based on the experimentation results, the project will propose evidence-based policy recommendations for transferability and sustainability of data literacy education strategies. The planned research, analysis, and experimentation phases will generate evidence-based insights and recommendations to inform policy making on data literacy education at national and European levels.

The DATA-READY project, by developing a comprehensive framework for DL skills in compulsory education and providing resources for teacher training and professional development, will equip educators with the necessary tools and guidance to cultivate these essential competencies in their students from an early age.

By establishing clear competencies, proficiency levels, and implementation guidelines, the DATA-READY framework will facilitate the utilization of data literacy into curricula and pedagogical practices, enabling a more cohesive and effective delivery of digital education across educational institutions, thus enhancing digital skills and competences for the digital transformation and creating a high-performing digital education ecosystem in the partners countries at first (Greece, Cyprus, Germany, Portugal, Poland) and in Europe on second stage.

1.2 The deliverable

Current deliverable “**D2.1 Study Data literacy strategies in Compulsory education**” is part of “**WP2 Analysis and Identification of best practices**” and more specific, belongs to the task “**T2.1 Research on Data Literacy strategies in Compulsory Education in partner countries**” (Figure 1).

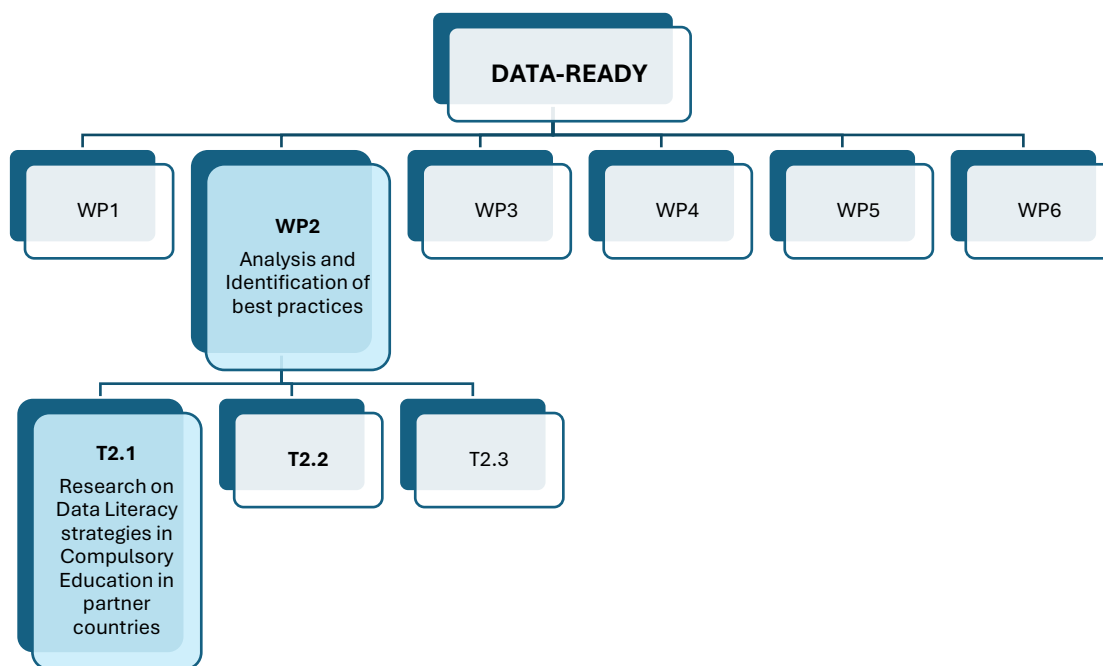


Figure 1 DATA-READY Work packages and Tasks

Key objectives of WP2 are the following:

- Conduct comprehensive research on DL strategies in compulsory education across partner countries.
- Identify and document the various approaches, policies, and practices currently in place.
- Identify gaps and areas for improvement in current DL education, providing a basis for further development.
- Develop and validate a standardized framework that defines key DL skills and competencies for teachers.

The primary objective of T2.1 is to conduct comprehensive research on existing DL strategies within compulsory education systems across the partner countries. This task aims to map the current landscape, identify effective practices, and uncover gaps that need addressing to enhance DL education. Findings from T2.1 will provide essential insights and evidence to guide the development of an effective framework for DL skills in compulsory education.

D2.1 supports both the *Preparation Stage* and *Development Stage* (see project's proposal, p.13), where the project a) will conduct an extensive research phase to understand the current landscape of DL education in partner countries and b) develop a comprehensive framework for DL skills.

In this context, the primary objective of D2.1 is to produce comprehensive study that analyzes and documents the current state of DL strategies in compulsory education across the partner countries. This study will serve as a foundational document that informs the development of a DL framework and guides subsequent project activities.

Key components of the deliverable are:

- Literature review.
- Analysis of data collected through surveys.
- Comparative analysis
- Case studies.
- Challenges and gaps.



- Best practices and recommendations.

2. Preliminary needs analysis in partner countries

During the project's proposal preparation phase, a preliminary needs analysis was conducted from the consortium, to trace the status of DL in their countries. The needs analysis included a review of relevant literature, reports, and studies to establish the context and importance of data literacy in today's data-driven society, identification of gaps and challenges related to DL education were identified and an analysis of previous efforts and Initiatives.

Moreover, the needs analysis included an examination of the national context related to DL in each of the partner countries involved in the project (Greece, Poland, Germany, Portugal, and Cyprus). Results of this preliminary work revealed gaps and challenges, current needs and national context and needs.

2.1 Gaps and challenges

Despite its importance, DL is not adequately integrated into education curricula across Europe. This gap leaves students unprepared to handle data responsibly and effectively in their future careers and daily lives. While there are frameworks for DL, there is an absence of standardized frameworks specifically addressing DL skills tailored to compulsory education. Educators lack clear guidelines on what constitutes DL and how to teach it effectively, resulting in inconsistent teaching practices and learning outcomes.

Also, teachers haven't received adequate preparation or training to teach DL. This includes both content knowledge and pedagogical strategies for integrating DL into the curriculum (Pappa et al., 2024). Both ITE (Initial Teacher Education) and TPD (Teachers Professional Development) lack focused training on DL, which is crucial for empowering teachers to integrate these skills into their teaching.

Moreover, there is a scarcity of empirical data on the best practices for teaching DL and the impact of such education on student outcomes. This gap hinders the development of policies that support the integration of DL into school curricula.

Finally, previous efforts and initiatives, such as the European Commission's DigComp framework, have focused on broader digital competencies, including data literacy as a component. However, there is a lack of a standardized framework that specifically addresses the domains, learning outcomes, and progressions for DL skills tailored to the needs of compulsory education.

2.2 Needs analysis

According to a 2017 OECD report, many education professionals consider data literacy a crucial skill for thriving in the twenty-first century. However, it is not yet widely recognized or integrated within the educational community's standard skill set. Internationally, the non-use, misuse, and abuse of data are prevalent, leading to a widespread fear of data.

In 2010, the global data collection amounted to two zettabytes, which, to offer perspective, is equivalent to over two quadrillion books if each book were two megabytes in size. This already massive figure pales in comparison to the 97 zettabytes of data collected in 2022, marking a staggering 4,750% increase from 2010. In today's data-driven society, the ability to comprehend, evaluate, and utilize data is crucial. Contrary to the common assumption that young students, due to their frequent online presence, are naturally adept at handling data, they do not inherently



acquire DL. Developing these essential skills requires structured opportunities throughout their primary and secondary education.

Educators play a crucial role in facilitating this learning. By integrating DL into school curriculums, utilizing appropriate tools, and presenting information creatively, teachers can impart one of the most valuable skills to their students. DL empowers students to sift through conflicting information, think critically about facts, and make informed, context-based decisions in both their personal and professional lives.

Despite its clear benefits, DL remains undervalued in educational settings, and student proficiency in this area has been declining. A 2016 study by the Stanford History Education Group found that 80% of middle school students could not distinguish between a paid ad and news content on a homepage. Recent assessments show a significant decline in student achievement in DL, with scores in Data Analysis, Statistics, and Probability dropping by ten points between 2019 and 2022.

Josh Bersin, in a 2020 Harvard Business Review article, noted that schools often lack the resources to address the DL gap, focusing more on critical concepts like calculus and algebra rather than applied subjects such as statistics and probability. This issue remains relevant, as highlighted at the 2023 SXSW EDU conference, where ed-tech investors emphasized the need for more resources to help young students learn DL skills.

A 2024 study on the self-efficacy of DL among primary and secondary school teachers, published in Journal of Electrical Systems, revealed that 69,86% of these teachers had not received DL training. Furthermore, 88,56% believed that such training was necessary. They identified limited learning time and overly complex content as major barriers to improving their DL. Teachers can only effectively enhance their self-efficacy and engage in sustained learning if they apply DL to their instruction. Therefore, the development of teacher DL needs to be problem-driven, with specific training provided. The study also found that younger, highly educated teachers and those teaching in urban schools had the highest self-efficacy in DL, while older, less educated teachers in rural areas had the lowest.

Additionally, a survey in upper secondary schools in Switzerland revealed that although more than half of the educators had access to data technology, only a third used these tools, and merely a quarter believed that such technology could improve their teaching. Efforts are being made to equip future generations with data skills, but educators often lack the same training, leading them to rely on familiar teaching methods without incorporating new data literacy tools.

2.3 National context and needs analysis per country

2.3.1 GREECE

- Pre-service teachers' curricula are not supporting efficient DL strategies, in the same manner as ICT literacy for example.
- In-service teachers' professional development during the last 20 years is mainly oriented in acquisition of ICT skills.
- Digital School initiative in Greece through the national learning platforms and repositories does not explicitly support data literacy.
- Teachers lack time and skills to design and implement effective and realistic lesson plans to cultivate DL among their students.
- Teachers lack open educational resources (OERs) referring to DL ideas and strategies that they can use in their teaching.
- Teachers need training to develop their own DL skills.



- This includes knowledge about data, skills in using data, dispositions towards data use, data application for various purposes, and data-related behaviors.
- Schools need resources to support teaching DL skills and concepts across the curriculum.
- This includes practical guidance, links to resources, and materials like posters.
- Schools need system-level support to foster teacher collaboration within in-school professional development programs.

2.3.2 POLAND

- DL in compulsory education is still in its nascent stages.
- While there is an increasing recognition of its importance, the integration of DL into the curriculum is sporadic and lacks a cohesive strategy.
- Most schools do not have dedicated programs or courses focusing specifically on DL.
- Limited Resources: Many schools lack the necessary technological infrastructure and resources to effectively teach DL.
- The existing curriculum is already overloaded, making it difficult to introduce new subjects without significant restructuring.
- A significant gap exists in the training and professional development of teachers concerning DL. Many educators do not feel confident or adequately prepared to teach these skills.
- There is a general lack of awareness among educational policymakers and stakeholders about the importance of DL, resulting in low prioritization.

2.3.3 GERMANY

- DL is mostly embedded within ICT and mathematics courses.
- Due to the lack of a standardized DL curriculum, students experience differing degrees of exposure and skill development.
- Many TPD programs do not cover data literacy concepts and teaching methods, leaving educators ill-prepared to integrate these skills into their classrooms.
- There is a lack of specialized courses or TPD opportunities specifically focused on DL for educators, resulting in a shortage of trained personnel in this area.
- Many teachers lack proficiency in using DL tools and software, hindering their ability to effectively teach DL skills to students.
- Educators may struggle to develop pedagogical strategies for teaching DL in engaging and accessible ways, particularly in subjects outside of mathematics and ICT.

2.3.4 PORTUGAL

- Many teachers lack adequate training in DL and digital competencies. While there are initiatives to improve this, the pace of implementation and coverage is not uniform across all regions and schools.
- Some teachers resist adopting new teaching methods and technologies, preferring traditional approaches. This resistance can slow down the integration of DL into the curriculum.
- There is a lack of standardized and high-quality educational materials and resources specifically designed for teaching DL at the primary level. Developing and distributing these materials can be a challenge.
- TPD programs do not include sufficient focus on DL. This includes both pre-service (initial teacher education) and in-service (ongoing professional development) training.



- Teachers often lack basic digital skills, and this can be even more evident in the scope of DL.
- Teachers often feel unprepared to teach DL because their training did not cover these skills adequately.
- There is a shortage of high-quality, accessible teaching resources and materials specifically designed for DL education. Teachers need ready-to-use lesson plans, interactive tools, and relevant examples to effectively teach DL, but such resources are not widely available.
- DL competencies in Portugal are recognized differently depending on the qualification level, but there are no specific frameworks or diplomas dedicated to this area.

2.3.5 CYPRUS

- There are no large-scale initiatives or programs specifically focused on DL in education.
- Some individual schools or teachers may incorporate data-related activities or projects, but there is no centralized effort or curriculum dedicated to this area.
- DL skills are not explicitly integrated into the education curriculum.
- Some elements may be covered indirectly through mathematics lessons involving basic statistics or graphing, but there is no dedicated focus on developing broader DL competencies.
- Lack of awareness and understanding of the importance of DL among educators and policymakers.
- Limited resources and training opportunities for teachers to develop their own DL skills and pedagogical approaches.
- Overcrowded curricula, leaving little room for the integration of new subjects or competencies.
- Shortage of instructional materials and resources specifically tailored to teaching DL in education.
- DL concepts and their pedagogical applications are not covered in depth, if at all, in initial teacher education programs or in-service professional development offerings for teachers.

3. Theoretical background

3.1 Educational Data

Educational data can be broadly defined as “*information that is collected and organized to represent some aspect of schools. This could include [...] any relevant information about students, parents, schools, and teachers derived from qualitative and quantitative methods of analysis*” (Lai & Schildkamp, 2013, p. 10).

As Sampson et al. (2022) stated, this definition implies that educational data are not restricted to students’ grades but comprises a wide range of data generated by various and multiple sources, both internal (school-wide and classroom-specific data) and external (state and/or district data) to the school.

According to Ikemoto & Marsh (2007), educational data can be:

- *input data*: school expenditures, student demographics,
- *process data*: data on financial operations, data on the quality of instruction,
- *outcome data*: dropout rates, student test scores,
- *satisfaction data*: opinions from teachers, students, parents, or the community.

Moreover, Lai & Schildkamp (2013) proposed a broader approach for educational data that includes:

- *context data*: curriculum, school human resources, infrastructure, financial plans, school culture,
- *input data*: student characteristics like demographics and prior academic performance, and teacher characteristics like teacher competences, academic qualifications, or professional experience,
- *process data*: lesson plans, methods of assessment, classroom management,
- *outcome data*: students’ achievements, wellbeing, social and emotional development.

U.S. Department of Education and the Institute of Education Sciences suggested **data-driven decision-making** (DDDM) as a process that involves educational stakeholders who systematically collect and analyze educational data to inform and guide a range of decisions and reconsiderations towards the improvement of students’ learning and schools’ performance (Hamilton et al., 2009; Van Geel et al., 2016).

DDDM is gaining an increasing attention in education because it considers to be a driver of internal school improvement processes (Mandinach, 2012) and has a wide use from the state to the individual, meaning the student to the teacher and also school leader. A prominent use is to make programmatic decisions, by collecting data by all actors of school as reliable information to take a decision that considers each part of a school unit (Dunn et al., 2013). School can collect data in various ways (Schildkamp, 2019): a) formal, like assessment results, surveys and systematic classroom observations in a systematic manner and b) informal, like classroom observations and discussions, formative assessment, educational research evidence and learning analytics. The data process can lead to action and evaluation to improve the quality of education in curriculum (e.g. improving curriculum coherence), assessment (e.g. developing and implementing (formative) assessments across the years to identify at risk students and instruction (Poortman & Schildkamp, 2016).

This type of decision-making from educational stakeholders has been defined as:

- *Systematically analyzing existing data sources within the school, applying outcomes of analyses to innovate teaching, curricula, and school performance, and implementing*

(e.g., genuine improvement actions) and evaluating these innovations (Schildkamp & Kuiper, 2010).

- *The systematic collection, analysis, examination, and interpretation of data to inform practice and policy in educational settings* (Mandinach, 2012).
- *The systematic collection of many forms of data from a multitude of sources in order to enhance student performance* (Dunn et al., 2013).
- *The process that refers to teachers, principals, and administrators systematically collecting and analyzing various types of data to guide a range of decisions to help improve the success of students and schools* (Marsh & Farrell, 2015).

Moreover, digital innovation is Data-Driven (OECD, 2020) and even though data has always been around in education, it is an area that right now gains the most interest (Schildkamp, 2019). Technologies increase the effectiveness, and the value of data and data can lead to new possible applications, purposes and goals of data use (Schildkamp, 2019). Digitalization will further increase the collection of data, which will become more frequent and easier. Data can help at least teachers, administrators and policy makers to bring the coveted school improvement (Athanatou, 2023).

As Sampson et al. (2022) summarizes, DDDM in schools refers to a continuous cycle of identifying, collecting, combining, analyzing, interpreting, and acting upon educational data from different sources, to report, evaluate, and improve the resources, processes, and outcomes of schools. This conception of DDDM implies a set of “data literacy” competences that may be needed to engage in meaningful data use and move from data, to information, to knowledge, to action.

3.2 Data Literacy as a concept

In the digital era, understanding and working with data is becoming increasingly vital. DL has emerged as a crucial skill for individuals across various fields in an age where data influences nearly every aspect of daily life.

The overall human capacity to understand, learn from, and use data as part of everyday thinking and reasoning for solving real-world problems could be synopsized under the term DL (Sampson et al., 2022).

With the increasing reliance on big data, artificial intelligence, and digital tools, DL has become an essential competency in education. It is not only relevant for data scientists, but also for professionals across various domains, educators, and students.

Thus, DL is a core skill for navigating the modern information landscape, where data-driven decision-making is increasingly prevalent (Wolff et al., 2016). According to D’Ignazio & Bhargava (2016), DL includes understanding how data is collected, processed, and analyzed, as well as being able to evaluate its credibility and relevance.

The importance of DL extends beyond technical fields, as it is a fundamental competency for informed decision-making in everyday life, from interpreting news articles to managing finances.

UNESCO (2022) emphasizes the importance of DL as a fundamental skill in artificial intelligence (AI) education and the need to integrate data literacy into AI curricula. Additionally, it highlights ethical considerations, as the curricula should promote teaching students about bias in data, privacy concerns, and responsible data usage.

DL is framed as a cross-disciplinary competency, integrating subjects like mathematics, computer science, and social sciences. It is linked to digital literacy, ensuring students can navigate the digital world effectively.

UNESCO's AI curriculum underscores DL as a core competency for understanding and engaging with AI technologies. By teaching DL, educators can empower students to evaluate AI systems critically, recognize biases, and responsibly use data in an increasingly AI-driven world (UNESCO, 2022).

In their work on educational data literacy, Sampson et al. (2022, p.10) listed various definitions, as the outcome of an environmental scan:

Definition	Source
The ability to formulate and answer questions using data as part of evidence-based thinking; use appropriate data, tools, and representations to support this thinking; interpret information from data; develop and evaluate databased inferences and explanations; and use data to solve real problems and communicate their solutions.	Vahey et al. (2006)
Skills in data location, data comprehension, data interpretation, question posing, and data use for instructional decision-making. <i>Their framework for DL consists of 5 dimensions: 1) data location (i.e., finding the relevant and available pieces of data in the data system or display), 2) data comprehension (i.e., understanding what the data signify), 3) data interpretation (i.e., figuring out what the data mean), 4) data use for instructional decision-making (i.e., selecting an instructional approach to address the situation identified through the data), and 5) question posing (i.e., framing instructionally relevant questions that can be addressed by the data in the system).</i>	Means et al. (2011)
<i>Their framework for DL consists of 5 dimensions: 1) accessing or collecting data, 2) filtering, organizing, or analyzing data into information, 3) combining information with expertise and understanding to build knowledge, 4) knowing how to respond and taking action or adjusting one's practice, and 5) assessing the effectiveness of these actions or outcomes that result.</i>	March (2012)
DL enables individuals to access, interpret, critically assess, manage (i.e., preserve and curate), handle, and ethically use data. <i>Their framework for DL consists of 5 dimensions: 1) understanding data, 2) finding and/or obtaining data, 3) reading, interpreting, and evaluating data, 4) managing data, and 5) using data</i>	Prado & Marzal (2013)
The ability to accurately observe, analyze, and respond to a variety of different kinds of data for the purpose of continuously improving teaching and learning in the classroom and school.	Love (2012)
One's level of understanding of how to find, evaluate, and use data to inform teaching and learning - a data-literate educator should possess the knowledge to gather, analyze, and graphically convey information and data to support decision-making at various levels of the educational process.	North Carolina Department of Public Instruction (2013)
The ability to understand and use data effectively to inform decisions [...] composed of a specific skill set and knowledge base that enables educators to transform data into information and ultimately into actionable knowledge.	Mandinach & Gummer (2013)
Data-literate educators continuously, effectively, and ethically access, interpret, act on, and communicate multiple types of data from state, local, classroom, and other sources to improve outcomes for students in a manner appropriate to educators' professional roles and responsibilities.	Data Quality Campaign (2014)
The ability to collect, manage, evaluate, and apply data, in a critical manner. <i>Their framework for DL consists of 5 dimensions: 1) conceptual framework, 2) data collection, 3) data management, 4) data evaluation, and 5) data application.</i>	Ridsdale et al. (2015)
The ability to ask and answer real-world questions from large and small data sets through an inquiry process, with consideration of ethical use of data. It is based on core practical and creative skills [...] that include the abilities to select, clean, analyze, visualize, critique, and interpret data, as well as to communicate stories from data and to use data as part of a design process.	Wolff et al. (2016)
The ability to transform information into actionable instructional knowledge and practices by collecting, analyzing, and interpreting all types of data (assessment, school climate, behavioral, snapshot, longitudinal, moment-to-moment, and so on) to help determine instructional steps. It combines an understanding of data with standards, disciplinary knowledge and practices, curricular knowledge, pedagogical content knowledge, and an understanding of how children learn. <i>Their framework for DL combines 7 dimensions: 1) content knowledge, 2) general pedagogical knowledge, 3) curriculum knowledge, 4) pedagogical content knowledge, 5) knowledge of learners and their characteristics, 6) knowledge of educational contexts, and 7) knowledge of educational ends, purposes, and values.</i>	Mandinach and Gummer (2016)

Table 1 List of definitions on educational data literacy

In general, DL refers to reading, interpreting, analyzing, and communicating data effectively. It enables individuals to make data-driven decisions, recognize biases, and critically evaluate information.

DL includes 4 main components (Figure 2):

- **Data Collection:** Understanding sources of data and methods of collection.
- **Data Analysis:** Applying statistical and analytical techniques.
- **Data Interpretation:** Drawing meaningful conclusions from data.
- **Data Communication:** Presenting data in an understandable and actionable manner.

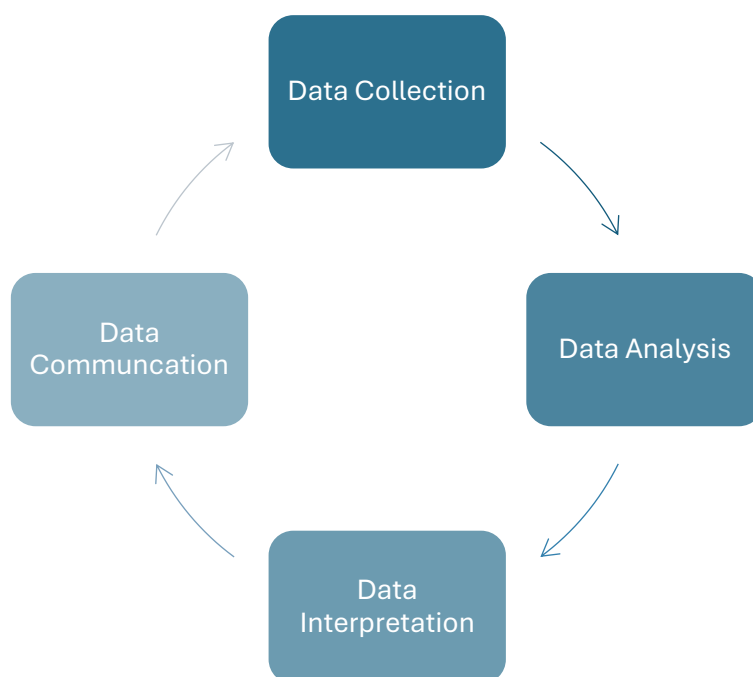


Figure 2 Data Literacy Components

3.3 Related concepts

DL is deeply interconnected with other literacy forms, including scientific and digital literacies.

3.3.1 Scientific Literacy

Scientific literacy is the ability to understand and apply scientific knowledge and methodologies.

DL enhances scientific literacy by enabling individuals to interpret scientific data critically, assess research findings, and make evidence-based conclusions (Bybee, 1997).

It includes:

- evaluating evidence,
- understanding research methods,
- and distinguishing between scientific facts and misinformation.

Since modern science relies heavily on data collection and statistical analysis, DL is fundamental to scientific literacy. Scientists must analyze experimental data, recognize biases, and validate results, making DL indispensable in the scientific process. Therefore, data and scientific literacies overlap significantly, as both require critical thinking, data interpretation, and evidence-based reasoning.

Scientific literacy involves understanding scientific concepts and processes, often requiring the ability to interpret and analyze data (Qiao et al., 2024). For instance, scientific research often involves analyzing experimental data, interpreting statistical findings, and drawing conclusions.

A person with strong DL skills can assess the validity of scientific claims, recognize flawed methodologies, and make informed decisions based on empirical evidence (Gibson & Mourad, 2018).

3.3.2 Digital Literacy

Digital literacy involves the ability to use digital tools and navigate online environments effectively.

However, while digital literacy focuses on the ability to use digital technologies effectively, DL is a more specialized skill set within digital literacy. Being digitally literate does not necessarily mean one can interpret and analyze data critically. Since much of today's data is stored, shared, and analyzed digitally, digital literacy and DL are deeply intertwined. DL complements digital literacy by equipping individuals with the ability to navigate and critically assess the vast amounts of digital data encountered daily.

According to Hallam et al. (2018), DL is positioned as a key subset of digital literacy. While digital literacy encompasses a broad range of skills related to the effective use of digital tools, platforms, and technologies, DL specifically focuses on the ability to find, interpret, analyze, and communicate data. The University of Queensland Library has established a strategy for integrating digital and DL within its programs to support students and researchers (Hallam et al., 2018).

Understanding privacy concerns, cybersecurity risks, and ethical considerations in data usage is essential to both literacies. Thus, modern education should integrate both literacies to prepare students for a data-driven world.

3.3.3 Learning Analytics, Data Science, and Citizen Science

DL, learning analytics, data science, and citizen science are interconnected concepts, each playing a critical role in the modern digital landscape. DL provides the fundamental skills necessary to understand and interpret data. It serves as the baseline competency that enables individuals to engage with data meaningfully, regardless of their expertise level.

Learning analytics is the process of analyzing raw data to find trends and make informed decisions.

DL serves as the first step towards mastering learning analytics, ensuring that individuals can interpret statistical outputs and draw meaningful conclusions (Mandinach & Abrams, 2022).

Data science is an interdisciplinary field where executive scientists combine principles and practices from the fields of mathematics, statistics, programming, artificial intelligence, and computer engineering to analyze large datasets.

While DL provides the foundational skills for understanding data, Data Science requires advanced techniques such as machine learning, predictive modeling, and artificial intelligence (Pedersen & Caviglia, 2019).

In citizen science, non-expert individuals actively participate in scientific research by collecting, analyzing, and interpreting data.

DL plays a crucial role in citizen science too. Citizen science projects, such as environmental monitoring, biodiversity tracking, and public health studies, rely on the ability of volunteers to



handle data accurately and responsibly (Bonney et al., 2014). A strong foundation in DL enables participants to gather reliable data, recognize biases, and contribute meaningful insights to scientific studies. Moreover, by engaging with real-world data, citizens develop critical thinking skills and a deeper understanding of scientific processes, reinforcing scientific literacy and public engagement with research.

Therefore, DL is the fundamental ability to work with data at a basic level:

- Learning analytics applies statistical and computational methods to analyze data.
- Data science incorporates learning analytics and involves programming, machine learning, and automation.
- As citizen science initiatives expand, fostering DL among participants ensures the quality of collected data and enhances their ability to make informed decisions based on evidence.

Thus, while all four fields are interconnected, **DL is the prerequisite skill that enables individuals to engage in more advanced data-driven disciplines.**

3.4 Data Literacy in Formal Education and Curriculum

DL is an essential competence for the 21st century, intersecting with scientific and digital literacies. It is also closely related to learning analytics, data science, and citizen science, serving as the steppingstone for more advanced data-driven disciplines. Although not yet included in curricula, integrating DL across subjects, training educators, leveraging technology, and employing project-based learning can help embed these skills in education systems. By embedding DL across subjects, utilizing project-based learning, and training educators, educational institutions can prepare students to navigate the data-driven landscape.

As data continues to shape the world, equipping students with DL skills is crucial for fostering informed, analytical, and engaged citizens. Future educational policies should prioritize the integration of data literacy to ensure that students are equipped with the analytical and problem-solving skills necessary for an increasingly data-centric world.

But, despite its importance, DL is not consistently included in school curricula worldwide. Integrating DL into formal education and its curriculum requires a comprehensive approach that addresses the interdisciplinary nature of the field, ethical considerations, and assessment challenges.

Several challenges exist in integrating DL into formal education (Donate-Beby et al., 2025; Mandinach & Gummer, 2013; Nwagwu, 2025):

- **Professional Development for teachers:** Targeted professional development programs should be designed to equip teachers with the necessary skills and knowledge to integrate DL into their teaching practices effectively.
- **Systemic Integration:** A systemic approach is needed to integrate DL into teachers' preparation programs. This involves collaboration among multiple stakeholders, including schools of education, school districts, professional development providers, state education agencies, and professional organizations.
- **Promoting Interdisciplinary Collaboration:** Collaboration across various fields should be encouraged to facilitate the exchange of ideas, resources, and best practices in DL education.
- **Supporting Open Access and Collaboration:** Initiatives promoting open access to scholarly literature and fostering collaboration among researchers should be supported to accelerate innovation and knowledge dissemination in DL.



- **Technological Infrastructure:** While substantial investment has been made in state and local data systems, the focus has primarily been on building technological infrastructure rather than developing human capacity to use these systems effectively.
- **Research and Evidence:** There is a lack of systematic empirical evidence on the prevalence and effectiveness of DL courses in schools. More research is needed to understand the impact of data use on classroom practice and student performance, as well as the developmental needs of different groups of educators.

Several strategies can be employed to integrate DL into educational curricula effectively:

- Offering **dedicated courses** on DL can provide students with a comprehensive understanding of data-related skills. These courses can cover topics such as data collection, analysis, visualization, and ethical considerations.
- DL can be **incorporated into existing subjects** such as mathematics, science, and social studies. For example, math classes can include lessons on statistical analysis, while science classes can teach students how to interpret experimental data.
- **Encouraging students to engage in projects** that require data collection and analysis can help them develop practical data literacy skills. Projects can involve real-world scenarios, such as analyzing environmental data or conducting surveys (Ghodoosi, 2022; Mandinach & Gummer, 2016).
- **Providing educators with training and resources on DL** is crucial for teacher training and professional development. Workshops, online courses, and professional learning communities can help teachers gain confidence in teaching data-related concepts (Kjelvik & Schultheis, 2019).
- To **utilize technology and open data resources**, digital tools such as spreadsheets, data visualization software, and coding platforms can make DL more accessible to students. Open data initiatives provide students with real-world datasets to explore and analyze (Gebre, 2022).

However, an important aspect that must be considered is promoting data ethics. For instance, students discuss issues related to privacy, bias, misinformation, and ethical dilemmas in artificial intelligence (Sampson et al., 2022).

4. Research design

4.1 Aims and objectives

Task “T2.1 Research on Data Literacy strategies in Compulsory Education in partner countries” and its deliverable “D2.1 Study Data literacy strategies in Compulsory education” aims to conduct comprehensive research on existing DL strategies within compulsory education systems across the partner countries to understand the current landscape of DL education and gather evidence to inform the design and validation of a comprehensive framework for DL skills.

The main objectives of the research, according to the proposal, are the following:

- Review national curricula, policies in partner countries regarding DL.
- Locate and analyze case studies of applying DL methods in partner countries.
- Collect and analyze quantitative data through surveys in partner countries mainly from teachers and stakeholders in compulsory education.
- Collect and analyze qualitative data through focus groups in partner countries mainly from stakeholders and authorities in compulsory education.
- Conduct a comparative analysis between the data gathered in partner countries.
- Identify the challenges and gaps of DL in compulsory education in partner countries.

- Identify the best practices and recommendations of DL in compulsory education in partner countries.

4.2 Methodology

The aim of the research conducted in the context of D2.1 was to investigate the current perceived awareness, views, dispositions, practices, challenges, needs and intentions of educational actors (teachers, administrators, stakeholders, national authorities, etc.), regarding DL in compulsory education in partner countries, providing answers to the following research questions:

1. *How do the national curricula and educational policies in each partner country approach the concept and methods of DL in compulsory education?*
2. *Are there any relevant case studies in partner countries showcasing successful implementation of data-driven methods in compulsory education?*
3. *What is the current level of actors' DL understanding and awareness of DL?*
4. *What is the current level of actors' DL knowledge and skills on DL?*
5. *Which are the current practices of actors in the school context regarding DL?*
6. *Which are the actors' attitudes and dispositions about DL?*
7. *What is the policy regarding DL in the national curricula?*
8. *Which are the teachers' training needs in each partner country?*
9. *What are the challenges and obstacles regarding the integration of DL in compulsory education?*
10. *Which are the actor's future intentions regarding the use of data-driven methods in their work?*

To answer the research questions and implement this comprehensive research study, the consortium followed a mixed methods research approach (Creswell, 2003), to collect quantitative and qualitative data. An online questionnaire was constructed with 62 closed and open-ended questions, grouped into three main categories: a) demographic data b) participants' perceptions on DL using Likert-5 questions and c) a general open-ended question.

To ensure construct validity, the questionnaire was aligned with the literature review, while for content validity, an adequate number of questions was assembled, while the questionnaire was piloted with 5 experts for modifications as needed. The final questionnaire was translated in 4 languages (Greek, German, Portuguese and Polish).

Regarding the qualitative research, the partnership conducted focus groups in each partner country to collect data from representatives of the target group. The focus group followed the form of a semi-structured interview, and the questions covered various areas aligned with the main sections of the survey. The focus groups were implemented in an online and/or face-to-face context, with the support of web conferencing tools. The partnership complied with the GDPR regulations, asking for the respondents' written permission for participation and recording of the focus group sessions. Ethical issues were considered; anonymity, confidentiality, and objectivity were maintained.

A total of 50 stakeholders participated in the focus groups in the partner countries (Cyprus: 10, Greece: 10, Germany: 10, Poland: 10, Portugal: 10) and 658 teachers and stakeholders participated in the online questionnaire in the partner countries (Cyprus: 122, Greece: 254, Germany: 105, Poland: 102, Portugal: 75).

Moreover, the consortium conducted a comprehensive structured literature review in each partner country to map any concepts and methods related to DL in existing national policies, strategic plans, national curricula and case studies in compulsory education.

4.2 Literature review

Literature review process was multi-dimensional, meaning that each partner searched in various sources to locate, analyze and document evidence in his country (Greece, Poland, Germany, Portugal, Cyprus).

For the review to be meaningful and aligned with the proposal, partners searched for evidence in the Eurydice database, Ministries of Education, Pedagogical/Educational Institutions, other EU projects relative to DL and universities library portals (local grey literature repositories).

Various search keywords were used for the search process, such as *data literacy, data-driven methods, data in education, data analytics, learning analytics, statistical literacy, AI in education, AI literacy, digital literacy, data-driven decisions, assessment data, interventions data analysis, statistics in education, data in education, data science, scientific literacy, citizen science, teaching with data, data visualization, data analysis, data collection, etc.*

The literature review is organized around the following topics:

A. Compulsory education

For each partner country, an overview of the **structure and organization of compulsory education** is provided, for the consortium to have a common understanding about the educational environment in which the project's activities will be deployed.

B. Data literacy in national curricula

For each partner country, the **school curricula (school analytical programs)** for each grade and for each course are analyzed to trace any references to the concept of DL (explicit or implicit). The aim of this task was to find how DL is approached as a concept and practice in the school education of the country, if there are any specific courses dedicated to DL, if DL is augmented within various disciplines and in what way and, if there is any specific structured method / framework / model / design in approaching DL in the school curriculum. Data gathered during this task are tabulated as follows, for better visualization and coherence in documentation.

C. Policy context

For each partner country, a small description of the **policy body and organization**, in which relevant documents were found, is provided. Data gathered during this task are tabulated as follows, for better visualization and coherence in documentation.

For each partner country, a small description of the relevant **educational policy documents** found, is provided. Data gathered during this task are tabulated as follows, for better visualization and coherence in documentation.

For each partner country, a small description of the relevant **strategic plan documents** found, is provided. Data gathered during this task are tabulated as follows, for better visualization and coherence in documentation.

D. Scientific Research

For each partner country, description of the relevant research (scientific papers and grey literature regarding educational interventions) found, is provided. Data gathered during this task are tabulated as follows, for better visualization and coherence in documentation.

4.3 Case studies analysis

For each partner country, 5 case studies were analyzed, regarding application of data-literacy methods in compulsory education. Data gathered during this task are tabulated as follows, for better visualization and coherence in documentation.

4.4 Survey research

According to the proposal, survey research was conducted in each partner country (Greece, Poland, Germany, Portugal, Cyprus) to gather data representing current views, attitudes, practices, dispositions and needs, on a sample of teachers and stakeholders in compulsory education.

A survey tool (online questionnaire) was initially designed in English, based on various research articles describing similar research designs, e.g. investigating aspects of DL in education via quantitative methods.

In the 1st step, an initial questionnaire with 65 items (questions) was created in a shared document, following an inclusive process based on the literature. The questions were organized in the following sections:

- A) Demographics
- B) Understanding and Awareness of Data Literacy
- C) Knowledge and Skills (Readiness) in Data Literacy
- D) Current Practices and Implementation
- E) Attitudes and Dispositions Towards Data Literacy
- F) Policy and Curriculum Perspectives
- G) Training and Professional Development Needs
- H) Challenges and Obstacles
- I) Future Intentions
- J) Open-ended Questions

In the 2nd step, the Steering Committee and the Quality Assurance Committee, together with the WP2 team, examined the questionnaire and reduced the number of items, recognizing any similarities, overlaps and redundancies between them. This recurring process finally managed to reduce the number of items to 42 items, as follows:

Section A: Demographic Data

1. Gender
2. Age
3. Role
 - a. Teacher
 - i. Years of teaching experience
 - ii. Teaching subject(s)
 - iii. School type
 - iv. School region
 - v. School size
 - vi. Number of teachers
 - b. Administrator
 - i. Years of experience in educational leadership
 - ii. School type
 - iii. School region
 - iv. School size
 - v. Number of teachers
 - c. National authority representative
 - i. Years of experience in educational leadership
 - ii. Level of authority
 - iii. Role in organization
4. Educational level
5. ICT skills level

6. Have you received training related to data use or data literacy?

Section B: Understanding and Awareness of Data Literacy

Note: items were based on previous work of Donate-Beby et al. (2025).

Please indicate your level of agreement with the following statements, using a 5-point Likert scale: **1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.**

1. I understand the following concepts:
 - a. Data Literacy
 - b. Digital Literacy
 - c. AI Literacy
 - d. Information Literacy
 - e. Statistical Thinking
 - f. Learning Analytics
2. Data Literacy is connected to the following concepts:
 - a. Digital Literacy
 - b. AI Literacy
 - c. Information Literacy
 - d. Statistical Thinking
 - e. Learning Analytics
3. I understand the potential uses and applications of data in supporting learning, assessment, research and decision-making in education
4. I recognize Data Literacy as an essential element of teachers' modern role
5. I recognize the legal, ethical and privacy issues associated with data in education

Section C: Knowledge and Skills (Readiness) in Data Literacy

Note: items were based on previous work of Donate-Beby et al. (2025), Beck & Nunnaley (2021), Papamitsiou et al. (2021) and Means et al. (2011).

Please indicate your level of agreement with the following statements, using a 5-point Likert scale: **1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.**

6. I know of data analysis methods, techniques and tools
7. I know how to use digital tools to manage and organize data effectively
8. I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information
9. I know how to create charts, tables, and graphs to organize and visually present data
10. I know how to make use of data to solve problems and make decisions related to my work

Section D: Current Practices and Implementation

Note: items were based on previous work of Donate-Beby et al. (2025), Beck & Nunnaley (2021), Papamitsiou et al. (2021), Data Quality Campaign (2014), Shreiner & Dykes (2021) and Means et al. (2011).

Please indicate your level of agreement with the following statements, using a 5-point Likert scale: **1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.**

11. I explore and collect data for my work (i.e. surveys, assessment results, participation statistics, etc.)
12. I assess and use data in my work
13. I analyze and synthesize data for addressing a problem or question
14. I use data visualizations in my work
15. I collaborate with colleagues on interpreting educational data

16. I share data with students, parents, teachers, administration and others

Section E: Attitudes and Dispositions Towards Data Literacy

Note: items were based on previous work of Donate-Beby et al. (2025), Schramm-Possinger & Harris (2021) and Yan & Chen (2022).

Please indicate your level of agreement with the following statements, using a 5-point Likert scale: **1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.**

17. I believe that data enhances:

- a. Learning
- b. Teaching
- c. Assessment

18. I believe that data enhances personalization and differentiated teaching

19. I believe that data-driven methods improve educational equity

20. I believe that data-driven methods increase teachers' workload

Section F: Policy and Curriculum Perspectives

Note: items were based on previous work of Donate-Beby et al. (2025), Schramm-Possinger & Harris (2021) and Yan & Chen (2022).

Please indicate your level of agreement with the following statements, using a 5-point Likert scale: **1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.**

21. Educational system in [Country] sufficiently promotes Data Literacy in schools

22. School curricula effectively integrate Data Literacy concepts and methods

23. School administrators play a critical role in successful Data Literacy integration

24. Teachers have adequate knowledge to address ethical considerations related to educational data (privacy/security/responsible use)

25. Teachers have adequate autonomy to implement data-driven methods

26. School curricula sufficiently cover:

- a. Data collection skills
- b. Data analysis skills
- c. Data interpretation skills
- d. Data visualization skills
- e. Data communication skills

27. School curricula approach the use of Data Literacy as follows:

- a. Integration with STEM/STEAM/STEAME disciplines
- b. Collaboration with other teachers
- c. Project-based learning across disciplines
- d. Other (please specify)

Section G: Training and Professional Development Needs

Note: items were based on previous work of Donate-Beby et al. (2025), Schramm-Possinger & Harris (2021), Yan & Chen (2022) and Shreiner & Dykes (2021).

Please indicate your level of agreement with the following statements, using a 5-point Likert scale: **1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.**

28. I believe that developing Data Literacy will significantly contribute to my professional development

29. I am interested in professional development related to Data Literacy

30. The available professional development programs address my needs regarding data use

31. What type of support do you need to effectively implement Data Literacy methods in your curriculum?

- a. Workshops and seminars
 - b. Mentoring
 - c. Peer collaboration
 - d. Online resources
 - e. Other (please specify)
32. What are your current training needs?
- a. Understand basic Data Literacy concepts
 - b. Acquire skills in data analysis methods
 - c. Acquire skills in interpreting complex data visualizations
 - d. Organize classroom interventions with my students
 - e. Get familiar with data-driven decision making in school
 - f. Understand the ethical use of educational data
 - g. Know how to integrate data literacy with other literacies
 - h. Other (please specify)

Section H: Challenges and Obstacles

Note: items were based on previous work of Donate-Bebry et al. (2025) and Yan & Chen (2022).

Please indicate your level of agreement with the following statements, using a 5-point Likert scale: **1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.**

33. Which of the following do you think constitute challenges and obstacles for Data Literacy in education?
- a. Insufficient resources (i.e. labs, equipment, software, etc.) for data-driven activities
 - b. insufficient time for data-driven activities
 - c. Insufficient training programs in Data Literacy
 - d. Resistance among educators towards adopting Data Literacy methods
 - e. Lack of support or encouragement from school administrators
 - f. Unclear national policies regarding Data Literacy implementation
 - g. Ethical concerns and privacy issues in educational data handling

Section I: Future Intentions

Note: items were based on previous work of Beck & Nunnaley (2021).

Please indicate your level of agreement with the following statements, using a 5-point Likert scale: **1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.**

34. In the future, I intend to use data more frequently in my work for:
- a. Administrative tasks
 - b. Instructional design
 - c. Communication and collaboration
 - d. Assessment and feedback
 - e. Counseling and parent engagement
 - f. Broader management responsibilities
 - g. Other (please specify)

35. In the future, I intend to seek further training in Data Literacy

Section J: Open-ended Questions

36. In your opinion, what are the most important factors for implementing successful data-driven methods in education in your country?

The survey was administered online and anonymously via Google Forms, translated into partner's languages. For each item of the questionnaire, frequency tables (Num, Percentage), graphs (Pies,



Bar Charts) are provided in the results section, together with a small narrative interpretation of the results. Inferential statistics were not applied and no means and standard deviations in Likert-5 variables were calculated.

4.5 Focus Group research

The aim of the focus group (FG) was to capture the views, practices and dispositions of stakeholders regarding the use and integration of DL methods in compulsory education. Data were gathered from five partner countries (Greece, Portugal, Cyprus, Germany and Poland) and helped the consortium to identify and understand the current educational landscape in a European context regarding data-driven educational practices in compulsory education.

FG in general is a research method that aims to collect data on a specific topic through the interaction of the participants in a group setting (7 and 15 people) F2F or online (teleconference). In this group, the researcher introduces the topic for discussion and then moderates discussion from group members (Krueger & Casey, 2015), fostering interaction between the participants, a key characteristic of this research method.

A pool of open questions was initially developed in English, based on various research articles describing similar research designs, e.g. investigating aspects of DL in education via qualitative methods (Arizona Data Literacy Resource Guide, 2020; Donate-Beby et al., 2025; Beck & Nunnaley, 2021; Schramm-Possinger, 2021; Yan & Chen, 2022; Shreiner & Dykes, 2021).

In the 1st step, an initial pool of 25 questions was created in a shared document, following an inclusive process based on literature. In the 2nd step, the Steering Committee and the Quality Assurance Committee, together with the WP2 team, examined the questions and reduced the number of items, recognizing any similarities, overlaps and redundancies between them. This recurring process finally managed to reduce the number of items to 12 items, as follows:

Section A: Understanding

1. How would you define data literacy? What key skills and competencies do you associate with it??
2. Do you believe data literacy should be an essential competence for teachers and students today? Why or why not?

Section B: Views

3. How would you view the generation and use of data in compulsory education overall?
4. In your opinion, what types of data do teachers use in schools?
5. In your opinion, how do teachers use that data?
6. In your opinion, what are the ethical implications of using student data? How do you evaluate the credibility and accuracy of data used in compulsory education?
7. In your opinion, what are the main barriers and challenges of data literacy in compulsory education?

Section C: Professional Development

8. What type of support and training do you believe that teachers need to effectively implement data-driven educational practices?



9. Would you prefer training sessions focused specifically on data literacy or integrated within broader pedagogical topics such as digital literacy or problem-based learning? Why?

Section D: National Policy and Curriculum Integration

10. In your opinion, is the educational system able to support and promote data literacy for teachers and students?
11. What is your opinion on the current national education policy regarding data literacy? Are there any gaps or inconsistencies you have identified that you would like to comment on?
12. Critically, how do you assess your national school curriculum in terms of integrating data literacy? What would you suggest improving it?

In the context of D2.1, 5 FGs were organized with 10 participants in each partner country, including educational stakeholders at local, regional and national levels. Before each FG session, a consent form was signed by each participant (see Appendix), to formalize their informed participation in the focus group.

In each FG, after the welcome and introduction, the researcher informed the participants about the following:

- Purpose and duration of the session.
- DATA-READY project and the task 2.1 ‘Research on Data Literacy strategies in Compulsory Education in partner countries’
- The session intends to gather their expertise and point of view on data literacy in compulsory education.
- There are no right or wrong answers and there will be equal space for all to talk.
- Participants should try to co-create on top of each other’s interventions.
- Participation is confidential, the participants’ identity will not be shared outside of the FG.
- The session audio should be recorded, to ensure the transcription and data analysis.
- Participants can abandon the focus group at any time.

Each session had a mean duration of 120’ with the following structure:

- 15’ for the beginning of the FG session
 - Welcome
 - Presentation of moderators
 - Purpose and objectives of the FG
 - Informed consent
 - Participants self-introduction
- 90’ for the discussion
 - Presentation of a question from the pool
 - 1 round of discussion per question
 - Reframing question if necessary
- 15’ minutes for the end of the FG session
 - Reflection
 - Summary
 - Conclusions

5. National Report [Cyprus]

The Cyprus National Report was authored by Eleni Papageorgiou, Marina Michael and Efi Paparistodemou.

5.1 Literature review

5.1.1 National curricula

5.1.1.1 Compulsory education description

Pre-school level

Day nurseries (παιδοβρεφκοκομικοί σταθμοί) are open to children under the age of three (or up to the age of 6 in the case that they are integrated with a kindergarten). The aim of day nurseries is to offer childcare rather than education. For this reason, they fall under the remit of the Ministry of Labour and Social Assurance. Parents of children in day nurseries pay fees.

Pre-primary education

Pre-primary education (προδημοτική εκπαίδευση) is open to children between 3 to 6 years old. It is free and compulsory for all children in the age range from 4 years and 8 months to 6 years, while children between 3 to 4 years and 8 months are accepted but not free of charge. The aim of pre-primary education is to satisfy the children's needs for the development of a wholesome personality in an experiential environment.

There are three types of pre-primary institutions - public kindergartens, community kindergartens, and private kindergartens. The educational program in the public and community kindergartens retains as many elements of normal family life as possible, with an emphasis on comfort, love, trust, acceptance, safety, respect and the child's individual personality.

Primary education

Primary education is free and compulsory for all children over the age of 6 and lasts for six years. At the end of this period, they receive a school-leaving certificate, which entitles them to enter secondary education. The aim of primary education is to create and secure learning opportunities for children, regardless of age, gender, family, social background and academic ability. A strong emphasis is placed on skills in languages and mathematics, as well as health and environmental education and creative and artistic expression. Recent innovations include the increased use of modern technology, the expansion of all-day schools (ολοήμερα σχολεία) and the move towards integrating pupils with special educational needs into the mainstream.

There are both public and private primary schools. Public schools operate in every town and village where more than fifteen children live. Areas with fewer than fifteen children are served by regional schools. Most of the large primary schools in urban and larger rural areas are divided into two cycles, cycle A catering for grades 1-3 and cycle B catering for grades 4-6. Because of the hardships faced by primary schools in the occupied area of the Republic of Cyprus, only one primary school is operating in this area, located in Rizokarpaso. Since 2005, a kindergarten is also operating in one of the classrooms of the Rizokarpaso primary school.

Secondary education

Secondary education is offered to children between 12 and 18 years old. It is free for all the six years of duration and compulsory up to the age of 15. There is secondary general and secondary technical and vocational education in Cyprus. Secondary general education offers two three-year cycles of education – the Gymnasium (Γυμνάσιο), which constitutes the lower secondary education cycle, and the Lyceum (Λύκειο), which constitutes the upper secondary general

education. The technical and vocational education offers a three-year cycle of upper secondary education. There are both public and private schools of secondary education.

The Gymnasium is a self-contained unit of general education, which complements the general education offered by primary schools and prepares pupils for upper secondary education. The curriculum is common for all pupils.

The Lyceum offers a three-year education program which includes both common core subjects and optional subjects of specialization and enrichment.

Instead of the Lyceum, pupils may choose to attend Secondary Technical and Vocational Education (STVE). STVE is offered in the Technical/Vocational Schools. The STVE programs include formal technical and vocational education, apprenticeship scheme and lifelong learning. Formal education is offered in two main streams, the 'theoretical' and the 'practical' with various specialties in each stream. The STVE school-leaving certificate is equivalent to that of the Lyceum and school leavers from technical schools can compete for places in higher education with graduates from the lyceums.

5.1.1.2 Data literacy in national curricula

Level	Discipline / Course	Description
Preschool	Cross-curricular project-based learning activities	In the context of project-based learning, a core learning approach in preschool education, children use symbolic ways to represent their ideas, experiences, and hypotheses and communicate their ideas to others (e.g., children and adults). Within project-based learning, structured play and other structured or semi-structured activities, children engage in learning opportunities that actively promote knowledge and skills in math, language, science, arts, social studies, physical education and music. Distinct skills related to data literacy are present in the following subjects: Language: children grasp and construct meaningful information via language and non-language elements. Math: children collect data and construct meaningful representations of all collected information. They also observe and interpret diagrams. Music: children invent their own codes in representing music. Science: children collect in a systematic manner information using their five senses and/or various instruments. To communicate effectively their findings children, organize their data and choose the appropriate representation means (e.g. graphs). Children are also expected to interpret data, by relating/connecting collected info.
Primary	Math	From first to sixth grade, in Statistics and Probability learning units, students are expected to learn and develop knowledge and skills in data collection, presentation and interpretation. The concepts and skills are gradually explored and developed through a spiral curriculum design. Students begin by formulating questions and collecting categorical or quantitative data from familiar contexts. They explore frequency tables, grouped data, and comparative diagrams. They also calculate and interpret measures of central tendency (mean) and variability (range). Activities include surveys, experiments, and real-life scenarios. Learners use relative frequencies and pie charts, design questionnaires, and apply statistical tools to real-world decisions (e.g. product orders). The emphasis throughout is on authentic data handling, critical thinking, and drawing conclusions.
Primary	Greek Language	Following the way learning outcomes are organized from first to sixth grade, students are expected to find and connect the information from the linguistic part of texts with those conveyed through other semiotic modes (e.g., image, sound), and vice versa.
Primary	Science	Through learning about and working with ideas in various topics and concepts of Natural Science students are expected to make observations, collect data, analyse and interpret data in order to infer ideas and come to conclusions.



Primary	Design and Technology/Digital Technologies	From first to sixth grade students are expected to develop research skills (e.g., skills in investigating problems and potential solutions, collecting and evaluating information, etc.).
Primary	Geography	Students collect, present and interpret data about various phenomena (e.g. traffic conjunction), they interpret physical and digital three-dimensional representation tools (e.g. that of a river) and deduce information. They are also expected to develop their own models to represent phenomena. They also use digital tools to collect, synthesize and represent data.
Primary	History	Students study and contrast different representations of the same historic event/person/ phenomena. They also search for and interpret information and evidence to support or refute certain questions. They conduct historic inquiries to answer questions and thus, they identify, evaluate and relate different historic references and sources. They also represent and present their research findings via various means taking care to refer to their sources.
Secondary	Biology	There is a strong emphasis in this curriculum on scientific experimentation. Students are expected to manifest their understanding of the scientific method. Students design and conduct experiments, organize and present results in graphs and proceed to interpretation. Surveying as a method of collecting data is also a main emphasis.
Secondary	Geography	A vast majority of learning objectives in Geography focused on learning to “read”and interpret data from various tables, graphs and graphemes, maps and other pictorial representations of information pertaining to the natural world
Secondary	History	A strong emphasis on historic investigations using variety of evidence. Students are expected to manifest their understanding that claims should be supported by evidence and that trustworthy evidence is the product of thinking about and evaluating information reflected in historic resources.
Secondary	Maths	Data literacy is systematically developed within the Cyprus curriculum from Year 7 to Year 9. Students represent and solve problems by using Venn diagrams. They compare datasets using measures of location (e.g., median, mean, dominant value) and dispersion (e.g., maximum, minimum range) and evaluate the appropriateness and limitations of using the above measures. They distinguish different types of variables (Qualitative, Quantitative, Discrete, Continuous) and they present data in various formats (tables, frequency charts, bar charts, histograms, pie charts, pie charts, flip charts), with or without the use of software. Moreover, they represent the sample space of experiments in multiple ways including tree diagrams and they understand and apply the multiplication principle to chance experiments.
Secondary	Greek Language	Several learning objectives in the Greek Language Curriculum pertaining to text comprehension focus on students’ability to interpret the meaning of a text not only through language but also through non-linguistic elements. These include images, photographs, diagrams, colors, sounds, effects, spatial arrangement, and the type and size of fonts. Students are expected to recognize the interaction between linguistic and non-linguistic components and to understand the emotional, ideological, or informational load that these elements convey.
Secondary	ICT	Students process numerical data and manage charts using spreadsheet applications, while also utilizing presentation software to organize and display information through tables, graphs, and organizational charts. At the same time, they follow the Application Development Cycle to solve programming problems related to a robot, determining what needs to be done, how it will be implemented, and how to verify its correctness. They become familiar with fundamental concepts related to Databases, identify the basic structural elements and main objects within them, and define relationships between database tables. Furthermore, they use functions such as search, filtering, and queries to locate information, manage forms, and utilize reports to present data. Finally, they are able to implement a complete database to meet specific needs or solve particular problems.



Secondary	Design and Technology	Students are expected to develop research skills, such as investigating problems and potential solutions, as well as collecting, analyzing, synthesizing, and evaluating information in a structured and critical manner.
Secondary	Physics	From Year 8 to Year 9 students apply the scientific method to explore physical phenomena, designing and conducting experiments to investigate concepts such as uniform linear motion, hydrostatic and atmospheric pressure, electrical circuits, and heat transfer. They analyze experimental data, construct and interpret position–time and velocity–time graphs, extracting relevant information and calculating quantities such as speed.
Secondary	Chemistry	From Year 8 to 9, students through experimental activities, prepare mixtures using different proportions of components and record their observations to identify key properties. Based on these observations, they distinguish between homogeneous and heterogeneous mixtures and draw conclusions about their composition. They investigate the differences between physical and chemical phenomena through hands-on experimentation, recognizing characteristic changes that occur. Also, they extract information about molecular structure either from chemical formulas or from simulations and models—and vice versa—enhancing their understanding of the composition and behavior of substances at the microscopic level.

Table 2 Cyprus Report [DL in National curricula]

5.1.1.3 Frameworks for data literacy in education

N/A. The school curriculum was informally based on frameworks of statistics education (e.g. Makar & Rubin, 2009; GAISE and NCTM frameworks on statistics education)

5.1.1.4 Summary

In the education system of Cyprus data literacy is progressively integrated across education levels (preschool, primary, and secondary) within various disciplines. Data literacy is mainly embedded through subject-specific learning objectives and to a lesser extent through project-based and inquiry-based methodologies.

At the preschool level, data literacy is informally introduced through cross-curricular project-based learning. Children engage in structured and semi-structured activities that incorporate symbolic representation, observation, and communication of ideas. In Math for instance, children collect simple data and interpret visual representations like diagrams, while in Science, sensory-based data collection is encouraged, and findings are organized using visual tools such as graphs. Music and Language curriculum foster early symbolic reasoning, where children invent codes and explore multimodal communication. The emphasis is on exploration and representation, laying the groundwork for structured data thinking later in school.

In Primary Education, data literacy is developed across subjects. Math provides a foundation via a spiral curriculum that builds from basic data collection to interpreting statistical measures like mean and range, applied in real-world contexts. Science fosters analytical thinking through observation and experimentation. Greek language promotes multimodal literacy by integrating linguistic and visual information. Geography and History encourage critical analysis of maps, models, and historical sources, with students also creating their own representations. Digital technologies and design subjects enhance research and data evaluation skills using digital tools.

At the secondary level, data literacy is developed in increased depth and complexity, with a focus on formal methods of data handling, analysis, and representation. In Math, students engage with statistical and probabilistic concepts using a wide range of tools: venn diagrams, histograms, measures of central tendency and dispersion, and software-based representations. They also learn to distinguish variable types and evaluate data critically. The Biology, Chemistry and Physics curriculums strongly promote the scientific method, via experimental design, data collection and interpretation through graphs, charts, and tables, with students engaging in evidence-based inferences. ICT courses focus on applied data literacy, including data processing with spreadsheets and databases, implementing queries, generating reports, and solving problems

via the application development cycle. Geography and History reinforce analytical skills through interpretation of visual data sources and evidence-based inquiry. Students learn to synthesize multiple data forms to support historical claims or geographical conclusions. The Greek language curriculum continues to support multimodal comprehension, helping students understand how different semiotic modes interact to convey complex messages.

Across subjects, the curriculum emphasizes critical thinking, communication, and evidence-based reasoning, reinforcing data literacy skills. Data literacy is integrated across educational levels and subjects, with increasing sophistication as students progress. From symbolic play in preschool to advanced data analysis and digital tools in secondary education, students are given multiple, scaffolded opportunities to develop key data literacy skills.

5.1.2 Policy context

5.1.2.1 National educational policy bodies

Policy body/institution	URL
Cyprus Ministry of Education, Sport and Youth	https://www.moec.gov.cy/en/
Cyprus Pedagogical Institute - Centre of Educational Research and Evaluation - In-Service Training Department	https://www.pi.ac.cy/pi/index.php?lang=el
Cyprus Mathematical Society	https://www.cms.org.cy/home
Public and Private Universities in Cyprus - University of Cyprus - European University University of Nicosia	https://www.ucy.ac.cy/?lang=en https://euc.ac.cy/en/ https://www.unic.ac.cy/

Table 3 Cyprus Report [National educational policy bodies]

5.1.2.2 Educational policies for DL in CE

There are no educational policies for DL in CE. The main body for all the strategic policies in Cyprus is the Cyprus Ministry of Education, Sport and Youth.

5.1.2.3 Strategic plans for DL in CE

There are no strategic plans for DL in CE. The main body for all the strategic policies in Cyprus is the Cyprus Ministry of Education, Sport and Youth.

5.1.2.4 Summary

There is not an established policy context for DL in Cyprus.

5.1.3 Scientific Research

Summary	Educational level, discipline



Meletiou-Mavrotheris, M., & Paparistodemou, E. (2024) This article is a self-narrative of a 18-year research into the Technological Pedagogical Content Knowledge (TPACK)-guided professional development of teachers in ICT-enhanced mathematics learning. Using autoethnography as the methodology to elucidate our transformative personal evolution in implementing the TPACK model, we describe how we conceptualized and enacted the TPACK framework across three distinct phases of our research trajectory. In the first phase, our efforts focused on offering afternoon seminars and workshops on using educational software. Mathematics teachers attended the seminars and workshops voluntarily. In the second phase, we concentrated on designing programs guided by the principles of adult education, which emphasize the importance of learner autonomy and relevance, and socio-constructivist views of teacher professional growth, which stress the role of collaboration and reflection in learning. In the final phase, we adopted a systemic, school-based approach to investigating and expanding TPACK for mathematics and other STEM/STEAM teachers. At the end of each phase's description, we delve into the profound lessons learned and how these led to a paradigm shift, expanding our perspective on TPACK as practitioners and researchers. Finally, we present a set of recommendations for future research and practice aimed at facilitating the sustainability of STEM/STEAM teacher professional learning initiatives.	Professional Development, Mathematics Education, STEM Education
Leavy, A., Dick, L., Meletiou-Mavrotheris, M., Paparistodemou, E., & Stylianou, E. (2023) Background: The advent of new and emerging technologies and industries has highlighted the need to equip youth with a unique skillset necessary to cope with a rapidly changing and complex digital era and adapt to modern societies' demands. This need has led to the development of teaching approaches to equip students with creative and innovative skills to help prevent any future skills gap. This shift has fuelled the growth of STEAM (Science, Technology, Engineering, Arts and Mathematics) Education worldwide. Objectives: Our goal was to engage in a systematic review of the literature to identify the application and prevalence of emerging technologies within the landscape of STEAM Education. Methods: We engaged in a systematic review of the literature. Following the application of exclusion criteria to 461 studies, 43 studies were extracted and analysed. Findings and Conclusions: Analysis of these studies provides evidence of the fast-growing use of innovative emerging technologies within the STEAM landscape across all levels of education, from early childhood to college-level settings. Our analysis reveals an emphasis on developing STEAM-related disciplinary knowledge and the desire to develop students' 21st-century skills with a notable lack of targeted emphasis on developing understandings in the arts disciplines. We identify the need for carefully designed intervention studies involving collaboration between multidisciplinary STEAM experts that use high-quality measures which support the development of inferences relating to learning outcomes arising from such interventions.	All levels of education STEM Education
Παπαριστοδήμου (Efi Paparistodemou) Ε., Μελετίου - Μαυροθέρη (Maria Meletiou- Mavrotheri) Μ., & Serrado Bayes, A. (2017) The contribution of modelling using dynamic statistical packages to better understand statistical concepts and assess their practical value is considered particularly important in the contemporary literature (e.g., Gil & Ben-Zvi, 2011). The paper focuses on how teachers, as postgraduate students, model statistical reasoning problems and presents the results of a study conducted in the context of a quantitative approaches postgraduate course addressed to prospective and practicing teachers. The findings of the study demonstrate that the informal approach to statistical inference adopted in the course, which focused on modelling and simulation using the dynamic statistical software TinkerPlots2®, contributed to the development of both students' statistical reasoning and the degree of appreciation of the practical value of modelling in the decision-making process. The ability offered by the technological tool for building models and then simulating them to solve realistic problems helped student-educators understand the relationship between the part and the whole in their data, the effect of the Law of Large Numbers, and the connection between theoretical and empirical probability.	In-Service Teachers
Παπαριστοδήμου (Efi Paparistodemou) Ε., & Μελετίου - Μαυροθέρη Μ. (2017) This article focuses on the development of informal inferential reasoning using the dynamic software TinkerPlots®, which was designed specifically for elementary and middle school children. The results of the research show that teaching statistics can promote the development of inferential thinking in young children through informal, data-based approaches. They also suggest that the use of dynamic statistical software has the potential to enhance the teaching of statistics through inferential statistical reasoning, which is accessible to young students.	Primary Early Secondary
Paparistodemou, E., Meletiou-Mavrotheris, M. (2018) The present research focuses on the early childhood teachers' reflection on designing and implementing probability tasks. Five early childhood teachers participated in this research, which was organized in three stages: design of lesson plan, classroom implementation and reflection. The researchers analysed the design of each lesson, observed teachers implementing their lesson and interviewed them while they reflected on their instruction. Teachers discussed critical incidents that occurred through their teaching, and they reflected on	Pre-Primary

challenges for teaching probability. An initial analysis of the collected data indicates that early childhood teachers appreciated the importance of using tools and real-life scenarios in their classrooms for teaching stochastics. The study also provided some useful insights into the varying levels of attention that teachers paid to different kinds of activities during their lesson implementation, and into the different types of instructional material they used. Moreover, the findings also show that early childhood teachers' attention to different aspects of probability tasks can be developed through a reflective process on their teaching.

Table 4 Cyprus Report [Scientific Research]

5.1 Case studies

5.2.1 Description

Case study 1: Environmental Data Collection with micro:bit	
URL	https://www.pi-eggrafes.ac.cy/internal/seminar?12
Educational level/context	Secondary school teachers seminar-teachers' professional development at the Cyprus Pedagogical Institute
Description	Secondary school teachers learned to use and program the micro:bit microcontroller to collect environmental data, like temperature and wind speed. Simultaneously, they used GPS apps on their phones to log the exact coordinates of each measurement. Data was gathered in and around the Cyprus Pedagogical Institute, which offers a mix of urban, semi-natural, and landscaped settings. Each team collected ten readings from different locations to capture varied micro-environmental conditions. After collecting the data, participants exported the readings from the micro:bit and matched them with the GPS coordinates. These datasets were then uploaded to CODAP (Common Online Data Analysis Platform), where the data was viewed in tables and on digital maps. This allowed teachers to explore spatial patterns, compare conditions across sites, and examine links between geography and environmental variables. Teachers observed patterns like temperature variations and wind hotspots and saw how such student-centered, data-rich activities could boost data literacy and engagement in schools. The accessible setting of the Institute showed that valuable fieldwork can happen even in everyday environments.
Methodology	The activity aimed to give teachers hands-on experience with real-world data and inquiry-based learning aligned with STEM goals. It combined environmental science, digital tools, and geographic literacy, helping develop scientific reasoning and prediction skills.
Technology	microbit microcontroller, mobile GPS applications, CODAP platform
Outcomes	Enhanced teacher capacity in STEM education; promoted inquiry-based, interdisciplinary learning; demonstrated how to integrate real-world data and technology in the classroom; encouraged scientific reasoning and student-centered practices
Case study 2: A Cyprus-based study examined the reasoning of Year 9 (age 15) students as they analyzed large-scale data tables. It explored their strategies—like spotting trends and drawing conclusions—revealing both strengths and stumbling blocks in data interpretation skills	
URL	https://www.researchgate.net/publication/320877638_Students'_Emerging_Reasoning_About_Large-Scale_Data_Tables
Educational level/context	A research study about the competence of 15 years old secondary school students from Cyprus in using large-scale data
Description	The study involved 32 Year 9 students (15 years old) from six different classes in Cyprus. These students were divided into eight groups of four and participated in a structured workshop-style activity. During the session, students were presented with authentic large-scale population data from EUROSTAT, focusing on population change across various EU and candidate countries. The task required students to examine tables containing data on natural population increase, net migration, and total population growth. Students were guided through a set of reflective questions that prompted them to observe, compare, and interpret the data. Their reasoning processes were carefully observed and analyzed. The researchers used Shaughnessy's (2007) four-level framework for data-table comprehension to categorize students' responses and identify the levels of students' emerging reasoning.



Methodology	Structured workshop-style activity for the 32 students. Group work and Investigative approach for analyzing and interpreting the data from EUROSTAT presented in large tables. Students were guided through a set of reflective questions to reach valid results.
Technology	EUROSTAT data tables with real-world population statistics from EU and candidate countries, Indicators (Natural population increase, Net overseas migration, Total population growth), digital formats of the tables for student use
Outcomes	The analysis of student responses revealed that their reasoning aligned with the four levels of Shaughnessy's framework: (a) Level 1: Reading the data (e.g., extracting literal values), (b) Level 2: Reading within the data (e.g., making direct comparisons), (c) Level 3: Reading beyond the data (e.g., identifying patterns and trends), (d) Level 4: Reading behind the data (e.g., explaining data using real-world context). Students showed varying levels of comprehension, with some able to advance beyond basic reading and identify complex relationships between data points. The study confirmed that Shaughnessy's framework, originally used for smaller data sets, is also effective for analyzing student reasoning with large-scale statistical tables.
Case study 3: Fostering Inductive Reasoning in Geometry: Exploring the Sum of Interior Angles in Polygons	
URL	https://users.sch.gr/kostg/math/images/pdf/Syros2015.pdf
Educational level/context	A research study about 11 year-old (Grade 6) Cypriot students' inductive reasoning ability. The activities were implemented during a regular mathematics lesson (two consecutive teaching periods totaling 80 minutes). Aligned with the national curriculum for discovering the relationship between the number of sides in a polygon and the sum of its interior angles.
Description	This study presents an inquiry-based, inductive teaching approach designed to help students discover the relationship between the number of sides in a polygon and the sum of its interior angles, with a strong emphasis on collecting, organizing, and interpreting data. The activity was supported by a dynamic applet that allowed students to construct multiple polygon examples, visualize and measure their interior angles, and automatically display the total angle sum for each shape. To facilitate systematic analysis, students were required to transfer the visual data provided by the app into 2x2 tables—recording for each polygon the number of sides and the corresponding sum of the interior angles. This structured representation enabled them to study the patterns emerging from multiple cases, compare results across examples, and apply inductive reasoning to formulate a general rule. Through this process, students not only strengthened their understanding of geometric properties but also developed essential data literacy skills: collecting measurements, organizing them effectively, analyzing trends, and interpreting results. The digital applet functioned as a mediator between geometry and algebra, supporting both the construction of mathematical knowledge and the development of inductive thinking. The generalizations made by the students were further analyzed within a hierarchical framework of three cognitive levels, based on the strategies used during the generalization process.
Methodology	Group-work, hands-on activities, inquiry-based learning methodology and inductive reasoning processes for forming generalizations
Technology	Dynamic Geometry Applet (The online tool "Interior Angles of a Polygon" from Math Open Reference),
Outcomes	The study showed that students developed a deeper understanding of the relationship between the number of sides of a polygon and the sum of its interior angles through structured exploration and guided generalization. Initially, students recorded their observations in unstructured ways but gradually adopted more systematic strategies—such as grouping similar shapes and organizing data into tables. This helped them detect consistent patterns and move toward meaningful generalizations. Their reasoning varied across levels. Some students identified the constancy of angle sums within the same type of polygon, while others recognized that each additional side increased the angle sum by 180 degrees. A few reached the symbolic generalization that the sum of interior angles equals $180 \times (n - 2)$, where n is the number of sides. The students' strategies were analyzed using García-Cruz and Martínón's cognitive model of generalization. Most students operated at Level 1 (procedural activity) or Level 2 (local generalization), while only a small number demonstrated Level 3 (global generalization and transfer)—showing conceptual understanding and the ability to apply their reasoning in new contexts.

	The use of the digital applet significantly supported exploration, pattern recognition, and justification, while the structured activities encouraged students to engage in inductive reasoning, articulate conjectures, and validate their ideas through multiple representations.
Case study 4: The Interpretation of the Concepts of ‘Random’ and ‘Fair’: An Experimental Teaching Approach in Mathematics	
URL	www.pi.ac.cy/pi/files/tekmiriosi/ekdoseis/deltia/deltio15_oct2013.pdf
Educational level/context	The approach presented in this study was designed within the framework of School-Based Teacher Training Seminars offered by the Cyprus Pedagogical Institute, aimed at the effective teaching of Mathematics in primary education. The research part of the study focuses on the 11-year-old (Grade 6) Cypriot students’ inductive reasoning ability. The hands-on activities were implemented during a regular mathematics lesson (two consecutive teaching periods total 80 minutes). Aligned with the national curriculum for discovering the relationship between the number of sides in a polygon and the sum of its interior angles.
Description	Within the context of teachers training, this study presents a teaching approach designed to enhance 11-year-old students’ understanding of theoretical probability, with a strong focus on developing their ability to collect, analyze, and interpret data. The intervention involved modeling the Law of Large Numbers through the use of digital simulations of repeated experiments with wheels of fortune. Students engaged with computer-based tools that displayed both the observed frequency of outcomes (i.e., how often each color appeared) and the corresponding theoretical probabilities, across varying numbers of repetitions. This allowed students to gather meaningful data sets, observe patterns, and draw connections between empirical results and mathematical expectations. Through this process, students not only deepened their conceptual understanding of probability but also practiced key data literacy skills—such as recording results, recognizing trends, and interpreting statistical representations. Furthermore, the activity led to a better understanding of fairness in games of chance, as students were able to justify why random devices like coins, dice, or wheels of fortune can serve as equitable tools for decision-making.
Methodology	For students: Group-work, hands-on activities, inquiry-based learning methodology and inductive reasoning processes for forming generalizations For teachers: Lesson-study methodology
Technology	The interactive simulation “Advanced Builder Spinner” Available at: http://www3.stats.govt.nz/games/Spinners-advanced-builder-2/index.html
Outcomes	The study showed that using computer-based simulations with virtual spinners helped 11-year-old students build a deep understanding of theoretical probability and develop essential data literacy skills. Through repeated trials (10 to 10,000 spins), students collected and compared data, observing how relative frequencies approached theoretical probabilities—grasping the Law of Large Numbers. They applied this understanding to evaluate fairness in games, using data evidence rather than intuition. During activities, students created their own spinners, tested fairness through experimentation, and interpreted graphical outputs (percentages, frequencies), improving their ability to use and interpret data accurately. The results revealed that most students recognized the connection between high repetition and fair outcomes, and understood that more trials produced more stable, balanced data. Some students formed accurate generalizations (e.g. “the more spins, the closer to equal”), while others showed partial understanding—still a sign of conceptual progress. The discussion confirmed that simulations supported a smooth transition from empirical observations to theoretical reasoning, helped overcome misconceptions (e.g. thinking grouped colors were more probable), and strengthened students’ abstract thinking and reasoning with evidence. Overall, the approach enhanced their ability to generate, explore, interpret, and validate data—core elements of mathematical thinking and real-world decision-making. Concerning teachers, they gained valuable professional learning by observing critically in action a lesson plan they collaboratively developed. Through this process, teachers enhanced their ability to plan, observe, and analyze teaching practices, deepened their understanding of student learning, and strengthened collaborative skills. Watching a peer implement a lesson they co-created allowed them to connect theory to practice and promote evidence-based teaching improvement
Case study 5: From Landfill to Landmark: Revitalizing Our Environment	
URL	N/A
Educational level/context	Lower Secondary Education (students aged 12–13), implemented within STEAM and Environmental Education framework. Conducted in-class and outdoors (field data collection).

Description	A multidisciplinary STEAM project in which students address the challenge of transforming an illegal landfill into a sustainable and environmentally friendly area. The project unfolds through a sequence of interconnected activities that simulate real-world urban and environmental planning. Students begin by analyzing visual materials depicting the current state and potential restoration of the site, identifying key environmental, social, and economic issues. They then study the terrain using maps enriched with contour lines as well as environmental data on ground temperature and noise pollution. This allows students not only to interpret landforms and slopes, but also to analyze spatial patterns of environmental stress, enhancing their data literacy. Using Google Maps and the enriched topographic maps, students calculate areas, perimeters, and slopes, and identify zones of vegetation and fire risk. They also compare the map-based environmental data with field measurements collected using micro:bit microcontrollers. These are programmed to record temperature and noise levels at specified coordinates, helping validate or challenge the map data. Students then engage in a game-based decision-making process using intervention cards (e.g., afforestation, eco-parks, firebreaks, recycling centers). Each card includes the expected impact on environmental parameters such as temperature and noise reduction. If the final proposed solution does not achieve acceptable levels, penalties are applied to the group's budget. Budgeting and environmental impact calculations are done using Excel formulas. Students compute costs, biodiversity scores, and ecological footprints, iterating on their plans to meet budgetary and sustainability constraints. Finally, students build a scaled model—either physical or digital using platforms such as Fortnite, Minecraft, or Roblox—and present their proposals in a mock municipal council session. This reinforces civic awareness, critical thinking, and persuasive communication.
Methodology	Project-based learning (PBL), inquiry-based learning, game-based decision-making with intervention cards, and field-based environmental data collection using microcontrollers. Students follow a cycle of analysis, planning, measuring, modeling, and presenting.
Technology	micro:bit microcontroller, GPS-enabled smartphones, Google Maps, Excel (formulas), GIS tools, CODAP platform (optional), digital modeling platforms (Fortnite, Minecraft, Roblox), map storytelling
Outcomes	- Improved understanding of sustainability and land restoration - Hands-on experience with digital and environmental technologies - Development of analytical, mathematical, and civic skills - Enhanced student engagement through real-world and game-based learning - Competency in digital presentation and communication

Table 5 Cyprus Report [Case studies]

5.2.2 Summary

This report examines five educational case studies from Cyprus, all of which demonstrate how inquiry-based learning, and the integration of technology can enhance data literacy—the ability to collect, organize, analyze, and interpret data meaningfully. While the studies differ in audience, setting, and specific learning goals, they collectively highlight the value of engaging learners in real-world, data-driven tasks. Two of the cases (Cases 2 and 3) are research studies focused on student reasoning, while two others (Cases 1 and 4) were conducted through teacher training seminars organized by the Cyprus Pedagogical Institute. The fifth case (Case 5), a STEAM-based project with younger students, further broadens the landscape by embedding data literacy in a multidisciplinary, project-based learning environment. Across all five, hands-on experience, reflective questioning, and strategic use of digital tools are shown to be powerful levers for building data literacy in both teachers and students.

The first and fourth case studies, situated in teacher professional development contexts, demonstrate how educators can be empowered to lead data-rich learning experiences. In Case 1, secondary school teachers collected environmental data (e.g., temperature, wind speed, location) using micro:bit microcontrollers and GPS applications, then uploaded their data into CODAP (Common Online Data Analysis Platform) for analysis. This process supported teachers in moving from raw data to meaningful interpretation, equipping them with both the technological and pedagogical strategies needed to translate environmental observations into STEM-focused classroom activities.



In Case 4, although the focus was on primary students' understanding of probability, the lesson was designed and observed by teachers as part of a collaborative lesson study. Students used the “Advanced Builder Spinner” simulation tool to compare empirical frequencies with theoretical probabilities. This iterative experimentation enabled them to observe statistical patterns, such as those explained by the Law of Large Numbers. At the same time, teachers gained insight into how learners process data and how lessons can be designed to foster skills like recording results, identifying trends, and interpreting visual and numerical information.

The second and third case studies center on student learning and reasoning within mathematics and statistics. Case 2 involved 15-year-old students working with EUROSTAT population tables. Through structured activities, students extracted and interpreted demographic indicators such as net migration and natural population growth. Their reasoning was analyzed using Shaughnessy's four-level framework, which revealed varying degrees of proficiency—from basic data reading to complex contextual interpretation. While some students struggled with deeper analysis, others progressed toward competencies vital for navigating large datasets in real-world contexts.

Case 3 explored inductive reasoning through geometric investigation with 11-year-old students. Using a dynamic applet, students created and measured polygons, organized data into structured tables, and identified numerical patterns—specifically the relationship between the number of sides and the sum of interior angles. Over time, students moved from informal pattern recognition to formal generalization, with some articulating the rule $180 \times (n - 2)$. The analysis, guided by García-Cruz and Martínón's cognitive framework, illustrated how digital tools and structured inquiry supported both mathematical thinking and essential data literacy skills.

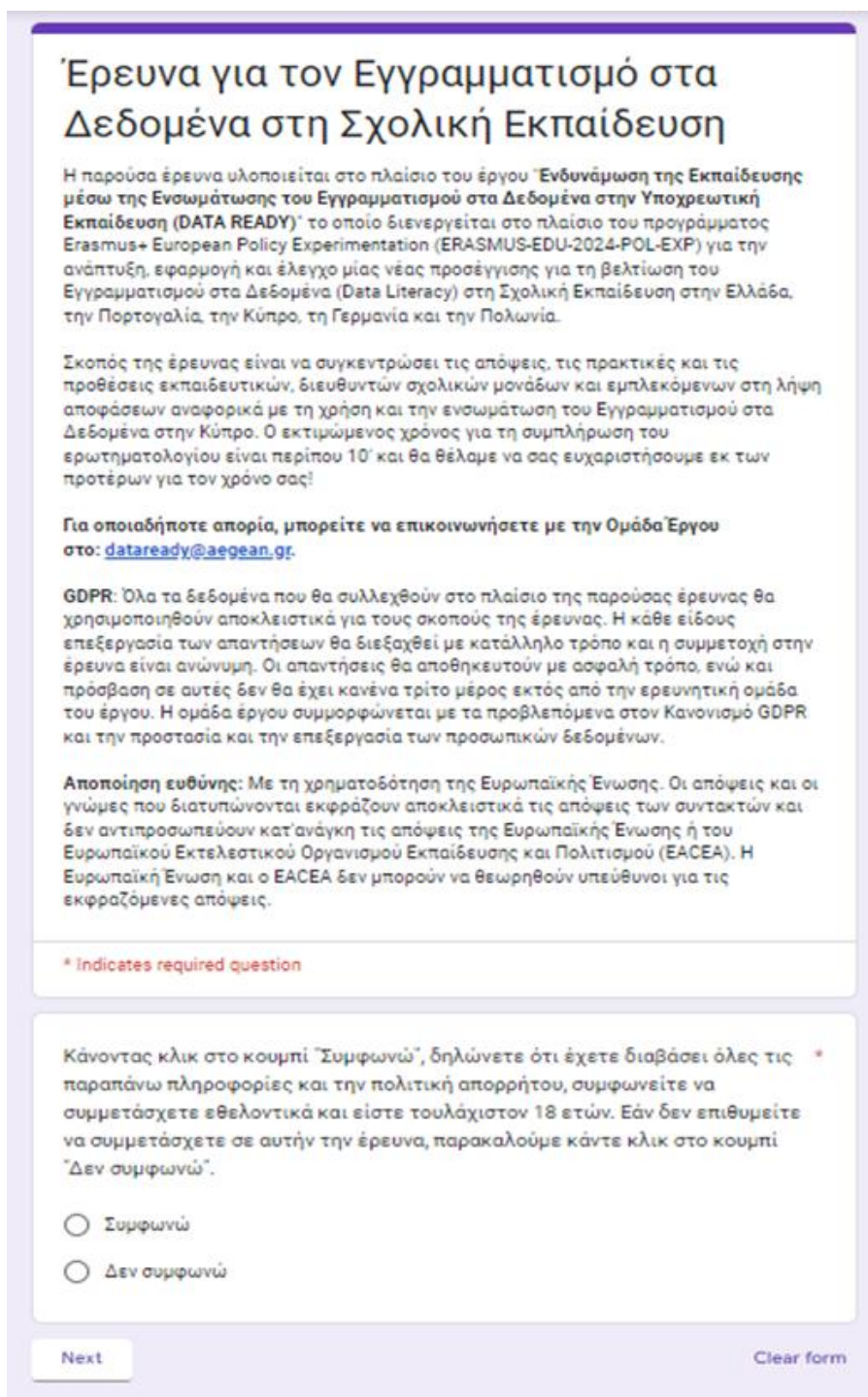
Case 5 extends the insights from the previous studies by illustrating how data literacy can be meaningfully embedded in a multidisciplinary STEAM project. Designed for lower secondary students (aged 12–13), this project challenged learners to redesign an illegal landfill site into a sustainable, eco-friendly area. Students engaged in a cycle of analysis, fieldwork, planning, modeling, and civic engagement. They examined the site's environmental, social, and economic conditions using maps, satellite imagery, and visual data, while collecting real-time environmental measurements with micro:bit microcontrollers. These datasets informed decisions made during a game-based planning phase, where students evaluated the environmental and budgetary impact of various interventions (e.g., afforestation, recycling centers, firebreaks). Budgeting and ecological assessments were conducted using Excel, fostering computational thinking and sustainability awareness. The project culminated in the creation of a scaled model—physical or digital (e.g., Minecraft, Roblox, Fortnite)—and a mock municipal council presentation, where students advocated for their solutions. This holistic approach not only cultivated data literacy, but also strengthened critical thinking, collaboration, and digital communication skills.

Across all five cases, data literacy was not treated as an isolated skill, but rather as a core competency embedded in broader learning context ranging from environmental science and civic education to probability, geometry, and statistics. Learners engaged in authentic processes of data generation, organization, comparison, interpretation, and explanation using real-world tools and platforms. Importantly, the studies emphasized scaffolded support, collaboration, and reflection as central to helping students and teachers transform raw data into meaningful insight.

In conclusion, these case studies collectively demonstrate that data literacy can be effectively developed through inquiry-based learning experiences that integrate technology and authentic data. The teacher training cases (1 and 4) show how educators can be equipped to guide such learning, while the research studies (2 and 3) and the STEAM project (Case 5) provide evidence that learners—from primary to secondary levels—can meaningfully engage in complex data reasoning. Together, these cases offer a practical and research-informed model for embedding

data literacy across the curriculum, preparing both students and teachers to think critically and act responsibly in a data-driven world.

5.1 Survey



Έρευνα για τον Εγγραμματισμό στα Δεδομένα στη Σχολική Εκπαίδευση

Η παρούσα έρευνα υλοποιείται στο πλαίσιο του έργου "Ενδυνάμωση της Εκπαίδευσης μέσω της Ενσωμάτωσης του Εγγραμματισμού στα Δεδομένα στην Υποχρεωτική Εκπαίδευση (DATA READY)" το οποίο διενεργείται στο πλαίσιο του προγράμματος Erasmus+ European Policy Experimentation (ERASMUS-EDU-2024-POL-EXP) για την ανάπτυξη, εφαρμογή και έλεγχο μίας νέας προσέγγισης για τη βελτίωση του Εγγραμματισμού στα Δεδομένα (Data Literacy) στη Σχολική Εκπαίδευση στην Ελλάδα, την Πορτογαλία, την Κύπρο, τη Γερμανία και την Πολωνία.

Σκοπός της έρευνας είναι να συγκεντρώσει τις απόψεις, τις πρακτικές και τις προθέσεις εκπαιδευτικών, διευθυντών σχολικών μονάδων και εμπλεκόμενων στη λήψη αποφάσεων αναφορικά με τη χρήση και την ενσωμάτωση του Εγγραμματισμού στα Δεδομένα στην Κύπρο. Ο εκτιμώμενος χρόνος για τη συμπλήρωση του ερωτηματολογίου είναι περίπου 10' και θα θέλαμε να σας ευχαριστήσουμε εκ των προτέρων για τον χρόνο σας!

Για οποιαδήποτε απορία, μπορείτε να επικοινωνήσετε με την Ομάδα Έργου στο: dataready@aegean.gr.

GDPR: Όλα τα δεδομένα που θα συλλεχθούν στο πλαίσιο της παρούσας έρευνας θα χρησιμοποιηθούν αποκλειστικά για τους σκοπούς της έρευνας. Η κάθε είδους επεξεργασία των απαντήσεων θα διεξαχθεί με κατάλληλο τρόπο και η συμμετοχή στην έρευνα είναι ανώνυμη. Οι απαντήσεις θα αποθηκευτούν με ασφαλή τρόπο, ενώ και πρόσβαση σε αυτές δεν θα έχει κανένα τρίτο μέρος εκτός από την ερευνητική ομάδα του έργου. Η ομάδα έργου συμμορφώνεται με τα προβλεπόμενα στον Κανονισμό GDPR και την προστασία και την επεξεργασία των προσωπικών δεδομένων.

Αποποίηση ευθύνης: Με τη χρηματοδότηση της Ευρωπαϊκής Ένωσης. Οι απόψεις και οι γνώμες που διατυπώνονται εκφράζουν αποκλειστικά τις απόψεις των συντακτών και δεν αντιπροσωπεύουν κατ'ανάγκη τις απόψεις της Ευρωπαϊκής Ένωσης ή του Ευρωπαϊκού Εκτελεστικού Οργανισμού Εκπαίδευσης και Πολιτισμού (EACEA). Η Ευρωπαϊκή Ένωση και ο EACEA δεν μπορούν να θεωρηθούν υπεύθυνοι για τις εκφραζόμενες απόψεις.

* Indicates required question

Κάνοντας κλικ στο κουμπί "Συμφωνώ", δηλώνετε ότι έχετε διαβάσει όλες τις παραπάνω πληροφορίες και την πολιτική απορρήτου, συμφωνείτε να συμμετάσχετε εθελοντικά και είστε τουλάχιστον 18 ετών. Εάν δεν επιθυμείτε να συμμετάσχετε σε αυτήν την έρευνα, παρακαλούμε κάντε κλικ στο κουμπί "Δεν συμφωνώ".

☐ Συμφωνώ

☐ Δεν συμφωνώ

Next Clear form

Figure 3 Cyprus Survey [Screenshot]

The national survey in Cyprus was conducted in the Greek language and the questionnaire was accessible through the following link: <https://forms.gle/3zn5CLcP9G61DuzE8>.

5.3.1 Demographic Data (Section A)

A total of 122 educators participated in the survey, confirming their voluntary consent and eligibility to take part. The gender distribution (Figure 2) was predominantly female (75.4%), reflecting broader trends in the teaching profession in Cyprus.

Φύλο

122 responses

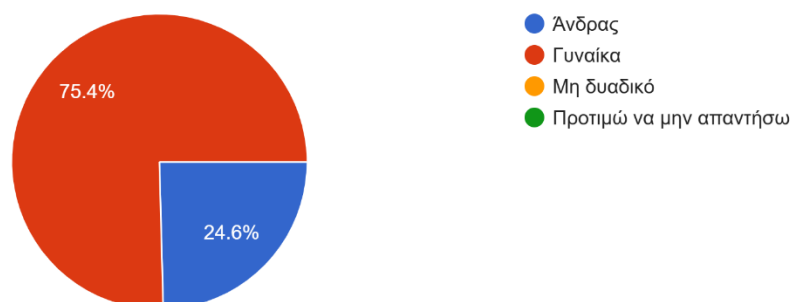


Figure 4 Cyprus Survey [Gender]

As shown in Figure 3, the respondents' age distribution was relatively balanced across several brackets, with the largest group (33.6%) falling within the 41–45 age range. This was followed by the 36–40 (18.0%) and 46–50 (16.4%) age groups. Together, these three categories comprised a substantial portion of the sample (68.0%), suggesting a participant pool that is mature and likely professionally established. Smaller percentages were recorded for the 51–55 (12.3%) and 30–35 (8.2%) age brackets, while only a few respondents were over 60, and none were under 30.

Ηλικία (έτη)

122 responses

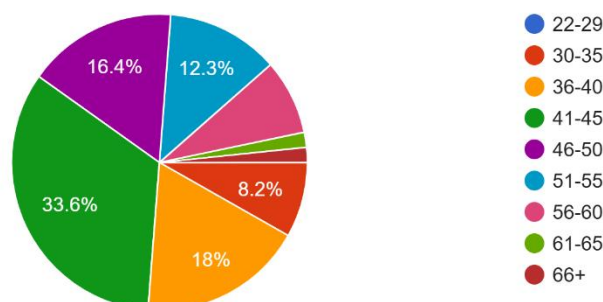


Figure 5 Cyprus Survey [Age]

About educational attainment (Figure 4), a substantial majority of participants (68.9%) held a master's degree (Μεταπτυχιακό Δίπλωμα Σπουδών), while 7.4% reported having a bachelor's degree (Πτυχίο) (Figure 4). A notable 23.0% of respondents held a Doctorate (Διδακτορικό), and a very small fraction (0.7%) reported Postdoctoral studies (Μεταδιδακτορικό). These figures underscore the overall high level of formal education among the participants in the sample.



Ποιο είναι το υψηλότερο επίπεδο τίτλου σπουδών που κατέχετε;

122 responses

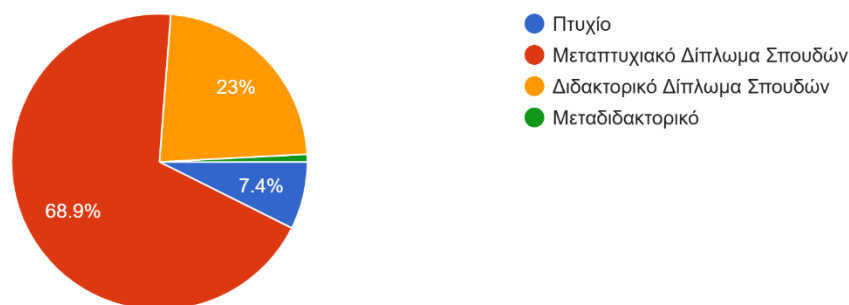


Figure 6 Cyprus Survey [Educational level]

Regarding their professional roles, Figure 5 shows that most respondents (83.6%) were active teachers across various educational levels and subject areas, including primary school teachers, kindergarten educators, and secondary school teachers of various subjects. Smaller groups identified as deputy school principals (n=9, 7.4%), school principals (n=2, 1.6%), and educational authority representatives (n=9, 7.4%).

Επιλέξετε τον τρέχοντα ρόλο σας στην εκπαίδευση

122 responses

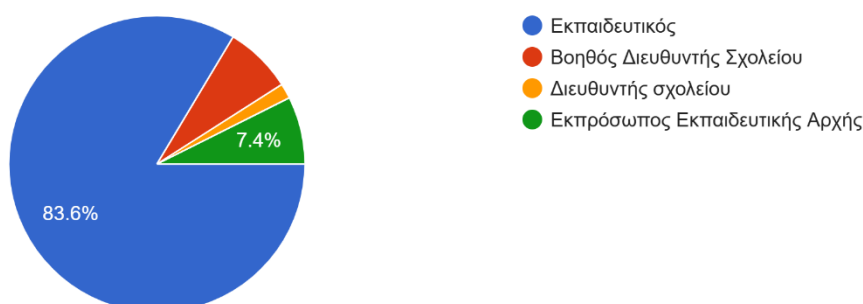


Figure 7 Cyprus Survey [Role in education]

The participants represented a broad interdisciplinary spectrum of teaching specializations. Primary Education teachers (Δάσκαλος/Δασκάλα) constituted the largest group, accounting for 24.8% of the sample, followed by Mathematics teachers, who comprised a notable proportion of 14.0%. Kindergarten teachers (Νηπιαγωγός) and Informatics teachers each constituted 5.0% of the respondents. Smaller proportions included Philology teachers (3.3%), and educators in Technology, Biology, and Physics, each representing 1.7% of the sample. A substantial portion—collectively categorized as 'Other'—included educators from various subject areas, interdisciplinary roles, or partial teaching appointments. This distribution highlights the growing significance of Data Literacy across all educational domains, extending from STEM and the humanities to early childhood education.

About the teaching experience of the sub-group of the active teaches (83.6%, n=102), the Figure 6 illustrates that the largest group had 12–19 years of experience (33.3%), followed closely by those with 20–30 years (30.4%). Educators with 4–6 years of experience made up 12.7% of the sample, while those with 7–11 years accounted for 10.8%. Early-career teachers with 1–3 years of experience represented 9.8%, and a small group (2.9%) had been teaching for more than 30

years. This variation in teaching tenure enriches the dataset, offering insights from educators at different career stages.

Έτη διδακτικής προϋπηρεσίας
102 responses

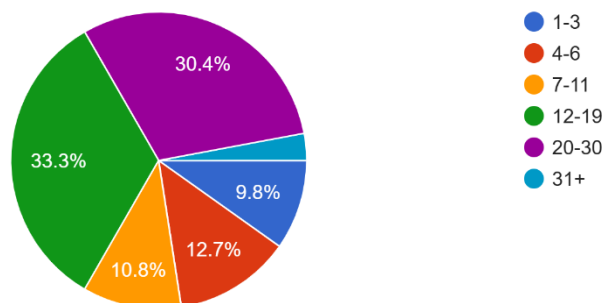


Figure 8 Cyprus Survey [Teachers: Experience]

Furthermore, the teachers surveyed were employed in schools of varying sizes, reflecting a diverse range of educational settings. As shown in Figure 7, the majority (68.6%) reported working in very large schools with enrollments exceeding 181 students. This was followed by 11.8% employed in medium-sized schools (61–120 students) and 9.8% in large schools with 121–180 students. The remaining participants reported working in small (6.9%) or very small (2.9%) schools, each with fewer than 60 students.

Μέγεθος Σχολείου
102 responses

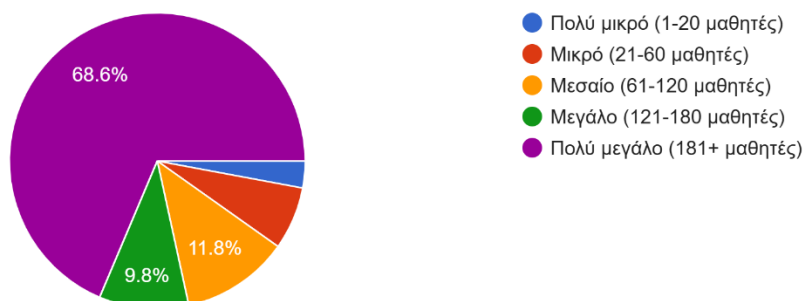


Figure 9 Cyprus Survey [Teachers: School size]

The subset of participants occupying administrative positions—specifically school principals and deputy principals ($n = 11$)—were employed across a range of educational contexts, exhibiting considerable variation in both institutional size and leadership tenure, as shown in Figures 8-11. In terms of school educational level, the majority of participants hold administrative positions in primary schools, while only 9.1% are employed in secondary education (Figure 8). About the size of the school, five participants reported working in very large schools enrolling more than 181 students; three were employed in schools with 121–180 students; two in medium-sized institutions with 61–120 students; and one in a very small school serving 1–20 students (Figure 9). Also, reported numbers of teaching staff at these schools varied substantially, ranging from 5 to 70 educators, as shown in Figure 10. This dispersion suggests heterogeneity in institutional scale and staffing, with no consistent pattern identifiable within the limited sample.



Τύπος Σχολείου

11 responses

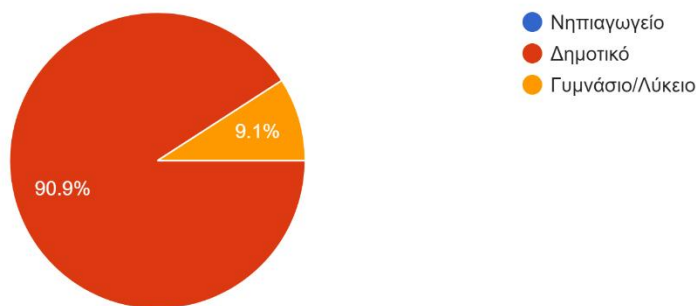


Figure 10 Cyprus Survey [Administrators: School category]

Μέγεθος σχολείου

11 responses

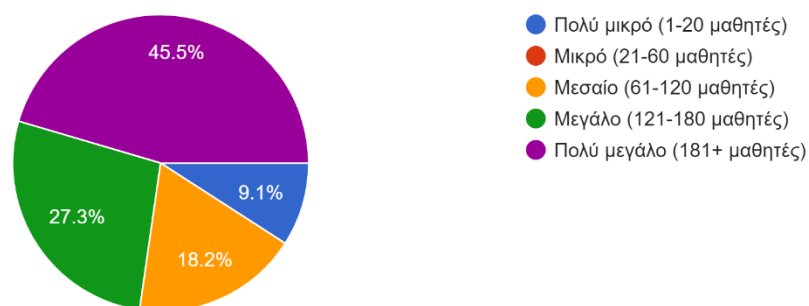


Figure 11 Cyprus Survey [Administrators: School size]

Αριθμός εκπαιδευτικών στο σχολείο

11 responses

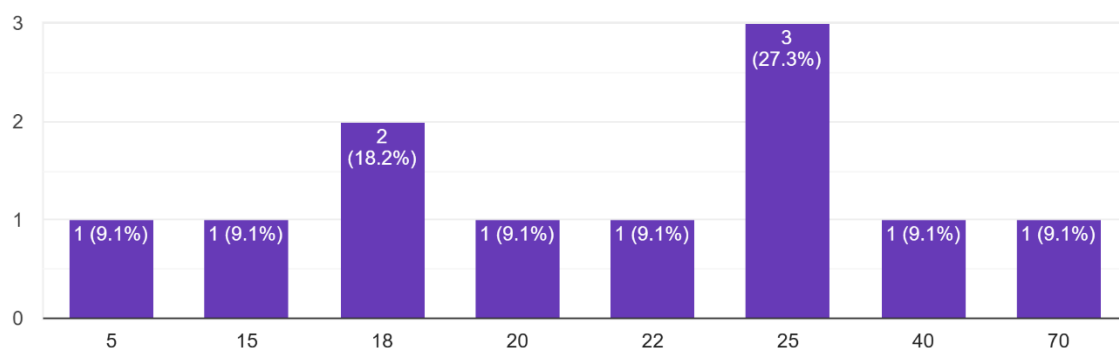


Figure 12 Cyprus Survey [Administrators: Number of teachers]

Figure 11 presents data on participants' leadership experience. Six respondents reported having 12–19 years of experience in educational leadership, two indicated 1–3 years, and the remaining three reported between 5 and 40 years. This distribution reflects a blend of early-career and highly experienced administrators, contributing a wide-ranging perspective on leadership practices. Collectively, this group represents a leadership demographic largely situated within larger educational institutions and characterized by considerable administrative expertise.

Έτη εμπειρίας στην εκπαιδευτική ηγεσία

11 responses

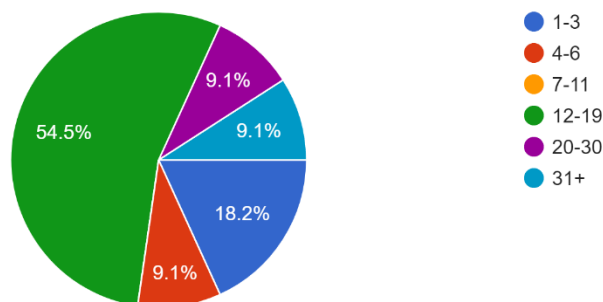


Figure 13 Cyprus Survey [Administrators: Experience]

Regarding the educational authority representatives (n=9 (Εκπρόσωπος Εκπαιδευτικής Αρχής), these participants bring a wealth of experience, particularly in long-term educational leadership, and many are positioned at the national level, highlighting their potential influence on strategic and systemic aspects of data literacy integration. The group is predominantly female, with eight (8) women and one (1) man. In terms of age, the majority fall within the 56–60 age group (3 individuals), followed by two (2) participants each in the 41–45 and 51–55 age ranges. One (1) participant is aged 46–50, and another is 66 or older, indicating an experienced and mature professional cohort. The nine educational authorities' representatives are holding leadership positions with varying levels of experience, as shown in Figure 12. Two participants reported more than 31 years of experience in educational leadership, while another two had between 20 and 30 years. An additional two participants reported 12–19 years of experience, and the remaining three indicated 4–6 years. This distribution reflects a balanced mix of senior and mid-career professionals, contributing diverse insights into educational governance.

Έτη εμπειρίας στην εκπαιδευτική ηγεσία

9 responses

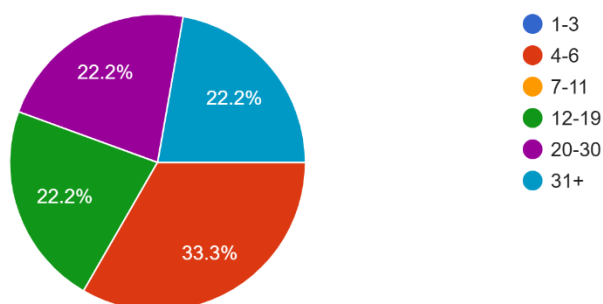


Figure 14 Cyprus Survey [Authority: Experience]

Notably, six of the nine participants currently serve in roles at the national level, while the remaining three operate at the local level, offering perspectives that span multiple layers of the educational system (Figure 13).



Επίπεδο Αρχής

9 responses

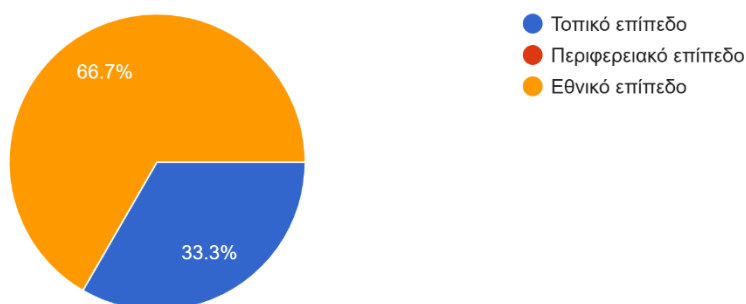


Figure 15 Cyprus Survey [Authority: Level]

The group is highly educated, since six (6) participants hold a Doctorate, and the remaining three (3) hold a master's degree. No participants reported qualifications below the postgraduate level, showcasing a strong academic background. Their ICT self-assessment scores further support this high competence. Specifically, seven (7) participants rated themselves at level 4, one (1) at level 5, and one (1) at level 3 on a 5-point proficiency scale. This suggests they are generally confident in their digital skills, an important asset for leadership in data-informed education. In terms of training in data literacy, four (4) participants reported informal training through self-learning or peer collaboration, three (3) had received formal university education, one (1) was trained through a Lifelong Learning Center, and one (1) had not received any training, indicating a mix of learning pathways and needs. All nine (9) educational authority representatives are placed in positions that likely influence policy, training, and systemic implementation of data-driven strategies. Their profile highlights a well-educated, digitally capable, and professionally experienced group of education leaders, whose perspectives on data literacy are crucial for shaping its integration in the broader educational system.

In relation to the ICT proficiency of the entire group of participants (n = 122), as illustrated in Figure 14, the survey results indicate a generally high level of proficiency, with the majority rating themselves at level 4 (Good) (51.6%) or level 5 (Very Good) (24.6%) on a 5-point scale, suggesting confidence in their digital skills. An additional 21.3% reported moderate digital skills (level 3), while only 2.5% selected level 2, and no participants rated themselves at the lowest level. This widespread confidence in digital competency is particularly pertinent given the study's focus on the integration of data in education.

Επίπεδο δεξιοτήτων Πληροφορικής

122 responses

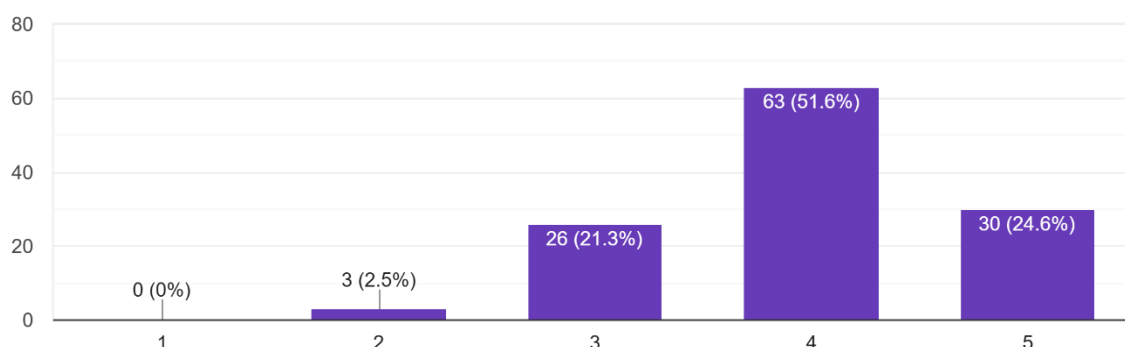


Figure 16 Cyprus Survey [ICT Level]

Concerning training related to data use and data literacy, the responses of the 122 participants varied considerably, as shown in Figure 15. While a subset of participants reported a lack of formal training, a large number indicated that they had engaged in informal learning through self-education, peer collaboration, or participation in non-structured learning opportunities to build relevant skills. This trend suggests a grassroots interest and recognition of the importance of data skills, even in the absence of systemic or institutionalized training programs. More specifically, 50.0% of the 122 participants noted that they had not received any training, while a significant portion (33.6%) had pursued informal learning, such as self-education or peer-supported development. As Figure 15 illustrates, formal training in this area was less common: 9.8% had participated in university-based programs, 5.7% had attended in-school in-service training, and only 0.8% had received training through Lifelong Learning Centers. These findings indicate both a growing awareness and interest in data-informed educational practices, as well as a clear need for more structured and accessible professional development opportunities in this field.

Έχετε λάβει εκπαίδευση σχετικά με τη χρήση δεδομένων ή τον Εγγραμματοισμό στα Δεδομένα;
122 responses

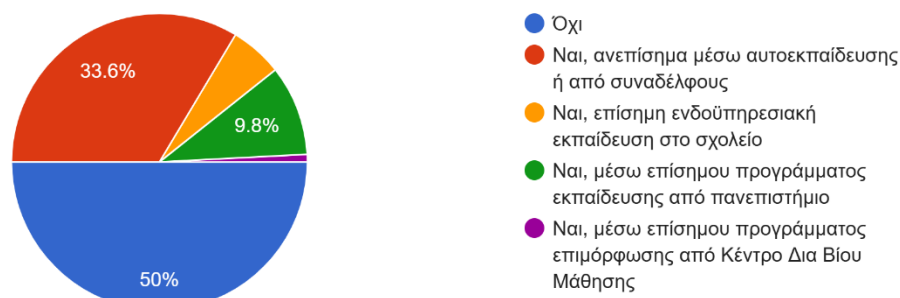


Figure 17 Cyprus Survey [Training in DL]

These demographic indicators suggest that the sample is composed of well-educated, digitally competent, and professionally experienced individuals, with a diverse age spread and a clear female majority. This context provides valuable insight into the background and potential perspectives of educators in Cyprus regarding data literacy and digital integration in schools.

In summary, the demographic profile of the respondents indicates a representative cross-section of educators within the Cypriot education system. Participants varied in terms of teaching level, years of experience, and subject expertise, offering a broad base for analyzing perspectives on data literacy. The diversity of roles and school contexts provides a reliable foundation for interpreting the subsequent findings, ensuring that the insights reflect the realities of a range of educational settings across the country.

5.3.2 Understanding and Awareness of Data Literacy (Section B)

This section presents the findings related to participants' levels of agreement with a set of statements assessing their understanding and awareness of Data Literacy and associated domains, including Digital Literacy, AI Literacy, Information Literacy, Statistical Literacy, Learning Analytics, and Science Literacy. Participants were asked to indicate their degree of agreement using a five-point Likert scale, where a response of '1' corresponded to 'Strongly Disagree' (Διαφωνώ πλήρως) and '5' corresponded to 'Strongly Agree' (Συμφωνώ πλήρως).

When asked to what extent they understood the concept of Data Literacy itself (Figure 16), 33.9% of participants agreed and 15.7% strongly agreed that they understood the term, while 30.6% selected a neutral stance. Notably, 14.9% disagreed and 5.0% strongly disagreed, indicating that approximately one in five respondents expressed limited familiarity with the concept. In contrast,

awareness levels were higher for related literacies. For example, Digital Literacy showed the strongest recognition, with 49.6% agreeing and 26.4% strongly agreeing—resulting in 76% of participants expressing positive understanding. A similar trend was observed for AI Literacy, where 65.3% of respondents agreed or strongly agreed, though 24.8% remained neutral. In the case of Information Literacy, 59.5% responded positively, while Statistical Literacy saw 49.6% agreement or strong agreement. These findings suggest a generally stronger familiarity with adjacent literacies compared to Data Literacy itself.

1. Κατανοώ τις ακόλουθες έννοιες:

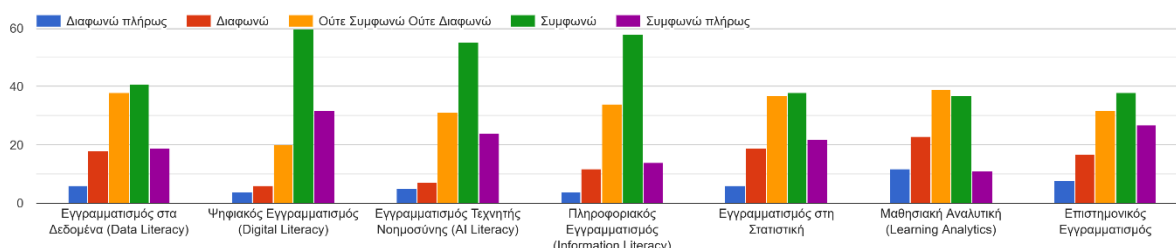


Figure 18 Cyprus Survey [Understanding the concepts Data Literacy, Digital Literacy, AI Literacy, Information Literacy, Statistical Literacy, Learning Analytics and Science Literacy]

Figure 17 provides insight into participants' views on the connection of Data Literacy with the six associated domains: Digital Literacy, AI Literacy, Information Literacy, Statistical Literacy, Learning Analytics, and Science Literacy. The responses indicate a strong overall agreement regarding the interconnectedness of these literacies. Specifically, 91.7% of participants agreed or strongly agreed that Data Literacy is relevant to Digital Literacy, while 87.6% saw it as relevant to Information Literacy. Similarly, 84.3% acknowledged its relevance to Statistical Literacy, and 82.6% to AI Literacy. Learning Analytics and Science Literacy also received high relevance ratings, with 81.8% and 80.2% agreement respectively. Neutral responses ranged from 7.4% to 15.7% across the domains, while disagreement was minimal, not exceeding 7.4% for any category. These results suggest that educators widely recognize Data Literacy as an integral component across various knowledge areas in contemporary education. The findings indicate that educators widely recognize Data Literacy as a critical, cross-disciplinary competency in contemporary education. Moreover, the strong consensus regarding its multifaceted nature and foundational relevance across diverse, interrelated domains underscores its essential role in advancing data-informed educational frameworks.

2.0 Εγγραμματοσύνη στα Δεδομένα συνδέεται με τις ακόλουθες έννοιες:

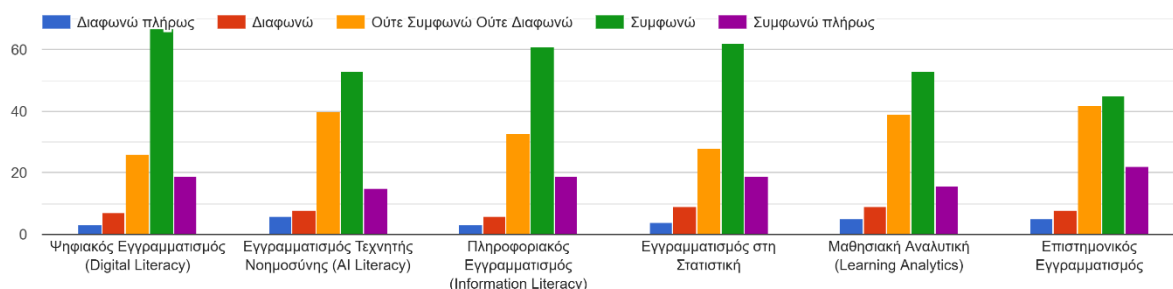


Figure 19 Cyprus Survey [Connection of Data Literacy with Digital Literacy, AI Literacy, Information Literacy, Statistical Literacy, Learning Analytics and Science Literacy]



According to the participants' understanding of the potential uses and applications of data in education, the results presented in Figure 18 show that most respondents expressed a strong grasp of these uses, with 36.1% agreeing and 39.3% strongly agreeing - totaling 75.4%. Meanwhile, 18.9% selected a neutral response, indicating moderate familiarity. Only a small portion of participants expressed limited understanding, with 4.1% disagreeing and 1.6% strongly disagreeing. These results highlight that most educators feel confident in recognizing how data can be applied to enhance educational processes, evaluation, research and decision-making practices within their professional context.

3. Κατανοώ τις πιθανές χρήσεις και εφαρμογές των δεδομένων για την υποστήριξη της μάθησης, της αξιολόγησης, της έρευνας και της λήψης αποφάσεων στην εκπαίδευση

122 responses

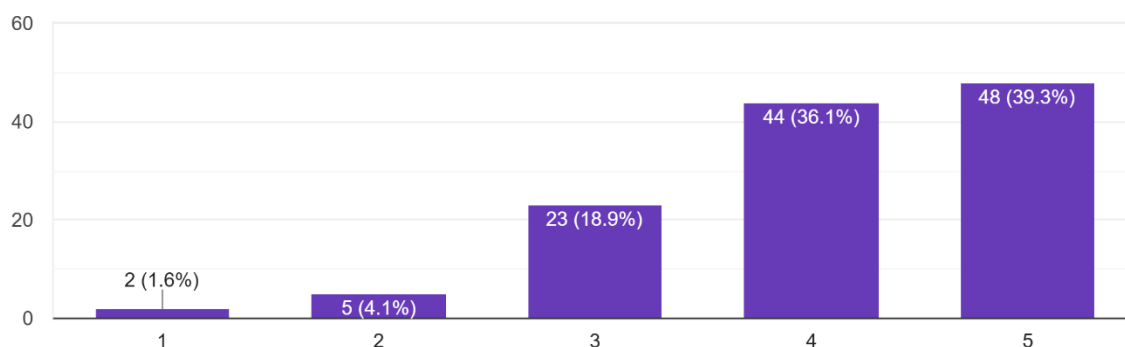


Figure 20 Cyprus Survey [Understanding the potential uses and applications of Data to Support Learning, Evaluation, Research, and Decision-Making in Education]

Figure 19 presents participants' views on recognizing Data Literacy as a vital component of the modern teacher's role. The results reveal a strong consensus, with 36.1% of respondents agreeing and an additional 36.9% strongly agreeing - bringing the total positive responses to 73.0%. A further 22.1% of participants remained neutral, reflecting a degree of uncertainty or moderate endorsement. Only a small minority (5.0%) disagreed with the statement. These findings suggest that the majority of educators perceive Data Literacy not just as a useful skill but as a fundamental aspect of effective teaching in today's data-driven educational environment.

4. Αντιλαμβάνομαι τον Εγγραμματισμό στα Δεδομένα ως ένα ουσιαστικό στοιχείο του σύγχρονου ρόλου των εκπαιδευτικών

122 responses

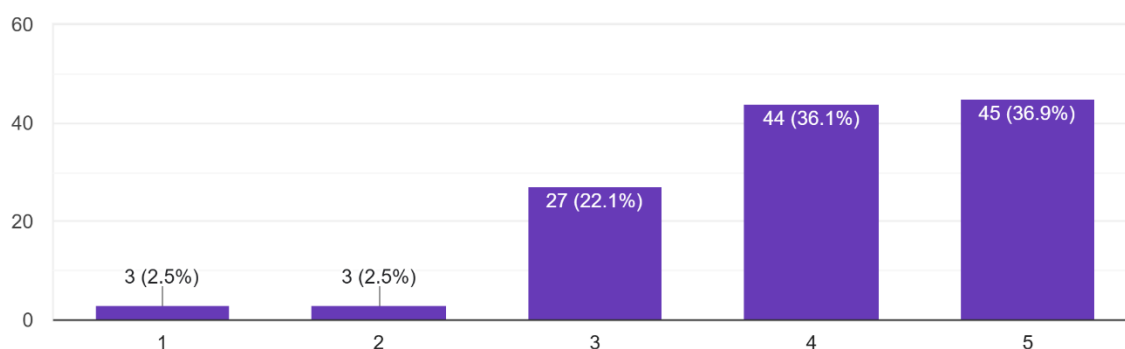


Figure 21 Cyprus Survey [Recognizing Data Literacy as a vital component of the modern teacher's role]

Figure 20 captures participants' recognition of the legal, ethical, and privacy issues associated with data use in education. A combined 80.3% of respondents acknowledged these concerns, with 33.6% agreeing and 46.7% strongly agreeing. Meanwhile, 13.9% selected a neutral stance, indicating either limited familiarity or indecision on the topic. A smaller group, comprising 5.8% who disagreed/strongly disagreed, expressed less awareness or concern regarding these issues. Overall, the majority of educators demonstrated a clear understanding of the importance of addressing ethical, legal, and privacy dimensions when working with data in educational contexts.

5. Αντιλαμβάνομαι τα νομικά, ηθικά και ζητήματα ιδιωτικότητας που σχετίζονται με τα δεδομένα στην εκπαίδευση

122 responses

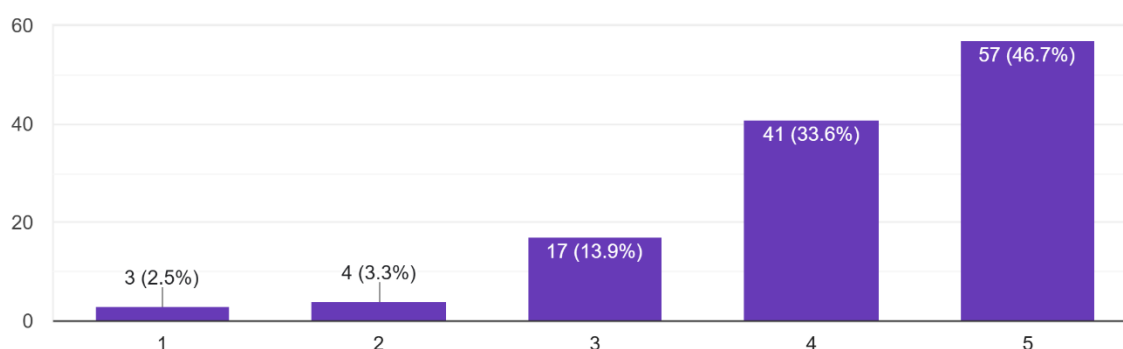


Figure 22 Cyprus Survey [Recognizing the legal, ethical and privacy issues associated with data in education]

Overall, the results in this section reveal that while many educators are familiar with the term "Data Literacy," a notable proportion still demonstrates limited understanding or remain neutral. Awareness of related literacies, such as Digital and AI Literacy, tends to be higher, suggesting that Data Literacy may not yet be as fully integrated into educators' conceptual frameworks. These findings underline the need for clearer definitions, contextual examples, and targeted awareness-raising initiatives within professional learning environments.

5.3.3 Knowledge and Skills (Readiness) in Data Literacy (Section C)

Figures 21 through 25 present a comprehensive overview of educators' self-perceived competence in various aspects of data literacy, including familiarity with data analysis techniques, digital data management, data interpretation, data visualization, and the application of data for decision-making in educational contexts.

As indicated in Figure 21, 42.6% of participants reported familiarity with data analysis methods, techniques, and tools (25.4% agreed; 17.2% strongly agreed). Nonetheless, a considerable proportion (41.0%) adopted a neutral stance, while 16.4% expressed disagreement to some extent, suggesting a moderate level of confidence and a potential need for further development in advanced analytical competencies.

6. Γνωρίζω μεθόδους, τεχνικές και εργαλεία ανάλυσης δεδομένων

122 responses

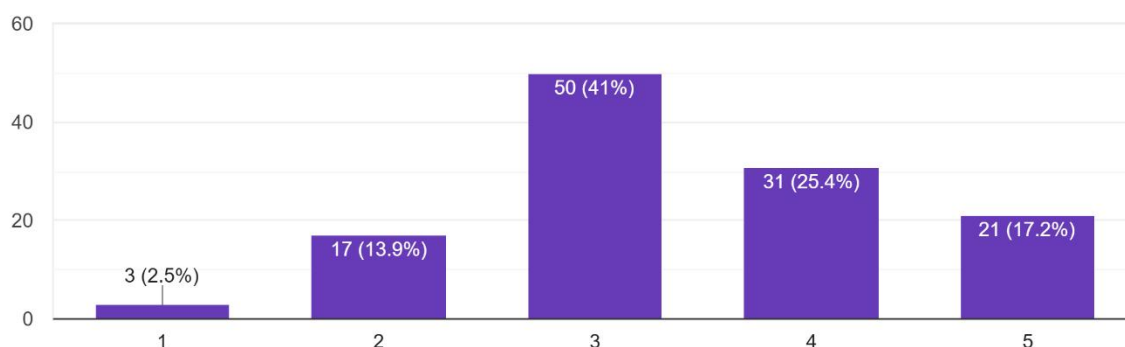


Figure 23 Cyprus Survey [I know of data analysis methods, techniques and tools]

In contrast, responses in Figure 22 reflect greater confidence in digital operational skills. A combined 54.1% of participants agreed or strongly agreed that they are capable of effectively managing and organizing data using digital tools, whereas 32.8% remained neutral and only 13.1% expressed disagreement. This indicates that educators generally possess strong foundational skills in digital data handling.

7. Ξέρω πώς να χρησιμοποιώ ψηφιακά εργαλεία για να διαχειρίζομαι και να οργανώνω αποτελεσματικά τα δεδομένα

122 responses

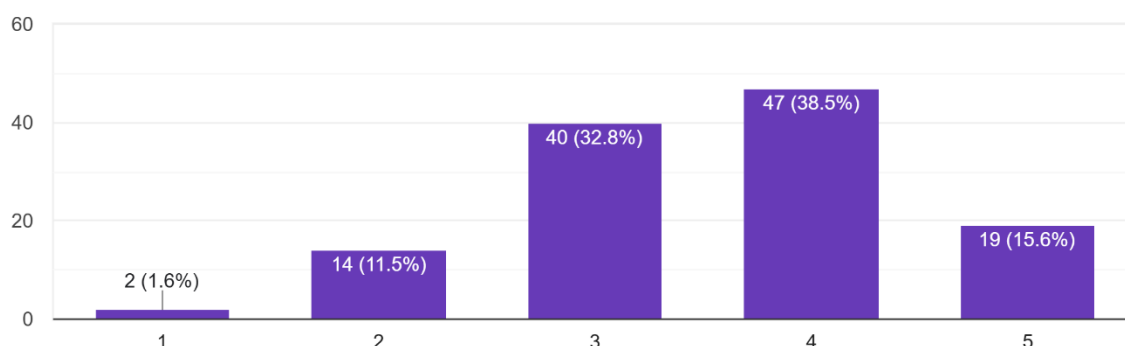


Figure 24 Cyprus Survey [I know how to use digital tools to manage and organize data effectively]

The findings in Figure 23 reveal particularly high confidence levels in data interpretation. A substantial 84.4% of respondents agreed (41.0%) or strongly agreed (43.4%) that they can read, understand, and interpret charts, tables, and graphs, and correlate them with other information.

Only 10.7% reported a neutral stance, and a mere 4.9% disagreed, underscoring this as one of the most developed competencies among the participants.

8. Ξέρω πώς να διαβάζω, να κατανοώ και να ερμηνεύω διαγράμματα, πίνακες και γραφήματα και να τα συσχετίζω με άλλες πληροφορίες

122 responses

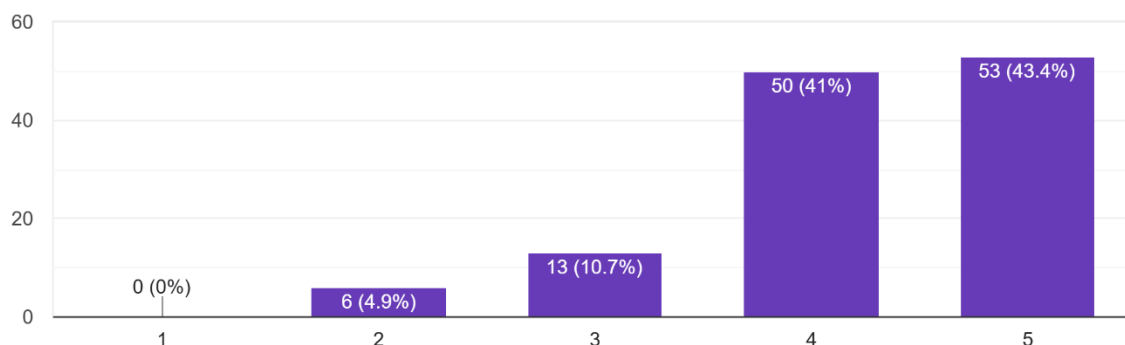


Figure 25 Cyprus Survey [I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information]

Similarly, Figure 24 shows that 75.4% of educators feel confident in creating charts, tables, and graphs for data visualization purposes (36.1% agreed; 39.3% strongly agreed), with 18.9% neutral and just 5.7% expressing disagreement. This reflects a high level of comfort with tools that support the visual communication of data.

9. Ξέρω πώς να δημιουργώ διαγράμματα, πίνακες και γραφήματα για να οργανώνω και να παρουσιάζω οπτικά τα δεδομένα

122 responses

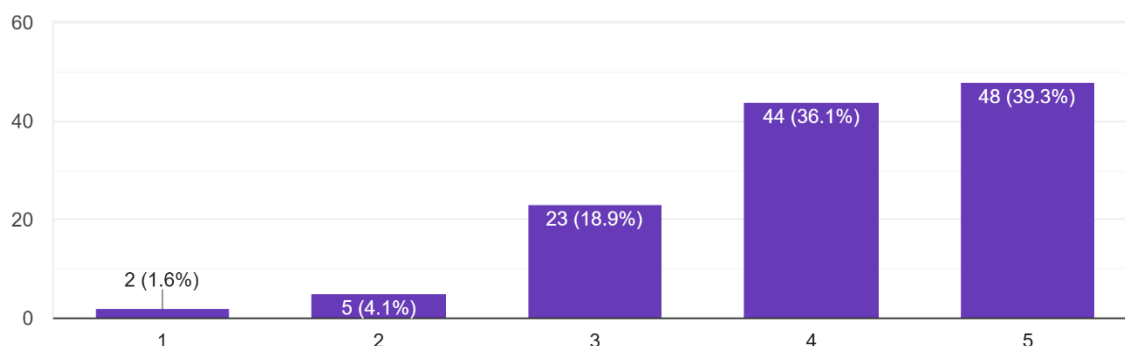


Figure 26 Cyprus Survey [I know how to create charts, tables, and graphs to organize and visually present data]

Finally, Figure 25 indicates strong perceived competence in applying data to solve problems and inform decision-making within professional practice. A total of 77.0% of participants reported agreement (43.4%) or strong agreement (33.6%), while 15.6% were neutral and 7.3% disagreed to some extent.



10. Ξέρω πώς να χρησιμοποιώ τα δεδομένα για να λύσω προβλήματα και να πάρω αποφάσεις σχετικές με τη δουλειά μου

122 responses

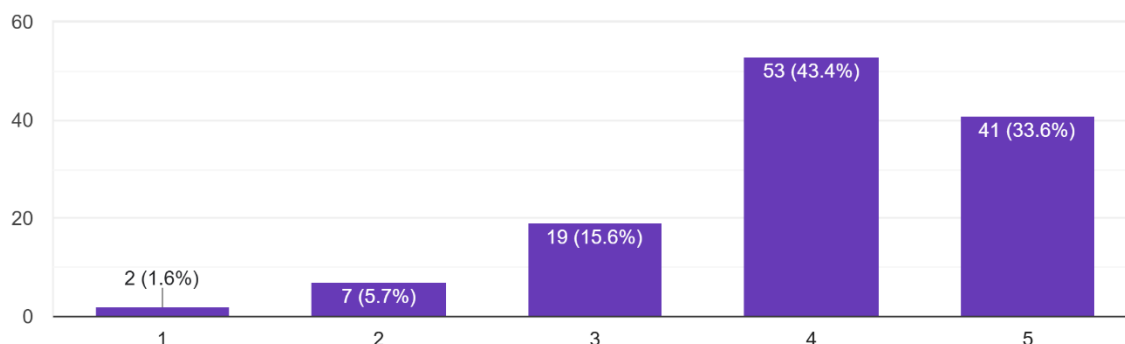


Figure 27 Cyprus Survey [I know how to make use of data to solve problems and take decisions related to my work]

Overall, the results suggest that while participants demonstrate considerable proficiency in data interpretation, visualization, and practical application, there remains a relative need to enhance competencies related to data analysis methods and tools. This highlights the importance of targeted professional development to support educators in deepening their analytical capabilities within a data-informed educational environment.

This section highlights educators' strong consensus on the relevance of data literacy to a wide range of educational domains. Most respondents agreed that data literacy supports teaching, evaluation, research, and decision-making in education, and they recognized it as a key component of the modern educator's role. Similarly, there was significant agreement on the importance of understanding legal, ethical, and privacy-related issues associated with data use. These results suggest that the teaching workforce values data literacy not only as a technical skill set but as a critical dimension of professional competence and ethical responsibility.

5.3.4 Current Practices and Implementation (Section D)

Figures 26 through 31 provide a detailed account of educators' engagement with data-informed practices in their professional settings. These practices encompass data collection, assessment, analysis, visualization, collaboration, and dissemination, offering a holistic view of how data is currently integrated into educational workflows.

In Figure 26, participants were asked whether they explore and collect data for their work. A combined 62.3% of respondents indicated positive engagement, with 39.3% agreeing and 23% strongly agreeing. Neutral responses accounted for 18.0%, while 19.7% of participants expressed disagreement (12.3% disagreed; 7.4% strongly disagreed). These figures suggest that while many educators recognize the relevance of data collection, nearly one in five remain disengaged from this practice, highlighting variability in adoption across contexts.

11. Εξερευνώ και συλλέγω δεδομένα για τη δουλειά μου (π.χ. έρευνες, αποτελέσματα αξιολογήσεων, στατιστικά συμμετοχής κ.ά.)

122 responses

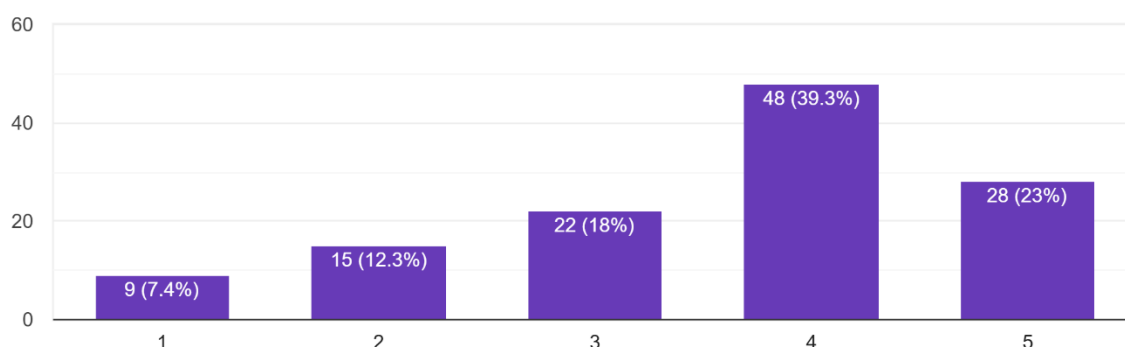


Figure 28 Cyprus Survey [I explore and collect data for my work]

Responses to Figure 27, which assessed the extent to which educators evaluate and use data in their professional activities, were similar. A total of 60.7% of participants either agreed (36.1%) or strongly agreed (24.6%) that they actively assess and utilize data. Neutral responses represented 20.5% of the sample, and 18.8% expressed disagreement (13.1% disagreed; 5.7% strongly disagreed). These results indicate that while data evaluation is commonly practiced, a significant portion of educators either do not engage with such processes or remain uncertain about their involvement.

12. Αξιολογώ και χρησιμοποιώ δεδομένα στη δουλειά μου

122 responses

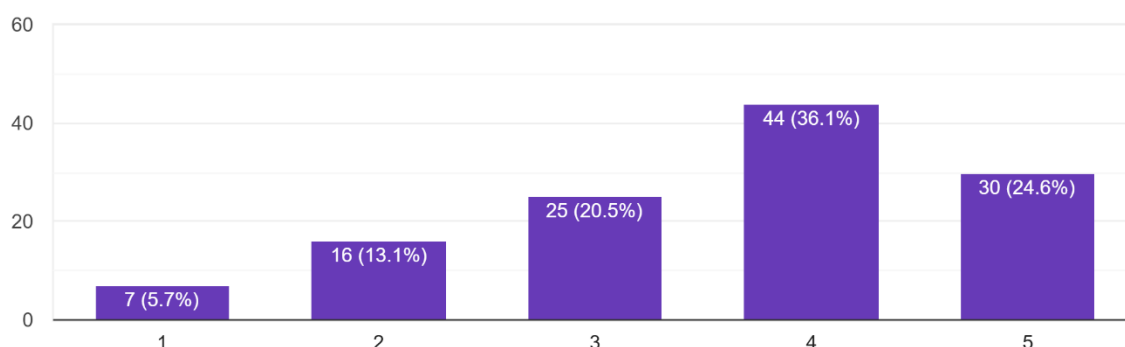


Figure 29 Cyprus Survey [I assess and use data in my work]

Figure 28 examined the use of data for analytical purposes, specifically in addressing educational problems or inquiries. Here, 64.7% of educators reported positive engagement, with 33.6% agreeing and 31.1% strongly agreeing. Neutral responses made up 20.5%, and 14.7% disagreed to some extent (11.6% disagreed; 3.3% strongly disagreed). This demonstrates a moderate-to-strong tendency among educators to use data as a problem-solving resource, though approximately one-third of respondents did not express clear agreement.



13.Αναλύω και συνθέτω δεδομένα για την επίλυση ενός προβλήματος ή ερώτησης

122 responses

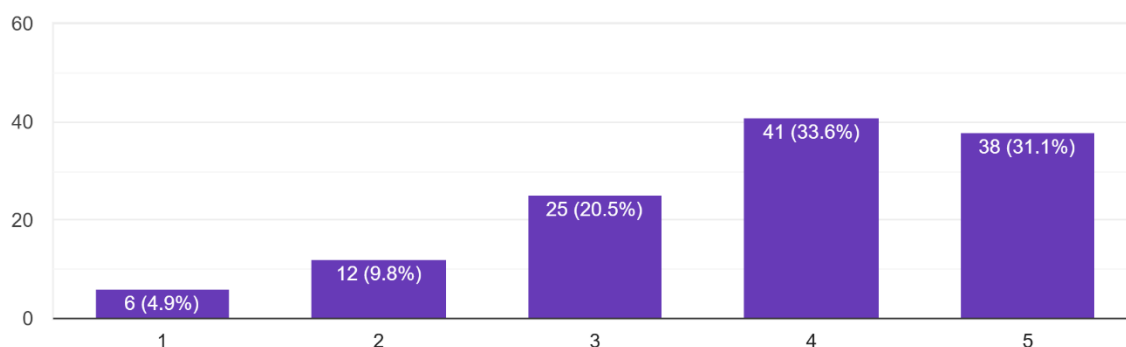


Figure 30 Cyprus Survey [I analyze and synthesize data for addressing a problem or a question]

In Figure 29, participants evaluated their use of data visualizations—such as charts and graphs—in their work. A total of 63.1% of respondents affirmed this practice (32.8% agreed; 30.3% strongly agreed), while 23.0% selected a neutral position and 13.9% reported disagreement. This high level of affirmative responses reflects a growing familiarity with visual data tools among educators, which may be attributed to the increasing availability of user-friendly digital platforms.

14.Χρησιμοποιώ οπτικοποιήσεις δεδομένων στη δουλειά μου

122 responses

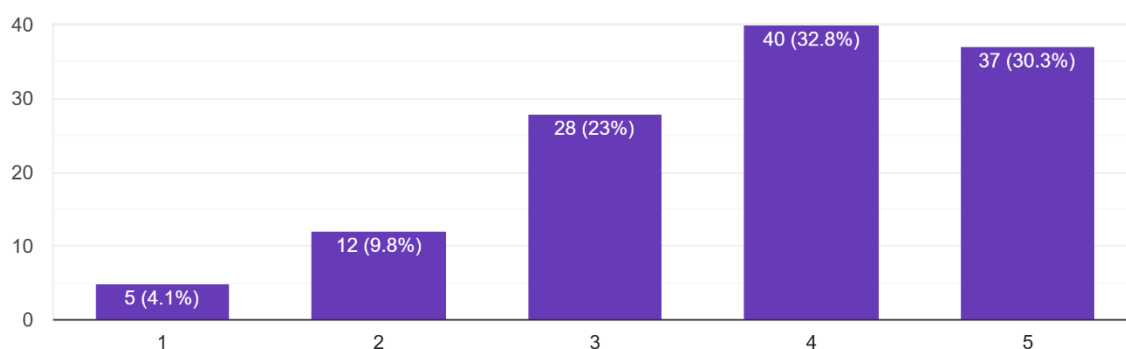


Figure 31 Cyprus Survey [I use data visualizations in my work]

Figure 30 explored collaborative engagement, specifically whether educators interpret educational data together with colleagues. The data indicate slightly lower levels of collaborative practice: 55.0% of participants agreed (32.0%) or strongly agreed (23.0%), while 20.5% remained neutral and 24.6% expressed disagreement (13.9% disagreed; 10.7% strongly disagreed). These findings suggest that while collaborative data engagement is present, it may not yet be a widespread or institutionalized practice in all educational settings.



15.Συνεργάζομαι με συναδέλφους για την ερμηνεία εκπαιδευτικών δεδομένων

122 responses

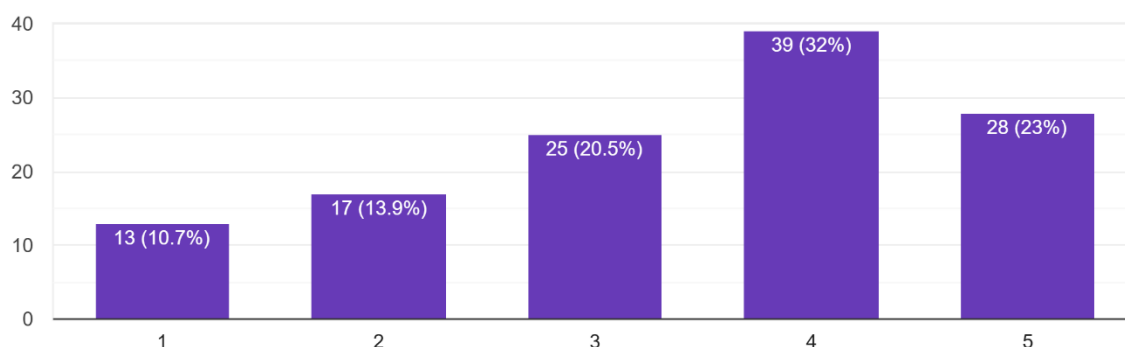


Figure 32 Cyprus Survey [I collaborate with colleagues on interpreting educational data]

Finally, Figure 31 addressed whether educators share data with key stakeholders, including students, parents, colleagues, and school administration. In this area, 49.2% of respondents indicated positive engagement (32.0% agreed; 17.2% strongly agreed), 24.6% were neutral, and 26.2% disagreed (18.0% disagreed; 8.2% strongly disagreed). The relatively high proportion of neutral or negative responses may point to existing barriers in communication practices, or uncertainty about data-sharing protocols and responsibilities.

16.Μοιράζομαι δεδομένα με μαθητές, γονείς, εκπαιδευτικούς, διοίκηση και άλλους

122 responses

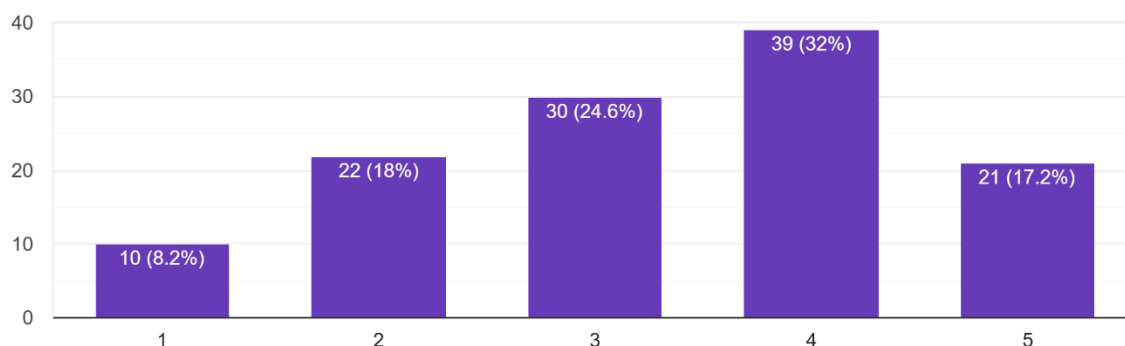


Figure 33 Cyprus Survey [I share data with students, parents, teachers, administration and others]

Collectively, the results from this section demonstrate that educators in Cyprus are moderately engaged in implementing data-informed practices, particularly in relation to personal data usage (collection, analysis, visualization). However, practices involving collaboration and data sharing show slightly lower engagement, indicating areas where further institutional support, professional development, and structured guidance may be required to promote more consistent and systemic use of educational data across the teaching profession.

Findings in Section D indicate varying levels of confidence and frequency in the practical application of data literacy skills. While a majority of educators report being familiar with reading and interpreting data, fewer feel confident in creating visualizations or synthesizing information to solve problems. Collaborative and communicative practices related to data use—such as sharing and discussing data with colleagues or stakeholders—remain less common. These

results highlight areas where educators require further capacity-building to shift from passive data consumption to active, data-informed decision-making.

5.3.5 Attitudes and Dispositions Towards Data Literacy (Section E)

Participants expressed strong agreement with the idea that data enhances core educational processes such as learning, teaching, and assessment. As shown in Figure 32, 85.1% of respondents either agreed (51.2%) or strongly agreed (33.9%) that data use contributes positively to these areas. Neutral responses accounted for 12.4%, and only a small minority (2.5%) expressed disagreement. These findings indicate widespread endorsement of data-informed practices as valuable tools for pedagogical improvement.

17. Κατά τη γνώμη μου, τα δεδομένα βελτιώνουν:

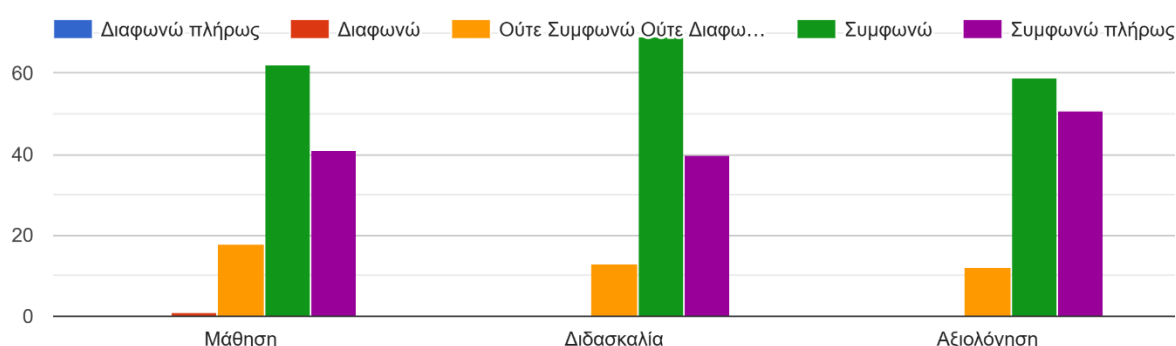


Figure 34 Cyprus Survey [In my opinion, data enhance: Learning, Teaching, Assessment]

With respect to differentiated instruction, educators also reported favorable attitudes. According to Figure 33, 79.5% of participants agreed (46.7%) or strongly agreed (32.8%) that data supports personalization in teaching. A further 18.9% responded neutrally, while just 1.6% disagreed. This suggests a broad recognition of data's potential to tailor instruction to individual learning needs, aligning with inclusive and student-centered teaching approaches.

18. Πιστεύω ότι τα δεδομένα βελτιώνουν την εξατομίκευση και τη διαφοροποιημένη διδασκαλία
122 responses

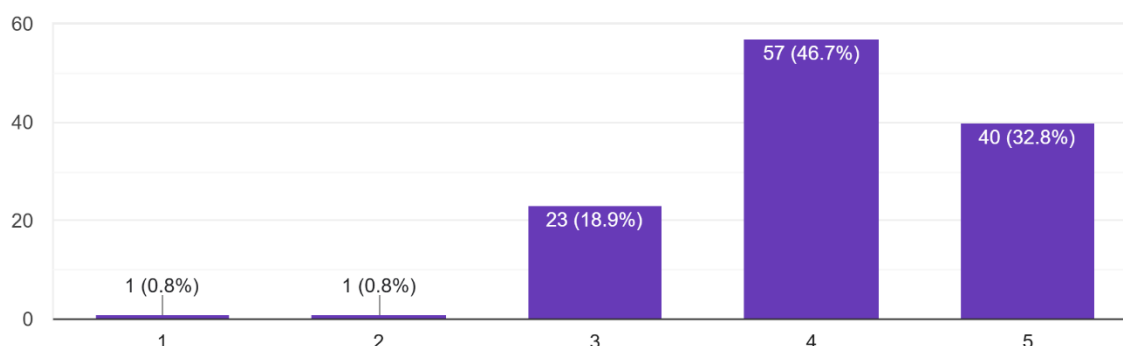


Figure 35 Cyprus Survey [I believe that data enhance personalization and differentiated teaching]



Perceptions regarding data's role in promoting equity were slightly more reserved. As depicted in Figure 34, 64.8% of educators agreed or strongly agreed that data-driven methodologies enhance educational equity. However, a notable 31.1% maintained a neutral stance, and 4.1% disagreed to some extent. While the majority expressed optimism, the relatively high rate of neutrality may reflect uncertainty or a lack of direct evidence of equitable outcomes in participants' own contexts.

19. Πιστεύω ότι οι μεθοδολογίες που βασίζονται σε δεδομένα βελτιώνουν την εκπαιδευτική ισότητα

122 responses

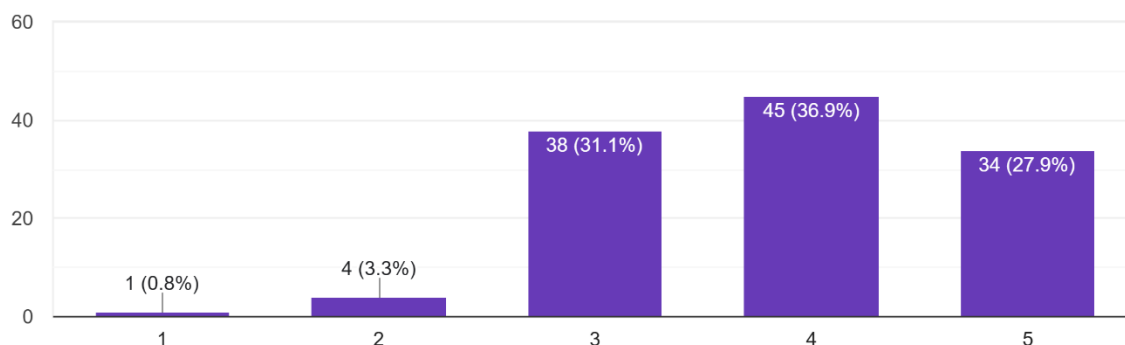


Figure 36 Cyprus Survey [I believe that the data-driven methods improve educational equity]

Although the benefits of data were widely acknowledged, concerns emerged around the potential increase in workload. Figure 35 reveals that 64.8% of respondents perceived data-driven methods as contributing to a heavier professional burden, with 36.9% agreeing and 27.9% strongly agreeing. Meanwhile, 33.6% selected a neutral option and 12.3% expressed disagreement. This highlights an important tension: while educators value the use of data in theory, its practical implementation may pose challenges in terms of time, effort, and institutional capacity.

20. Πιστεύω ότι οι μεθοδολογίες που βασίζονται σε δεδομένα αυξάνουν το φόρτο εργασίας των εκπαιδευτικών

122 responses

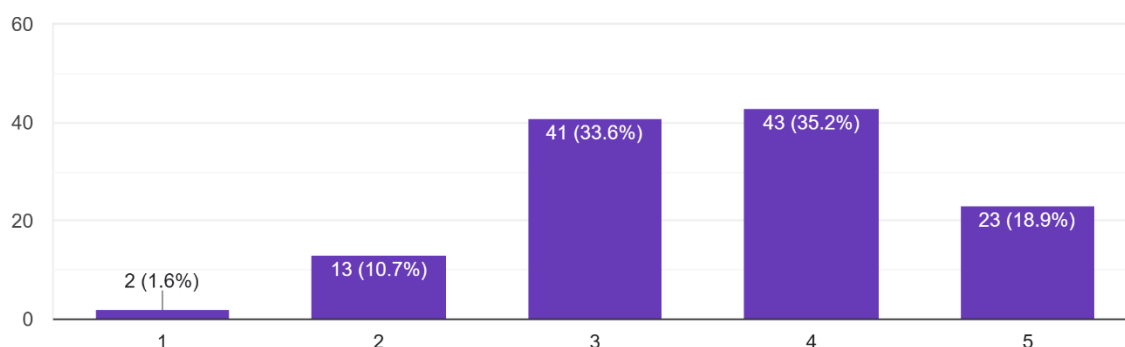


Figure 37 Cyprus Survey [I believe that the data-driven methods increase teachers' workload]

In conclusion, the data presented in Figures 32 through 35 demonstrate that educators in Cyprus generally hold positive attitudes toward data literacy and its integration into educational practice. However, these views are tempered by pragmatic concerns, particularly regarding workload and



the realization of equity-related goals. These findings underscore the importance of not only promoting data-informed practices but also ensuring that educators are adequately supported through training, time allocation, and systemic guidance.

Educators in Cyprus generally exhibit a positive attitude toward data literacy, associating it with improved teaching, assessment, and personalization. There is widespread belief in its potential to promote educational equity, although concerns were also raised regarding its impact on workload. These findings reflect an openness to embracing data-informed practices, tempered by realistic concerns about time, resources, and institutional support.

5.3.6 Policy and Curriculum Perspectives (Section F)

Educators' responses to items related to policy frameworks, institutional support, and curriculum integration reveal a critical gap between the perceived importance of data literacy and the systemic conditions necessary for its effective implementation.

As shown in Figure 36, there is a strong perception that the current educational system in Cyprus does not sufficiently promote data literacy in schools. Only 9.8% of participants responded positively, with 9.0% agreeing and a mere 0.8% strongly agreeing that the system offers adequate support. In contrast, a clear majority - 60.7% - expressed negative perceptions, comprising 45.1% who disagreed and 15.6% who strongly disagreed. A notable 29.5% adopted a neutral stance, suggesting that a substantial portion of educators either lack information on system-level initiatives or find the existing efforts insufficiently visible or impactful.

21. Το εκπαιδευτικό σύστημα προωθεί επαρκώς τον Εγγραμματισμό στα Δεδομένα στα σχολεία
122 responses

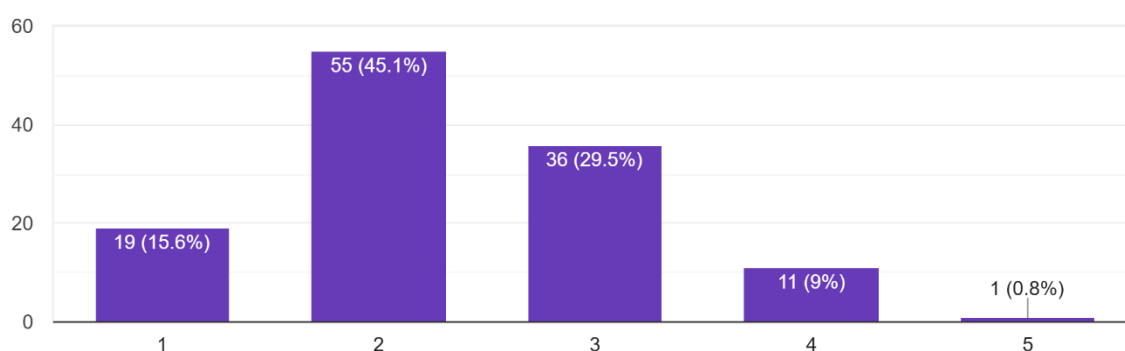


Figure 38 Cyprus Survey [Educational system sufficiently promotes Data Literacy in schools]

The issue of curriculum integration was assessed in Figure 37, yielding similarly unfavorable results. Only 9.8% of educators—9.0% agreeing and 0.8% strongly agreeing—believe that school curricula effectively integrate data literacy concepts and methodologies. A majority of 59.1% disagreed (44.3% disagreed; 14.8% strongly disagreed), while 31.1% indicated neutrality. These findings point to a widespread perception that data literacy is not embedded meaningfully in curricular structures, whether as a stand-alone competency or integrated across subject areas.



22. Τα σχολικά αναλυτικά προγράμματα ενσωματώνουν αποτελεσματικά τις έννοιες και μεθόδους του Εγγραμματισμού στα Δεδομένα

122 responses

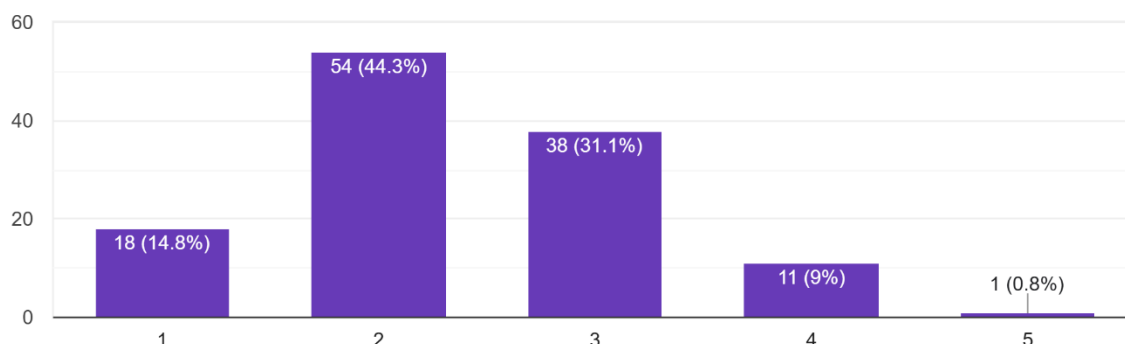


Figure 39 Cyprus Survey [School curricula effectively integrate Data Literacy concepts and methods]

In contrast, opinions about the role of school administrators in data literacy integration (Figure 38) were more varied. A total of 45.9% of respondents agreed (28.7% agreed; 17.2% strongly agreed) that school leaders play a critical role in promoting data-informed practices. However, 27.9% of educators were neutral, and 26.3% disagreed to some extent (18.9% disagreed; 7.4% strongly disagreed). These results suggest variability in leadership engagement, possibly reflecting differences between schools or a lack of systematic guidance on how principals and senior staff can support data literacy adoption.

23. Οι Διευθυντές των σχολείων διαδραματίζουν κρίσιμο ρόλο στην επιτυχή ενσωμάτωση του Εγγραμματισμού στα Δεδομένα

122 responses

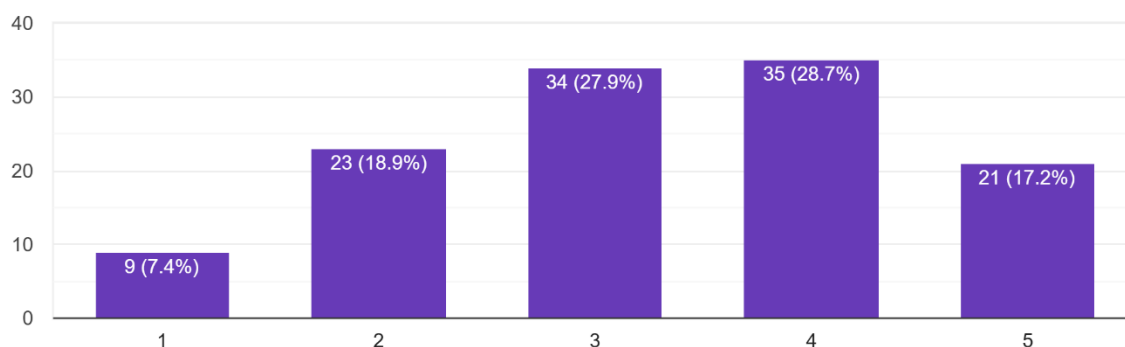


Figure 40 Cyprus Survey [School administrators play a critical role in successful Data Literacy integration]

Educators' self-assessed preparedness to manage ethical, legal, and privacy-related issues is notably limited. According to Figure 39, only 16.4% expressed confidence in their knowledge in this area (15.6% agreed; 0.8% strongly agreed), while a large proportion - 41.8% - reported a neutral stance. Meanwhile, 41.8% expressed disagreement (33.6% disagreed; 8.2% strongly disagreed). These results highlight a significant area of concern: while educators may be willing to use data in their practice, many feel unequipped to navigate its ethical dimensions, including responsible use, student privacy, and data security.



24. Οι εκπαιδευτικοί διαθέτουν επαρκείς γνώσεις για να διαχειριστούν ζητήματα ηθικής που σχετίζονται με εκπαιδευτικά δεδομένα (ιδιωτικότητα/ασφάλεια/υπεύθυνη χρήση)

122 responses

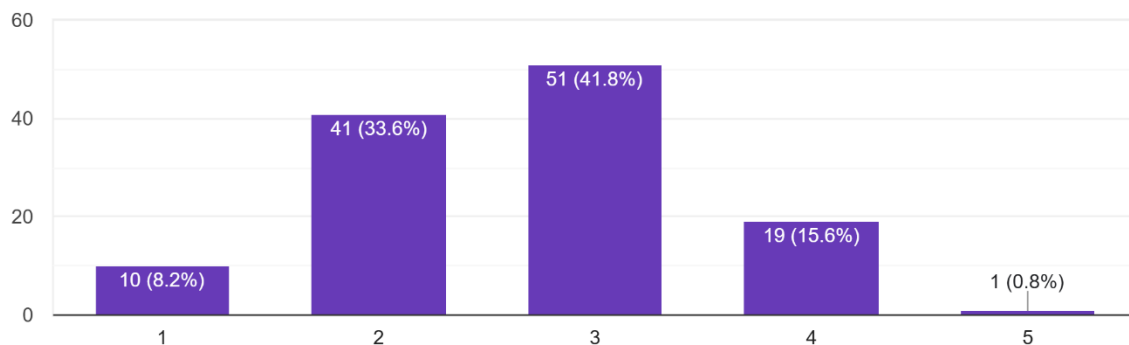


Figure 41 Cyprus Survey [Teachers have adequate knowledge to address ethical considerations related to educational data (privacy/security/responsible use)]

Perceptions of professional autonomy in applying data-driven methods were equally divided. In Figure 40, only 16.4% of participants reported having sufficient autonomy to implement such methods (14.8% agreed; 1.6% strongly agreed). Both disagreement and neutrality were high and equally distributed, with 41.0% selecting "neutral" and 42.6% indicating disagreement (35.2% disagreed; 7.4% strongly disagreed). This parity between neutral and negative responses suggests that a large portion of the teaching workforce either lacks the flexibility to experiment with data practices or is unsure about the boundaries of their professional agency in this regard.

25. Οι εκπαιδευτικοί διαθέτουν επαρκή αυτονομία για να εφαρμόσουν μεθόδους που βασίζονται σε δεδομένα

122 responses

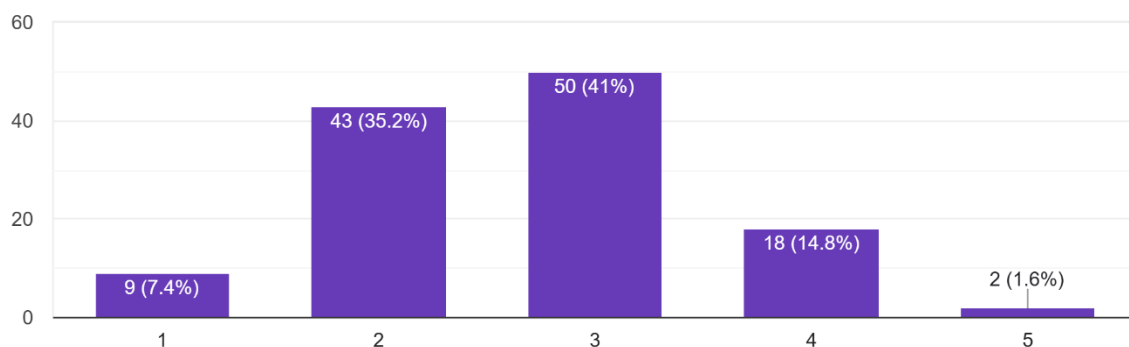


Figure 42 Cyprus Survey [Teachers have adequate autonomy to implement data-driven methods]

In Figure 41, participants evaluated whether the school curriculum sufficiently addresses key competencies associated with data literacy. These include data collection, analysis, interpretation, visualization, and communication. Across all competencies, reported agreement levels were consistently low, indicating a shared perception of limited curricular provision. The majority of educators either disagreed or remained neutral for each sub-domain, further underscoring the need for explicit curricular integration of these core skills. While detailed

breakdowns per skill were not included in the summary, the overall trend points to a lack of systematic instruction in the foundational elements of data literacy.

26. Τα σχολικά αναλυτικά προγράμματα καλύπτουν επαρκώς

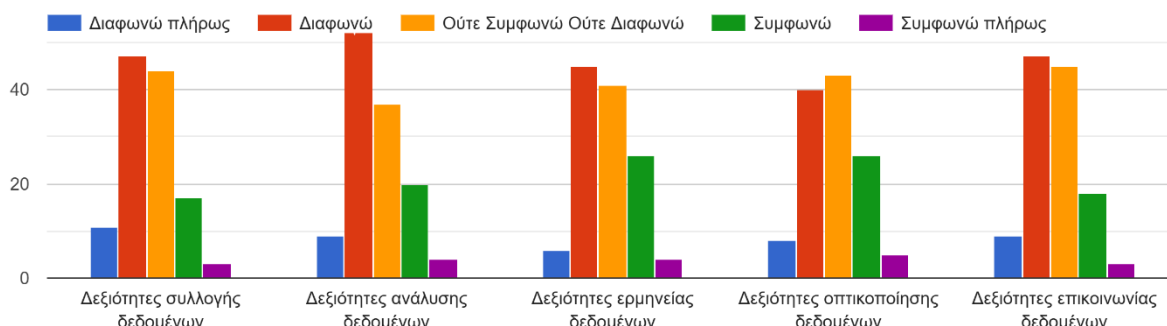


Figure 43 Cyprus Survey [School curricula sufficiently cover Data collection skills, Data analysis skills, Data interpretation skills, Data visualization skills, Data communication skills]

Finally, Figure 42 explored whether curricula support data literacy through cross-disciplinary, project-based, and STEM/STEAM/STEAME approaches. Again, the results were underwhelming. Most educators reported either disagreement or neutrality, indicating that such pedagogical strategies are not yet widely leveraged to teach data-related skills. Given the strong international emphasis on interdisciplinary and experiential learning as effective vehicles for digital and data competence, this gap represents a missed opportunity within the current national curriculum.

27. Τα σχολικά αναλυτικά προγράμματα προσεγγίζουν τον Εγγραμματισμό στα Δεδομένα

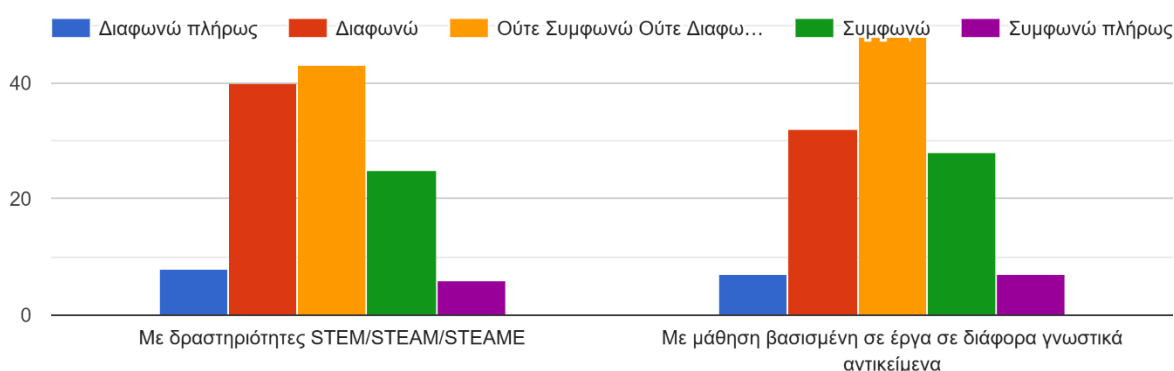


Figure 44 Cyprus Survey [School curricula approach the use of Data Literacy with STEM/STEAM/STEAME activities and with Project-Based Learning across disciplines]

Taken together, the findings presented in Figures 36 through 42 illustrate a systemic shortfall in both policy support and curricular implementation of data literacy in Cyprus. While there is recognition among educators of the importance of data-driven practices, they report limited structural support, insufficient training on ethical use, constrained professional autonomy, and weak curricular integration. These results call for coordinated action at the policy, leadership, and curriculum design levels to address these deficiencies and build a coherent framework for equipping educators and students with essential data competencies.



Section F reveals a critical gap between educators' awareness of the importance of data literacy and the extent to which it is currently supported by policy and curriculum. Respondents largely believe that neither the educational system nor school curricula adequately promote or integrate data-related competencies. Furthermore, ethical, analytical, and communication dimensions of data literacy are insufficiently addressed, and cross-curricular approaches such as STEM and project-based learning are underutilized. These results suggest an urgent need for coherent national strategies to embed data literacy into curriculum design and educational policy.

These results are also verified by the participants' responses in a related open-ended question. Specifically, they pointed to a need for better integration of data literacy into existing curricula, with emphasis on interdisciplinary, project-based learning, and clearer curricular guidance. Among the meaningful responses, several clear themes emerged, like the Curriculum modernization (The curriculum should approach data literacy through interdisciplinary projects). A few educators called for greater integration across subjects, recommending the inclusion of data activities in non-STEM subjects as well. Some responses highlighted the need for more clarity and structure in the way data-related learning outcomes are presented in the national curriculum. They also emphasize that limited time is a major obstacle to integrating data activities into teaching and requested for more support, professional development, and resources. Some noted that the best way to apply data literacy is through projects and cross-curricular activities, especially in subjects like science or math and offered practical ideas, such as integrating real-world data tasks, embedding data themes in STEM or STEAM

The open-ended input reflects a clear demand for clearer curricular guidance, training, and time allocation to effectively embed data literacy in schools. Teachers appear willing to engage but require systemic support to move beyond informal or isolated practices.

5.3.7 Training and Professional Development Needs (Section G)

The findings presented in Figures 43 through 46 reveal strong interest among educators in developing their data literacy skills, accompanied by a notable gap between this interest and the availability of adequate training programs. Additionally, the results emphasize the importance of structured, practical, and ongoing support mechanisms to facilitate effective implementation of data-informed practices.

A significant majority of participants recognize the value of data literacy for their professional growth. As shown in Figure 43, 77.0% of educators agreed that developing competencies in this area would contribute meaningfully to their professional development. Specifically, 47.5% agreed and 29.5% strongly agreed with the statement. Only 2.4% disagreed to any extent, while 20.5% maintained a neutral position. These figures suggest widespread alignment between data literacy and professional identity, reflecting educators' perception that such skills are increasingly essential in a modern teaching context.



28. Πιστεύω ότι η ανάπτυξη του Εγγραμματισμού μου στα Δεδομένα θα συμβάλλει σημαντικά στην επαγγελματική μου ανάπτυξη

122 responses

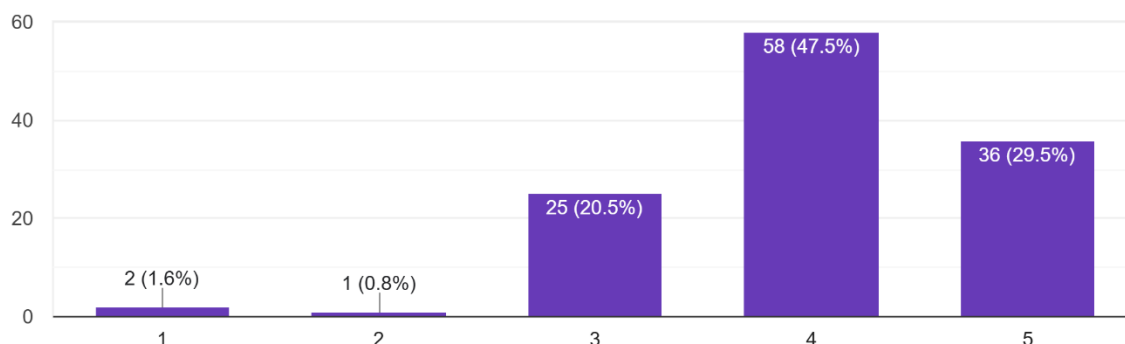


Figure 45 Cyprus Survey [I believe that developing Data Literacy will significantly contribute to my professional development]

Interest in pursuing relevant professional development opportunities was similarly high. According to Figure 44, 77.0% of respondents also expressed interest in receiving professional development related to data literacy, with 37.7% agreeing and 39.3% strongly agreeing. Neutral responses were recorded by 19.7% of participants, while only 3.3% indicated disinterest (2.5% disagreed; 0.8% strongly disagreed). These results point to a highly motivated teaching workforce eager to engage with data-oriented training, which can be leveraged by educational authorities in shaping future upskilling strategies.

29. Με ενδιαφέρει η επαγγελματική ανάπτυξη σχετικά με τον Εγγραμματισμό στα Δεδομένα

122 responses

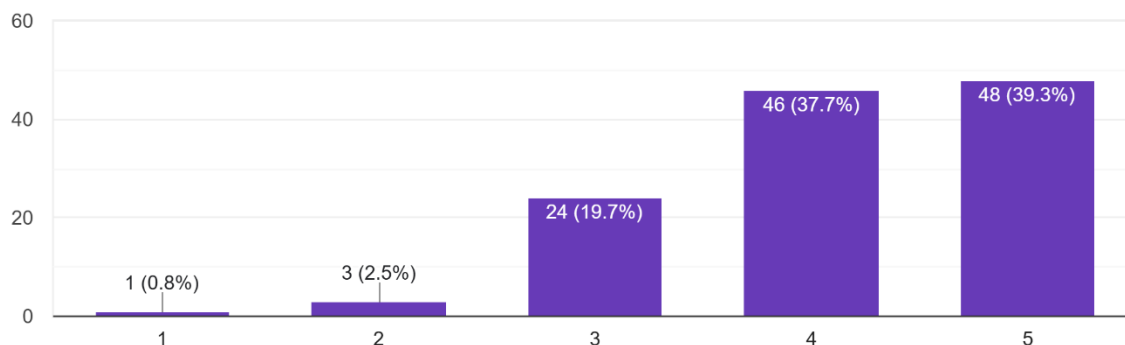


Figure 46 Cyprus Survey [I believe that developing Data Literacy will significantly contribute to my professional development]

Despite this enthusiasm, perceptions of the adequacy of currently available training programs were far less positive. As indicated in Figure 45, only 30.3% of educators believed that existing professional development offerings meet their needs regarding data use (22.1% agreed; 8.2% strongly agreed). A considerable portion of the sample—39.3%—selected a neutral response, and 30.3% disagreed or strongly disagreed. This distribution suggests uncertainty or dissatisfaction with the current availability, accessibility, or relevance of training content. It also highlights the existence of unmet needs that, if addressed, could strengthen implementation at scale.



30. Τα διαθέσιμα προγράμματα επαγγελματικής ανάπτυξης καλύπτουν τις ανάγκες μου όσον αφορά τη χρήση δεδομένων

122 responses

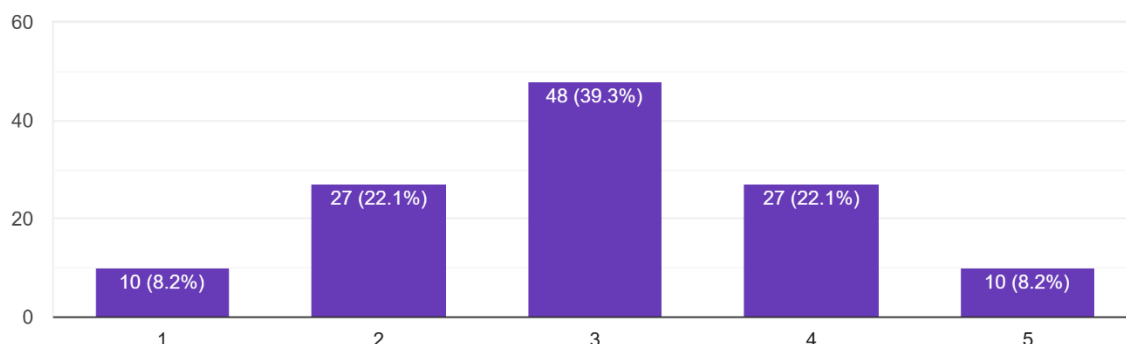


Figure 47 Cyprus Survey [The available professional development programs address my needs regarding data use]

Further insight into the nature of these needs is provided in Figure 46, which asked educators what type of support they require to effectively implement data literacy methods in their teaching practice. The responses point to several recurring priorities. A large majority - 92.6% - agreed or strongly agreed that they require structured support to integrate data into the curriculum (52.1% agreed; 40.5% strongly agreed). Only 5.0% were neutral, and a minimal 2.4% disagreed. These results clearly underscore the demand for concrete, sustained, and practice-oriented assistance, including hands-on training, expert guidance, mentoring, and access to ready-to-use materials and digital tools. The overwhelmingly affirmative responses demonstrate that educators not only recognize the value of data literacy but are actively seeking the infrastructure to make it actionable within their professional environments.

31. Τι είδους υποστήριξη χρειάζεστε προκειμένου να εφαρμόσετε αποτελεσματικά τις μεθόδους του Εγγραμματισμού στα Δεδομένα στο πρόγραμμα σπουδών που διδάσκετε;

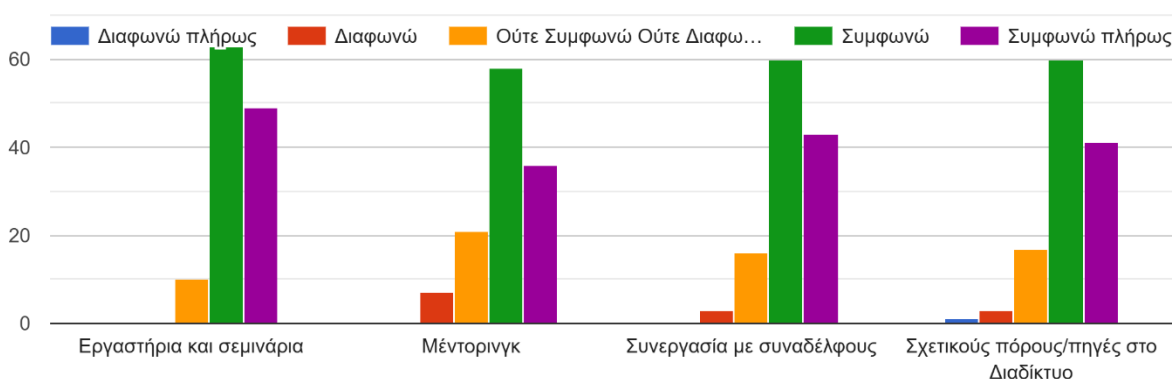


Figure 48 Cyprus Survey [What type of support do you need to effectively implement Data Literacy methods in your curriculum?]

The need for specific training programs and their alignment with the curricula was highlighted by the participants in a related open-ended question, where the following key-themes Identified:

Concrete examples and practical tools: Multiple teachers asked for real-world, classroom-ready examples, such as “real world examples” or just “examples”, reflecting a need for practical, scenario-based guidance rather than only theoretical training.

- Post-training support: Responses like “Feedback after implementation and support by the specialist” indicate a desire for follow-up support, mentoring, and reflective feedback after implementing training in real contexts.
- Clearer instructions and structured resources: Several entries pointed to the need for step-by-step guidance, digital resources, and ready-made lesson plans or materials tailored to school-level implementation.
- Time and space for experimentation: Though not as frequently, some respondents implied that flexibility and freedom to experiment with data methods in the classroom would help adoption.
- Professional Learning Communities (PLCs): A few educators hinted at collaborative environments where they can share practices, consult peers, or work under guidance, though this was more implicitly stated.
- General expressions of interest or overwhelmed sentiment: A few answers like “Many things” or “I don’t know where to start” reflect a sense of overload, emphasizing the importance of structured progression in training programs.

These responses suggest that teachers are eager for hands-on, concrete support -not just one-off workshops, but actionable tools, ongoing mentoring, and classroom-embedded guidance. Designing support that is iterative, interactive, and practically grounded will significantly enhance their confidence and effectiveness in implementing data literacy in the curriculum.

About the participants’ training needs, these are summarized in Figure 47. The respondents’ current training needs are summarized across the key areas of data literacy “Collecting educational data,” “Analyzing and interpreting educational data,” “Data visualization and communication,” “Using data to support personalized learning,” “Using data to support school decision-making,” and “Legal and ethical aspects of data use.” Across these categories, the highest levels of agreement were seen in needs related to data analysis and interpretation, and using data for personalized learning, indicating strong interest in improving practical classroom applications of data. Similarly, substantial demand was reported for data visualization and communication, highlighting a need to better translate raw data into actionable insights. Educators also identified gaps in their ability to use data at a whole-school level, such as for decision-making or leadership, and emphasized the importance of understanding legal and ethical dimensions, pointing to growing awareness of privacy, security, and responsible use issues. The broad range of training needs expressed reflects a workforce eager to enhance both technical and strategic competencies in data literacy.

32. Ποιες είναι οι τρέχουσες επιμορφωτικές σας ανάγκες;

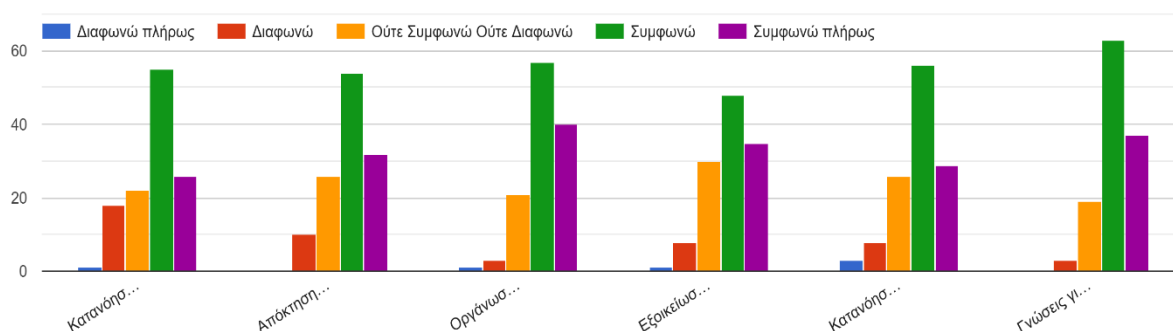




Figure 49 Cyprus Survey [What are your current training needs?]

In a related open-ended question about additional training needs, educators mentioned the need for more time to engage with the topic, and a desire for combined training on multiple areas, highlighting the need for dedicated instructional time and workload adjustments to accommodate training in data literacy. More specific, the answers to the open-ended question identified the following key themes:

- **Desire for Practical Application:** Several teachers requested training with a hands-on focus, reflecting a common need for moving beyond theory into realistic classroom practice.
- **Training on Presentation & Communication of Data:** Some respondents emphasized the need to better present and visualize data, hinting at gaps in their confidence or skills in data communication.
- **Flexible or Personalized Learning:** Statements like “Whatever else might help” reflect a willingness to engage in diverse formats or custom-tailored support, suggesting that one-size-fits-all training may not be enough.

In general, responses to this open-ended question confirm a recurring demand for practical, contextualized, and flexible professional development in data literacy. Teachers are eager to apply skills in their daily work but need support that is clear, actionable, and responsive to real classroom conditions. Training programs should emphasize data visualization, communication, hands-on learning, and include follow-up resources to deepen engagement.

In sum, the findings in Section G highlight a significant and encouraging interest in building capacity around data literacy. Educators are both aware of its relevance and motivated to enhance their own skills in this area. However, current training provisions appear insufficiently aligned with the expressed needs of the teaching workforce. Bridging this gap will require the development of targeted professional development programs that are context-sensitive, practically oriented, and embedded within long-term support structures. Ensuring access to such programs will be vital for realizing the full potential of data-driven educational practices across the Cypriot school system.

5.3.8 Challenges and Obstacles (Section H)

The data from Figure 48 provide critical insights into the perceived systemic and pedagogical barriers that obstruct the implementation of Data Literacy in Cypriot education. Respondents were asked to identify key challenges from a predefined list, and their responses converge around several recurring institutional deficiencies. Chief among them is the perception of inadequate training programs—both in scope and relevance—as a dominant barrier, reflecting broader concerns about the absence of structured professional development in this domain. The high selection of “Insufficient educational programs in Data Literacy” underscores a disjunction between educators’ recognition of data literacy’s value and the availability of opportunities to acquire applied skills. In parallel, the obstacle of limited time (“insufficient time”) reveals the operational pressures within schools, suggesting that even when training exists, educators struggle to integrate data-driven practices into already demanding workloads. Equally concerning is the reported lack of institutional encouragement (“Lack of support or encouragement from management”), which suggests that leadership structures are either disengaged from or unprepared to foster a culture of data use.

Moreover, the prominence of responses related to vague national policy guidance (“Unclear national policies”) and inadequate resources further highlight that the barriers extend beyond the classroom to systemic and infrastructural shortcomings. These findings suggest that teachers are not only underprepared but also under-supported, both materially and structurally, which inhibits the meaningful integration of data into pedagogical workflows. The fact that “ethical and

privacy concerns” are also recognized as obstacles points to a critical awareness of the socio-technical risks associated with educational data use, but simultaneously implies that educators may lack sufficient training to navigate these issues confidently.

Taken together, the data reflect a pervasive structural fragility in the national education ecosystem’s capacity to support Data Literacy. The convergence of pedagogical, organizational, and policy-level barriers signals an urgent need for a coordinated, multilevel strategy. Such a strategy must include the integration of data literacy in initial teacher education, the creation of sustained in-service training pathways, institutional leadership development, policy clarification, and robust ethical frameworks. Without addressing these intertwined factors, any effort to cultivate data-informed pedagogical practices risks remaining sporadic, unsystematic, and ultimately unsustainable.

33. Ποια από τα παρακάτω θεωρείτε ότι αποτελούν προκλήσεις και εμπόδια για τον Εγγραμματοισμό στα Δεδομένα στην εκπαίδευση;

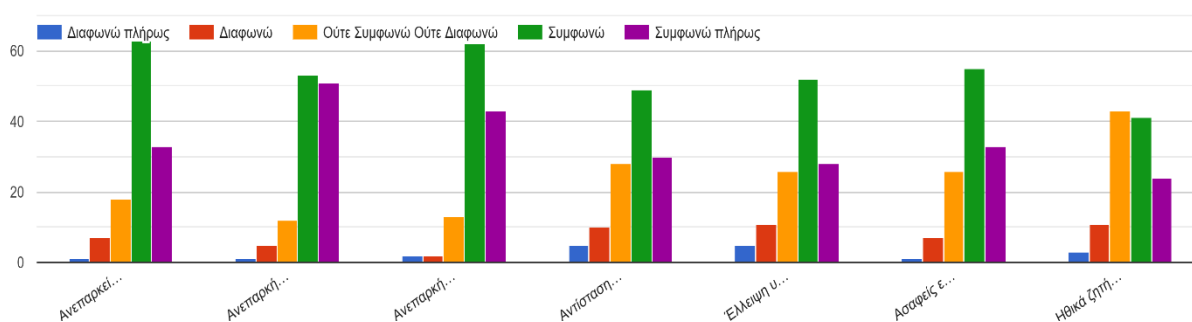


Figure 50 Cyprus Survey [Which of the following do you think constitute challenges and obstacles for Data Literacy in education?]

5.3.9 Future Intentions (Section I)

Figure 49 captures participants’ intentions regarding the future use of data in various domains of their professional practice. The results indicate a strong overall willingness to increase data use across multiple functional areas. The most frequently cited purpose was monitoring student learning progress, with 81.8% of respondents indicating their intention to use data more frequently for this reason. This was followed by informing teaching and instructional planning (74.4%), student assessment (66.9%), and supporting differentiated or personalized instruction (64.5%). A significant proportion of participants also reported intentions to apply data for school-level decision making (48.8%) and for identifying at-risk students (44.6%). Less commonly cited, though still notable, were intentions to use data for collaboration with colleagues (33.9%) and for reporting to external stakeholders such as parents or administrators (28.1%).

34. Στο μέλλον, σκοπεύω να χρησιμοποιώ δεδομένα πιο συχνά στη δουλειά μου για:

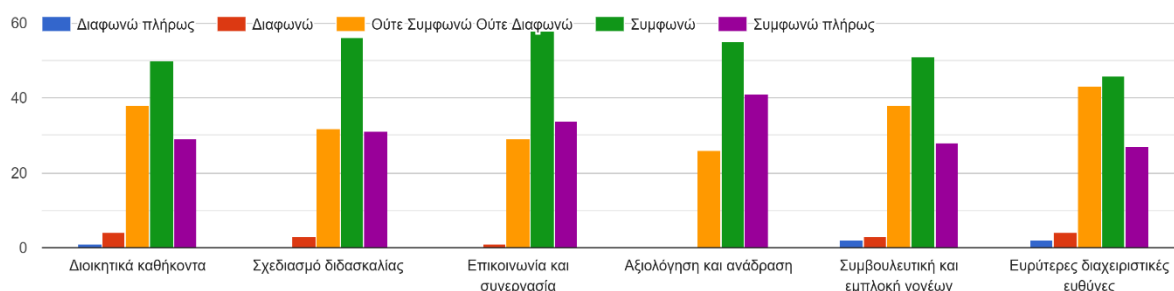




Figure 51 Cyprus Survey [In the future I intend to use data more frequently in my work for...]

These results suggest that while teachers predominantly view data as a tool for improving instructional effectiveness and student outcomes, there is comparatively less emphasis placed on collaborative or administrative uses. The data also reflect a positive disposition toward expanding data-driven practices, particularly those directly linked to teaching and learning processes.

When teachers asked in an open-ended-question to provide additional ways they plan to use data in their professional practice beyond the listed categories, they mentioned intentions to use data for academic growth, pointing to a link between data practices and professional advancement through further education or research. Moreover a few participants reflected that data use is already embedded in their routines, as expressed in “As I mentioned before, I believe it’s already happening daily”. This highlights that data usage may be informal or unrecognized within current practices.

In general, the findings from this final section indicate a promising orientation toward increased future use of data by educators. Participants reported intentions to apply data more frequently for monitoring student progress, planning instruction, conducting assessments, and personalizing learning. However, intentions were relatively lower for administrative functions and collaboration, highlighting a continued emphasis on classroom-level application. These trends lead to an overall readiness to adopt more data-informed practices, provided that the necessary support and infrastructures are in place.

5.3.10 Open-ended Questions (Section J)

The open-ended question then followed the closed-item list about ‘the most important factors for implementing successful data-driven methods in education in Cyprus’ list provided valuable insights into additional perceived uses of data in the educational context. Among their substantive responses, several key themes emerged:

Teacher training and professional development

This was by far the most frequently mentioned factor. Many participants explicitly emphasized the need for ongoing education, practical workshops, and structured training programs in data literacy as foundational for success. This reflects a core belief that competent application of data literacy depends on building teacher capacity.

Time and Workload Considerations

Responses like “time and education” or just “time” suggest that insufficient time is a key barrier. Teachers feel overwhelmed and express that applying data-driven methods requires dedicated time during work hours to be feasible.

Policy and Systemic Alignment

Several entries pointed to the need for cohesive institutional strategies, such as “The existence of a common policy”. Respondents want clear, aligned guidelines at the school, regional, and national levels, including policy frameworks, institutional backing, time allocation, and resource provision. Several teachers mentioned that without time, technical support, and clear strategies, even well-intentioned efforts may fail.

Collaboration among educators

This factor also appeared frequently, with references to “collaboration between teachers”, ‘collaborative/cooperative learning’, and the importance of shared professional learning communities.

Collaboration and Leadership Support



Some mentioned the need for collaborative environments and administrative backing, e.g., “collaboration and support”, highlighting that peer interaction and school leadership are essential for scaling and sustaining practices.

Access to Tools and Infrastructure

Although less frequently mentioned, terms like “Digital data” and indirect references show that availability of proper digital tools, platforms, and infrastructure is also seen as a necessary condition.

Holistic Integration

There were suggestions that a combined, multi-dimensional approach is needed, reflecting a view that success requires synergy across training, time, tools, leadership, and policy.

In sum, the open-ended feedback reinforces findings from previous sections. Educators are interested in data-informed teaching, but successful implementation depends on professional development, collaborative environments, and strong institutional support. Specifically, they overwhelmingly identify training, time, collaboration, and supportive policy as the key pillars for successfully integrating data-driven methods in education. These findings reinforce the call for systemic, school-wide strategies that not only provide tools and content but also cultivate the conditions for teachers to implement them meaningfully and sustainably.

5.3.11 Summary

The national survey on Data Literacy in Cyprus, conducted with 122 participants, presents an educational workforce with high levels of academic qualifications and professional experience, but one that operates within a system that has yet to institutionalize Data Literacy as a core pedagogical and policy priority. Most respondents are experienced educators with postgraduate degrees, working across various educational levels and school sizes. The gender and age distribution reflects national patterns in the teaching profession, with a predominance of middle-aged female educators in primary and secondary education.

Despite their academic qualifications, the majority of educators have not received formal training in data literacy. Data Literacy-related competencies are primarily acquired through informal means such as peer exchange, personal initiative, or experiential learning. While participants demonstrate a general understanding of the concept and its relevance, their knowledge often lacks depth and systematic grounding. Compared to broader digital or AI literacy, Data Literacy remains underdeveloped both as a professional concept and as an educational objective within the Cypriot context.

Nevertheless, educators in Cyprus overwhelmingly recognize the importance of Data Literacy in modern teaching. The vast majority associate it with improved teaching practices, personalized learning, classroom assessment, institutional evaluation, and informed decision-making. There is also widespread agreement on the significance of legal and ethical considerations in handling educational data. However, respondents report significant uncertainty in specialized domains such as statistical literacy, data analytics, and learning analytics, indicating a lack of targeted exposure to these areas.

The survey findings reveal that while educators are open to integrating data into their practice, actual implementation is fragmented and primarily confined to classroom-level interventions. Most educators engage in data collection and basic analysis, but fewer participate in collaborative data practices such as team reflection, communication with stakeholders, or institutional decision-making based on data. The absence of collective, school-wide data cultures results in data use remaining individualized and disconnected from broader strategic



goals. This highlights a clear disconnect between theoretical recognition of Data Literacy's value and the structural support required for its realization.

One of the most pronounced findings concerns the inadequacy of current professional development pathways. Fewer than one-third of participants believe that existing in-service training programs meet their needs, and even fewer report receiving relevant pre-service preparation. This lack of systematic training was identified as a central obstacle to meaningful Data Literacy integration. Educators expressed strong interest in further professional development, emphasizing the need for practical, real-world applications and ongoing mentorship over one-off workshops. The need for longitudinal and context-sensitive training formats—such as communities of practice and embedded support—was repeatedly stressed.

In addition to training gaps, several systemic and structural challenges were consistently identified by respondents. These include lack of time, insufficient technological and pedagogical resources, absence of school-level encouragement, and unclear national policy frameworks. Many educators reported that the curriculum does not include explicit Data Literacy objectives or cross-disciplinary strategies for implementation. Furthermore, ethical and privacy concerns surrounding the use of student data were widely acknowledged, yet few educators reported receiving training on navigating these complexities. This points to a significant gap between awareness and institutional preparedness.

Despite these challenges, Cypriot educators exhibit a forward-looking stance. Many expressed intentions to expand the use of data in areas such as individualized instruction, assessment design, and professional reflection. However, their willingness is tempered by pragmatic concerns about workload, limited autonomy, and the current lack of a supportive ecosystem. Data Literacy is still seen more as an individual teacher's responsibility than a shared school-wide or policy-driven agenda.

The results suggest that the current educational environment in Cyprus is not yet conducive to the holistic development of DL. There is limited policy clarity, inadequate curriculum integration, and insufficient infrastructural and administrative support. These limitations significantly constrain the operationalization of Data Literacy, despite high levels of enthusiasm among educators.

In summary, the Cypriot educational workforce demonstrates strong professional motivation and a growing awareness of the significance of data literacy. However, these strengths are undermined by systemic constraints and practical barriers. A coordinated strategy is urgently needed—one that includes embedding Data Literacy within teacher education curricula, expanding access to high-quality professional learning opportunities, ensuring alignment with school leadership structures, and integrating Data Literacy meaningfully within the national curriculum. Strengthening ethical and legal literacy is also essential to build educator capacity for responsible data use.

For policymakers, the findings emphasize the necessity of establishing clear frameworks and actionable standards for Data Literacy integration. For school leaders, the study points to the importance of cultivating collaborative, data-informed environments. For researchers, the identified gaps in training, confidence, and policy coherence open multiple pathways for further study and intervention design.

Ultimately, while Cypriot educators are willing and increasingly aware of Data Literacy's potential, the systemic infrastructure required to support its adoption remains incomplete. Transforming this potential into sustainable practice will require coordinated investment at all levels of the educational system—from curriculum and leadership to training and technological provision.

5.4 Focus group

5.4.1 Understanding (Section A)

1. How would you define data literacy? What key skills and competencies do you associate with it?

Defining Data Literacy

During a focus group discussion with key educational stakeholders in Cyprus, data literacy was repeatedly emphasized as a critical and multifaceted competence for the 21st century. Participants described data literacy as the ability to collect, organize, analyze, interpret, create, and communicate data effectively. It was viewed not merely as a technical skill but as a core capability for navigating everyday life and making informed decisions. One participant highlighted the importance of understanding that “everything around us is information,” stressing that modern society requires individuals to be equipped with the tools to interpret and act upon this information quickly and accurately.

Another perspective offered in the discussion defined data literacy as the capacity to explore, understand, and communicate information meaningfully—skills that support evidence-based decision-making in both personal and professional contexts. It was noted that this literacy enables individuals to critically engage with data, assess its credibility, and understand its real-world implications. Several stakeholders agreed that data literacy should not be considered a specialized skill, but foundational literacy that must be cultivated from an early age through the national curriculum.

Key Skills and Competencies

Stakeholders in the focus group identified several core competencies associated with data literacy. These included quantitative reasoning, inductive thinking, and critical analysis—skills often nurtured through mathematics and science education but equally relevant across disciplines. The ability to interpret data from tables, graphs, charts, and maps was emphasized as a key component, along with the need to assess the validity and source of data. According to one participant, understanding such visual representations is already a daily necessity: “Many of us have devices tracking steps and heart rate—presenting us with graphs we need to understand.” This highlights the relevance of data literacy in everyday decision-making.

In addition to analysis, the importance of communication skills was underlined. Participants argued that students must learn not only how to interpret data but also how to present it clearly and persuasively. In the workplace, these skills are increasingly required across a range of roles, from entry-level to executive positions, where interpreting and acting upon data is part of the decision-making process. As one stakeholder noted, even basic job interviews may involve tasks that test one’s ability to understand data, such as reading tables or interpreting trends in a chart.

Connections with Other Literacies

A key theme that emerged from the discussion was the connection between data literacy and other forms of literacy. Participants drew clear links between data literacy and statistical literacy, given their shared reliance on understanding and analyzing numerical information. Several also emphasized the strong relationship between data literacy and digital literacy, particularly in light of the digital platforms through which most data is now accessed. Information literacy was also mentioned, particularly in relation to evaluating the credibility and relevance of data sources.

One participant made a compelling point about the need to cultivate critical thinking, suggesting that data literacy closely aligns with critical literacy. This includes the ability to question how data is framed and to identify underlying assumptions or biases. Furthermore, some stakeholders



highlighted the relevance of AI literacy, noting that as artificial intelligence systems increasingly shape the ways we interact with data, understanding these systems becomes part of being data literate. The conversation also touched on assessment literacy, particularly the ability to interpret assessment data in educational or workplace settings, further illustrating the broad applicability of data-related skills.

2. Do you believe data literacy should be an essential competence for teachers and students today? Why or why not?

All participants in the focus group unanimously agreed that data literacy is not only desirable but necessary for preparing students to navigate life in a data-driven world. This shared viewpoint reflects a strong consensus that the ability to understand, interpret, and communicate data is a foundational skill in modern society—comparable in importance to reading and numeracy. Stakeholders emphasized that the growing presence of data in everyday contexts, from personal devices to professional environments, demands that students are equipped with the competencies needed to make informed decisions, think critically, and engage responsibly as citizens. As one participant noted, cultivating data literacy early in education is essential for reducing future skill gaps and ensuring that individuals are not left behind in an increasingly information-saturated landscape.

Stakeholders also argued that data literacy should not be treated as an optional or supplementary skill, but rather as an integrated component across subjects, beginning in primary education and continuing through secondary levels. This integration would require not only updated teaching materials but also targeted professional development for educators to build confidence in teaching data-related content. Several participants stressed that this initiative cannot be delayed, as the pace of digital and societal transformation demands urgent educational reform. Embedding data literacy in policy and curriculum frameworks would ensure that future citizens are equipped to understand the world around them, interpret complex information, and participate meaningfully in democratic, economic, and technological systems.

5.4.2 Views (Section B)

3. How would you view the generation and use of data in compulsory education overall?

Participants overwhelmingly agreed that the generation and use of data in compulsory education is not only necessary but increasingly urgent. Several participants pointed out that while the importance of data is acknowledged rhetorically, its implementation in schools remains superficial. For instance, one participant criticized the current curriculum by stating that statistics have been "stripped down to very basic elements, without real analyses or applications," which prevents students from acquiring practical analytical skills. Another added that in today's world, where misinformation and fake news are rampant, equipping students with the ability to critically evaluate and communicate data is more important than ever. Data literacy was described as a "complex skill that must be cultivated early," and participants stressed its relevance beyond the academic domain, framing it as a foundational skill for active and informed citizenship. One participant described it as "central to civic engagement and critical decision-making," suggesting that students must learn to analyze data as a life skill, not just a school subject.

4. In your opinion, what types of data do teachers use in schools?

The participants identified several types of data that are commonly used by teachers in schools. These included summative assessment data such as standardized test results, internal classroom assessment scores, student attendance records, behavioral logs, and feedback from students. However, they noted that such data is often limited to immediate teaching needs and not used as part of a broader strategy. One educator remarked, "schools are not sufficiently



exposed to data collection or analysis practices," indicating systemic limitations in data infrastructure. Another teacher shared that they often rely on "classroom-generated data from previous years or peer classrooms," but acknowledged that this method lacks consistency and formal structure. Furthermore, there was concern that the types of data most frequently used are reactive in nature (e.g. disciplinary records or exam grades) rather than proactive (e.g. learning behavior trends or engagement metrics), which restricts the potential of data-informed decision-making in educational planning.

5. In your opinion, how do teachers use that data?

Teachers' use of data was described as largely informal and based on intuition rather than structured analysis. While some teachers attempt to adapt instruction based on students' performance or classroom dynamics, this process is often unsystematic. One participant emphasized, "students had difficulty even presenting data in graphical form," highlighting a wider issue of low data fluency that extends from students to educators. Another added that "teachers often trust their experience and instincts" more than the actual evidence in front of them. The lack of professional development in data analysis means that even when data is available, teachers may not have the skills to interpret or apply it effectively. In many cases, the data usage remains superficially used to justify existing assumptions rather than to question or inform new teaching strategies. This reactive and limited engagement with data significantly reduces its potential to drive meaningful improvement in learning outcomes.

6. In your opinion, what are the ethical implications of using student data? How do you evaluate the credibility and accuracy of data used in compulsory education?

Ethical concerns related to the use of student data emerged strongly in the discussion. Several participants voiced apprehension about how data is handled, stored, and interpreted—especially in the absence of sufficient training. One stated, "data use can become ethically problematic when teachers are not trained to interpret it correctly," particularly when it involves sensitive student information or high-stakes decision-making like placement in special education programs. There were also concerns around data privacy and consent, as exemplified by the comment, "children regularly share photos of each other without understanding the implications," pointing to a broader lack of awareness regarding digital ethics. Participants highlighted the urgent need to embed data ethics into teacher training and the curriculum itself. In addition, the credibility and validity of data were questioned, with multiple contributors expressing doubt over whether educators are equipped to discern high-quality data from flawed or misleading sources. This is particularly critical in the age of big data and artificial intelligence, where not all data presented to educators comes from transparent or neutral origins.

7. In your opinion, what are the main barriers and challenges of data literacy in compulsory education?

The discussion identified several structural and cultural barriers that hinder the development of data literacy in compulsory education. First, there is a lack of adequate training for educators. Participants reported that many teachers feel unprepared to use even basic tools like Excel, which restricts their ability to analyze or visualize student data effectively. Second, there is curricular fragmentation—data-related skills are primarily confined to mathematics, with minimal integration across subjects such as science, geography, or language arts. This disconnection prevents students from developing a comprehensive and transferable set of data competencies. Third, access to relevant and actionable data remains limited. As one participant noted, "not all schools or students benefit equally," pointing to inequalities in both technological infrastructure and access to performance data. Finally, a significant mindset gap persists. Some teachers reportedly view data use as an administrative burden rather than a pedagogical tool. One participant described the situation as "a long road ahead," indicating that without a fundamental cultural shift in how educators perceive data, training alone will not suffice.



Participants concluded that for data literacy to flourish, there needs to be alignment between policy, curriculum, infrastructure, and teacher mindset.

5.4.3 Professional Development (Section C)

8. What type of support and training do you believe that teachers need to effectively implement data-driven educational practices?

Participants emphasized the urgent need for accessible, practice-oriented training that equips teachers with confidence and tools to use data effectively. Several contributors highlighted that training should include real-world classroom scenarios, with one suggesting the use of "ready-made material accompanied by reflective questions" that allow teachers to integrate data literacy into their subject areas progressively. Another emphasized the value of "sample datasets and contextualized exercises" that mirror teachers' actual classroom realities. The participants also discussed the importance of sustained support structures rather than one-off workshops. Mentorships, collaborative learning environments, and in-school professional development communities were all proposed as mechanisms to support long-term change. Beyond technical skills, participants stressed that training must also include elements of ethical use, data interpretation, and application of data for differentiated instruction and formative assessment. There was an agreement that empowering teachers to critically engage with both qualitative and quantitative data is key to making informed pedagogical decisions.

9. Would you prefer training sessions focused specifically on data literacy or integrated within broader pedagogical topics such as digital literacy or problem-based learning? Why?

When asked whether data literacy training should stand alone or be integrated within broader educational themes, most participants leaned toward an integrated approach. One noted, "data literacy should be part of critical thinking," asserting that it should not be limited to math or IT contexts but instead embedded across the curriculum. By integrating data skills into broader areas like digital literacy, inquiry-based learning, and problem-solving, educators can better relate to the content and see its relevance in multiple teaching contexts. Another participant pointed out that in real-world teaching, data does not appear in isolation is always tied to student behavior, classroom management, assessment, and pedagogy. Thus, embedding data training within those familiar pedagogical discussions would enhance uptake. At the same time, a few voices emphasized that basic standalone modules may be necessary as a foundation, especially for teachers with limited prior exposure. Overall, the majority supported blended models that begin with targeted instruction and evolve into cross-disciplinary applications.

5.4.5 National Policy and Curriculum Integration (Section D)

10. In your opinion, is the educational system able to support and promote data literacy for teachers and students?

Participants expressed mixed views about the ability of the current education system to support and promote data literacy for both teachers and students. On the one hand, some acknowledged recent efforts by the Ministry of Education to use data from national programs—such as the Literacy School project—to make evidence-informed decisions. For example, targeted support hours were allocated to schools with consistently high percentages of at-risk students. However, many participants noted that these efforts remain limited in scope and impact. A recurring concern was that "schools are expected to improve learning outcomes without ever receiving their own data," which hinders their ability to develop localized, data-informed strategies. There was also a general sense that while policy recognizes the importance of data, the translation into practical tools, training, and feedback mechanisms is still lacking.

11. What is your opinion on the current national education policy regarding data literacy? Are there any gaps or inconsistencies you have identified that you would like to comment



on?

A consistent critique from participants was the disconnect between national policy intentions and classroom realities. Despite the wealth of data available through national and international research initiatives, schools often do not receive timely, school-specific feedback. One participant explained that school principals often request access to their own PISA or national assessment data, but “we have not managed to achieve the obvious—sending schools their own data.” Another added that when data is made available, teachers are often unsure how to interpret or apply it effectively. There was also concern that national-level educational strategies prioritize general performance metrics over teacher empowerment and school autonomy. Participants emphasized the need for more transparency, better communication, and inclusive policymaking that actively involves school-level actors.

12. Critically, how do you assess your national school curriculum in terms of integrating data literacy? What would you suggest improving it?

The current curriculum was described as fragmented and inconsistent in its approach to data literacy. While mathematical subjects may touch on statistics or graph interpretation, there is little effort to integrate these skills across disciplines. One participant emphasized that “data isn’t just about math—it includes any kind of information we interpret and use to make decisions.” For example, geography lessons include rainfall charts, and science lessons present experimental results, yet these are rarely connected to broader concepts of data literacy. Participants proposed revising the curriculum to promote interdisciplinary learning and cross-subject alignment of data skills. This would include redefining learning objectives, integrating authentic data tasks in various subjects, and training teachers to support a unified vision of data literacy. One educator stressed the importance of fostering “critical and creative thinking” as a central aim of data literacy, calling for simple yet meaningful activities that would empower students to interpret and trust the information they encounter daily.

5.4.6 Summary

A focus group of educational stakeholders in Cyprus provided rich insights into the meaning, importance, and implementation challenges of data literacy in compulsory education. Participants broadly defined data literacy as the ability to collect, analyze, interpret, and communicate data, emphasizing that it is not just a technical or mathematical skill but a foundational competence essential for modern civic life. They identified key skills such as critical thinking, quantitative reasoning, and the ability to evaluate data credibility and context. Data literacy was frequently linked to other literacies—statistical, digital, and information literacies—and framed as a tool for empowerment in both personal and professional contexts.

There was unanimous agreement that data literacy should be an essential competence for both students and teachers. Stakeholders viewed it as vital for developing informed, responsible citizens capable of navigating a complex, data-driven world. The group emphasized that this competence should be cultivated from early education and deeply embedded across the curriculum, rather than treated as an isolated topic.

Participants expressed concern over the superficial implementation of data-related content in the existing school curriculum. Statistics and graphing were often reduced to mechanical tasks with limited real-life application. Teachers commonly use data such as test scores, attendance, or behaviour logs, but often informally and without systematic analysis. Many educators rely more on personal intuition than on evidence-based strategies, reflecting a broader lack of professional development in this area. Furthermore, the ethical dimensions of data use—including concerns about privacy, consent, and misuse—were seen as urgent but largely unaddressed in current teacher training or school policy.



Barriers to implementing data literacy included insufficient training, lack of integration across subjects, unequal access to data and digital tools, and a general resistance to seeing data as pedagogically valuable. Many teachers feel underprepared to use basic tools like Excel, and some see data use as administrative rather than instructional. Participants emphasized the need for a shift in mindset, where data becomes a natural part of educational reflection and decision-making.

Regarding teacher development, participants called for practical, contextual training that connects directly with classroom realities. Sample datasets, real-world exercises, and reflective activities were seen as helpful tools. Long-term support mechanisms like peer mentoring and school-based communities of practice were recommended to embed change sustainably. Most participants favored integrating data literacy training within broader pedagogical themes—such as digital literacy or problem-solving—rather than offering it in isolation. However, some agreed that basic standalone sessions might be necessary as a foundation, especially for less experienced educators.

Systemic and policy-level issues were also raised. While some national initiatives use data to inform broad educational strategies, participants reported that schools rarely receive detailed, actionable data about their own students. This disconnect between national data collection and school-level application was a recurring frustration. Teachers are often left without clear guidance on interpreting available data or implementing insights into classroom practice. The curriculum was criticized as fragmented, with limited interdisciplinary integration of data skills. Stakeholders proposed reforms to align learning objectives across subjects, embed data tasks in authentic learning contexts, and support teachers through ongoing training and resources.

Conclusion

This focus group discussion highlights a shared understanding among stakeholders that data literacy is a foundational competence, not a peripheral skill. Defined as the ability to collect, interpret, and communicate data effectively, it is essential for critical thinking, civic engagement, and navigating a data-driven society. Participants emphasized that data literacy must be introduced early and integrated across the curriculum—not confined to STEM subjects—to equip all students with the tools to engage responsibly with information.

However, the effective implementation of data literacy requires systemic reform. Isolated initiatives are insufficient; coordinated efforts across teacher training, curriculum design, infrastructure, and policy are needed. Teachers must receive ongoing, contextual professional development, grounded in real classroom practice and supported by access to quality data.

Ethical concerns were also raised, particularly around student privacy and the risk of misinterpretation. Embedding data ethics into both teaching and policy frameworks was seen as crucial. Additionally, participants pointed to a disconnect between national policy goals and the realities of school practice, calling for better access to school-level data and actionable feedback.

Ultimately, fostering data literacy is a democratic necessity. In a world shaped by data and algorithms, empowering students to critically interpret and use data is vital for equity, informed participation, and future societal resilience.

5.5 Country Summary

The Cyprus national research, drawing from a triangulated methodology of literature review, teacher survey, and focus group discussions with key educational stakeholders, provides a comprehensive snapshot of the current understanding, implementation, and challenges surrounding data literacy in compulsory education.



Across all three strands of research, there is strong consensus that data literacy is a foundational 21st-century competence, not a peripheral or technical skill. Literature review situates data literacy within a broader set of digital and civic literacies essential for navigating contemporary life, where individuals must increasingly interpret, evaluate, and use data in personal, educational, and professional contexts. This view is echoed by focus group participants, who define data literacy as the ability to “collect, organize, analyze, interpret, create, and communicate data meaningfully”—skills viewed as essential for informed decision-making, critical thinking, and democratic engagement.

In practice, however, the survey data show a gap between this conceptual ideal and current classroom realities. Teachers overwhelmingly agree with the importance of data literacy, yet most report low confidence in applying or teaching it. Less than half say they have received any formal training in using educational data, and many indicate they lack access to tools or institutional support.

Considering the curriculum, findings from both the survey and focus group highlight the fragmented integration of data literacy in the Cypriot curriculum. While statistical and graphical literacy appears in mathematics and science, cross-subject applications remain minimal. The literature review similarly notes the absence of a coordinated national strategy for embedding data literacy across subjects and grade levels.

Participants stressed that confining data literacy to math or ICT not only narrows its relevance but excludes students from learning how to interpret real-world data in contexts such as geography, civic education, or language studies. They called for a curriculum shift toward interdisciplinary learning, with authentic data experiences linked to societal issues, such as media misinformation, health, and sustainability.

About professional development, a key finding across all data sources is the lack of teacher preparation and support. Focus group participants reported feeling underprepared, especially when using tools like Excel, interpreting student assessment data, or designing classroom activities involving data. The teacher survey similarly identified training gaps as one of the main obstacles to implementing data-driven practices.

In addition, systemic barriers such as insufficient access to school-specific data, lack of feedback from national assessments, and poor integration of data governance policies were noted. School principals, for instance, are often unable to obtain their own PISA or internal assessment data, limiting evidence-informed decision-making. This lack of usable data severely undermines school autonomy and innovation.

The research also surfaced important ethical considerations. Participants expressed concern over student privacy, the credibility of data sources, and the risk of misinterpretation in high-stakes settings (e.g., special education referrals). These concerns reflect a broader absence of ethical frameworks or training in data governance within teacher education or school policy. Literature calls for the integration of digital ethics into data literacy curricula, especially given students’ exposure to surveillance, AI systems, and data collection via social media and educational platforms.

Finally, all research strands conclude that developing a robust data literacy culture in Cyprus will require a holistic approach. Participants emphasized the need for cross-sector collaboration between policymakers, curriculum designers, and school leadership, supported by transparent data systems and sustained professional development. This is not only a pedagogical reform but a societal imperative: to prepare students for a future where evidence-based reasoning, ethical data use, and critical digital engagement are essential civic competencies.



5.5.1 Conceptualization of the term ‘Data Literacy’

The conceptualization of data literacy in Cyprus reflects a growing recognition that it constitutes a core competence for the digital age—one that intersects with digital, statistical, information, and civic literacies. Drawing from the national literature review, teacher survey responses, and rich insights from the focus group discussion, a multidimensional and evolving understanding of data literacy emerges—encompassing both theoretical framing and practical expectations for educational settings.

Multidimensional and Foundational Literacy

Stakeholders across all data sources define data literacy as more than technical data handling or numerical competence. It is understood as the ability to collect, interpret, critically evaluate, and communicate data in diverse contexts. The literature emphasizes that data literacy supports evidence-based decision-making, citizenship, and lifelong learning. Participants in the focus group similarly viewed data as “a language of modern society,” noting that everything from personal health tracking to public policy requires individuals to make sense of quantitative and qualitative data.

Importantly, stakeholders stressed that data literacy should be considered a foundational rather than advanced skill. It must be cultivated early and systematically, not reserved for older students or specialist subjects. This perspective was consistently voiced across all methods of inquiry and aligns with international research emphasizing early exposure to data reasoning skills in cross-curricular formats.

Practical Interpretation by Educators

In practical terms, teachers responding to the national survey associate data literacy with interpreting test results, monitoring student behavior, adjusting teaching strategies, and using spreadsheets or school management systems. However, most noted that their daily use of data is informal and largely intuitive, rather than driven by structured pedagogical frameworks. This indicates a disjunction between conceptual endorsement of data literacy and its operationalization in the classroom.

Focus group participants reinforced this point, highlighting that teachers often lack both confidence and institutional support to engage meaningfully with data. Several educators admitted they “trust their instincts more than the data,” citing insufficient training and a lack of practical resources. This reinforces the need for targeted support if data literacy is to be translated into an actionable teaching competence.

Links to Other Literacies

The Cyprus findings also underline the interconnectedness of data literacy with other educational literacies. Strong links were drawn between data and statistical literacy, particularly in mathematics education. However, participants emphasized that data literacy is equally connected to digital literacy—given that most data is now accessed, generated, and visualized through digital tools—and information literacy, due to the need for students and teachers to assess the credibility of data sources in an age of misinformation.

There was also a growing awareness of the relevance of AI literacy and ethics, as new technologies increasingly shape how students interact with and generate data. Focus group stakeholders discussed how learners today must also understand the biases and limitations of data systems, calling for a critical literacy that extends beyond technical skills to include ethical judgment and social awareness.

The Curriculum Perspective



Conceptually, the literature and stakeholder views converge on the need to embed data literacy across disciplines and school levels. There was widespread agreement that current curriculum approaches are fragmented, with data-related learning objectives primarily confined to mathematics. Participants stressed that true data literacy involves engaging with real-world data in meaningful, interdisciplinary contexts—such as analyzing climate patterns in geography or interpreting statistics in social studies.

This broadened conceptualization demands a curriculum shift: one that moves from treating data literacy as a discrete skill set to recognizing it as an overarching educational aim. This also requires rethinking learning outcomes, assessment methods, and teaching materials to reflect the realities of a data-intensive world.

5.5.2 Challenges and Gaps

The Cyprus national findings reveal significant systemic, pedagogical, and infrastructural barriers to the effective integration of data literacy into compulsory education. Despite a shared understanding among educators and stakeholders of its importance, data literacy remains underdeveloped in practice, hindered by fragmented curricular implementation, uneven access to resources, and insufficient teacher training. A recurrent challenge identified across all research strands is the fragmentation of data literacy within the national curriculum. Data-related content is largely confined to mathematics, with limited opportunities for interdisciplinary application. While data may occasionally appear in subjects such as science or geography, it is rarely framed within the broader concept of data literacy. Instead, statistical or graphical elements are often treated as isolated skills, disconnected from broader critical thinking and decision-making processes. This compartmentalized approach limits the transferability of data competencies and reduces learners' ability to perceive the relevance of data across real-world contexts.

Compounding this issue is a prominent gap in teacher preparedness and confidence. Survey and focus group participants consistently reported that many educators feel unequipped to collect, analyze, and interpret data in pedagogically meaningful ways. Tools such as Excel or educational dashboards are either underused or applied in limited, procedural ways. The lack of sustained professional development opportunities and minimal institutional support further erodes confidence. As one participant remarked, “Even simple tasks like analyzing graphs feel difficult without guidance,” underscoring the urgent need for contextualized, long-term teacher training that empowers educators to embed data literacy authentically into their teaching practice.

Infrastructure and access disparities also contribute to unequal implementation. Schools do not have equal access to the technological tools, platforms, or repositories needed for data-informed teaching. These inequalities are particularly pronounced between urban and rural areas, and between well-resourced and under-resourced schools. The literature and stakeholder insights consistently emphasized that this uneven distribution of resources hinders the broader adoption of data literacy practices. Moreover, the absence of centralized systems for providing schools with timely, school-specific assessment data further prevents educators from tailoring interventions and responding to learners' needs at the local level.

In addition to structural and pedagogical barriers, ethical and interpretive concerns were repeatedly raised. Teachers expressed uncertainty around issues such as data privacy, student consent, and how to responsibly handle sensitive information. In the absence of clear protocols or professional preparation, there is a risk that data may be misinterpreted or applied in ways that reinforce systemic bias. Several participants questioned the credibility and validity of data obtained from external platforms or automated systems, warning that uncritical use of such data could undermine trust and pedagogical integrity. These findings point to the necessity of



embedding ethical reasoning and critical data evaluation into both teacher education and curriculum policy.

Policy implementation gaps further weaken the effectiveness of national strategies that, in principle, promote data use in education. While various initiatives aim to collect and monitor educational data, schools frequently lack access to the outcomes of these efforts or the guidance needed to act on them. As one educator observed, “We’re expected to improve outcomes, but we never see the data we need to understand what’s working.” This illustrates a systemic shortcoming where national policies fail to translate into actionable tools or insights at the school level, leaving educators with expectations but insufficient support.

Finally, cultural attitudes toward data within the educational community present another key challenge. Some educators perceive data use primarily as an administrative obligation rather than a meaningful component of pedagogy. The belief that data literacy is the exclusive concern of mathematics or IT specialists further marginalizes its application across other disciplines. Without a cultural shift that positions data literacy as a shared responsibility and a critical civic skill, efforts to embed it throughout the education system are unlikely to achieve coherence or sustainability. Collectively, these barriers highlight the need for an integrated, multi-level strategy that addresses not only curriculum and infrastructure, but also the attitudes, capacities, and conditions necessary for effective implementation.

5.5.2 Best practices and recommendations

The findings from the literature review, survey, and focus group discussions in Cyprus offer both emergent best practices and actionable recommendations to promote data literacy as a core educational competence. While the challenges remain significant, the evidence reveals promising practices and strategic pathways that can inform both national policy and pedagogical advancement.

Among the most notable best practices is the interdisciplinary framing of data literacy, whereby some schools have begun integrating data-related tasks across subjects such as geography, science, and civic education—demonstrating that data literacy need not be confined to mathematics or ICT. This cross-curricular approach strengthens students' ability to interpret and use data in diverse contexts, fostering both critical thinking and practical relevance. Moreover, contextualized teacher training materials, including ready-made classroom resources, sample datasets, and reflective prompts, have proven effective in increasing teacher confidence and facilitating the incorporation of data skills into instruction. Collaborative professional development environments, such as peer mentoring and school-based learning communities, were also identified as successful mechanisms for long-term capacity building. At the policy level, the targeted use of national program data—for example, allocating support hours based on literacy performance metrics—offers a compelling example of how centralized data can be used to inform equitable and needs-based educational interventions.

Building on these insights, several recommendations emerge to further enhance data literacy across the education system in Cyprus:

Embed data literacy systematically across the curriculum, beginning in primary education and continuing through secondary levels. Data-related skills should be explicitly connected to real-world applications and not siloed within technical subjects.

Provide sustained, interdisciplinary professional development that goes beyond one-off workshops. Training should be embedded in classroom realities, including ethical and pedagogical components, and equip educators to critically engage with both quantitative and qualitative forms of data.

Strengthen the ethical dimension of data literacy, ensuring that teachers and students alike understand issues of privacy, consent, data credibility, and bias. Ethical awareness should be integrated into training frameworks and curricular goals.

Enhance access to usable school-level data, allowing teachers and school leaders to receive and interpret feedback from national and international assessments. This would support data-informed decision-making at the local level and strengthen school autonomy.

Foster a culture of data use, supported by leadership at both school and policy levels. This includes promoting the view that data is a pedagogical tool—not merely an administrative task—and ensuring that educators are empowered rather than burdened by its use.

Promote the alignment between national policy and school-level implementation, bridging the current gap between policy ambitions and classroom realities. Greater transparency, timely feedback, and active involvement of practitioners in policymaking processes are essential.

Taken together, these practices and recommendations highlight the need for a comprehensive and coordinated approach to data literacy—one that recognizes it as a cornerstone of 21st-century education. Ensuring its successful implementation will require political commitment, strategic investment, and collaborative efforts across all levels of the educational system.

5.6 References

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6. National Report [Germany]

The German National Report was authored by Jasmin Bastian, Ulrike Krein, Lea Papke, Madlen Glass.

Germany's approach to data literacy in compulsory education is marked by increasing awareness but lacks coherent systemic integration. While data literacy is widely acknowledged as a critical 21st-century skill, its inclusion in national curricula, teacher training, and policy frameworks remains fragmented and inconsistent.

Data literacy is mainly anchored in secondary-level computer science curricula. However, computer science is not a mandatory subject in many federal states and is often introduced only in later grades. Other subjects rarely include data literacy explicitly, resulting in unequal student access across regions and school types. A key issue is the absence of a nationwide, binding competence framework that ensures comprehensive and cross-curricular integration.

At the federal level, the concept of data literacy is rarely mentioned explicitly in educational strategy papers. While frameworks such as the KMK's "Education in the Digital World" promote digital skills broadly, the term "data literacy" remains undefined and unstandardized. Teacher training lacks systematic approaches to build data competencies, relying heavily on informal or voluntary initiatives.

A national survey (n=105) of mostly early-career teachers revealed strong conceptual support for data literacy but limited practical knowledge and application. Most participants lacked formal training and expressed low confidence in using data tools, analyzing data, or integrating data practices into teaching. Interest in targeted professional development is high, with clear demand for subject-specific, practical, and modular training formats.

Interviews with experts confirmed structural and cultural challenges. Participants emphasized the urgent need for stronger curricular anchoring, standardized definitions, improved infrastructure, and supportive school leadership. Teachers' willingness to engage with data is often hindered by time constraints, unclear responsibilities, and insufficient training.

Initiatives like KI-Campus (for primary education), Digital Sparks (project-based learning), and Unblock the Box (critical digital education) offer promising models. University projects such as CODIP and DiAL:OGe integrate data literacy into teacher education.

Recommendations include:

- Developing a national data literacy competence framework.
- Embedding data literacy across teacher training phases.
- Promoting cross-curricular integration in all school levels.
- Expanding practical, scalable training formats.
- Strengthening intergovernmental coordination.

Germany recognizes the importance of data literacy but faces significant gaps in policy, training, and curriculum. With better coordination and strategic investment, there is strong potential to embed data literacy systematically across the education system.

6.1. Literature review

6.1.1 National curricula

6.1.1.1 Compulsory education description

Germany's education system is shaped by its federal structure, in which the 16 federal states (Länder) hold primary responsibility for schooling. According to the Basic Law (Grundgesetz),



each state regulates the organisation, curricular content, and legal frameworks governing education. This division of authority leads to substantial variation in school structures, curricula, and implementation practices across the country.

Compulsory education in Germany typically begins in the calendar year in which a child turns six and comprises nine (or in some states, ten) years of full-time schooling. This phase is followed by a period of part-time compulsory education, usually fulfilled by attending vocational schools in parallel with an apprenticeship.

The German school system is characterised by the federal structure of the federal states. The Basic Law states that the main responsibility for the organisation and content of compulsory education lies with the 16 federal states¹ – and not with the federal government. In Germany, compulsory schooling covers the grades that children and young people must attend in accordance with legal regulations. It usually begins in the year the child reaches the age of six and comprises nine, or in some federal states, ten years of full-time schooling. This is followed by part-time compulsory education (vocational school attendance) for young people who are not required to attend school full-time, which usually lasts three years and is based on the duration of an apprenticeship (Sekretariat der Kultusministerkonferenz [KMK], 2021).

Compulsory education begins with enrolment in primary school, which usually lasts four years (six years in Berlin and Brandenburg). During this time, children are taught together regardless of their performance and socio-cultural background. The overarching goal of primary school is to impart basic and transferable skills, especially key skills in language and mathematics, that serve as a central prerequisite for further education, lifelong learning and independent cultural participation (KMK, 2021).

After completing primary school, students progress to lower secondary education, which is part of the compulsory schooling framework and typically lasts until the ninth or tenth grade. At this stage, the German school system is divided into different types of schools: ‘Hauptschule’, ‘Realschule’, ‘Gymnasium’ or ‘Gesamtschule’, although the exact names and structures can vary depending on the federal state. During this time, depending on the type of school, learners acquire a basic, extended or advanced education and are prepared for vocational training or further education (KMK, 2021). Depending on the type of school and individual performance, students can achieve different qualifications: the ‘Allgemeine Berufsreife’ (general vocational qualification), the ‘Mittlere Reife’ (intermediate school leaving certificate) or the ‘Allgemeine Hochschulreife’ (equivalent to a general university entrance qualification). Comprehensive schools offer classes for all qualification levels. The German school system also includes special schools for children with special educational needs.

The general school system is divided into several levels. At the state level, the ministries of education and culture are responsible for setting curricula, examination regulations and school laws, at federal level, the Federal Ministry of Education and Research (BMBF) and the Standing Conference of the Ministers of Education and Cultural Affairs (KMK) are responsible for coordinating educational objectives to ensure standardization despite the responsibilities of the federal states, while at the municipal level, the school authorities (usually cities or communities) are responsible for the material resources of schools, infrastructure and, in some cases, administrative staff. In accordance with the objectives of general school education, all children and young people should receive a comprehensive basic education and be prepared for life in a democratic society.

¹ The 16 federal states of Germany are Baden-Württemberg, Bavaria, Berlin, Brandenburg, Bremen, Hamburg, Hessen, Mecklenburg-Western Pomerania, Lower Saxony, North Rhine-Westphalia, Rhineland-Palatinate, Saarland, Saxony, Saxony-Anhalt, Schleswig-Holstein and Thuringia.



Although the federal government itself has no legislative powers in general compulsory education, it can influence the education system through the Federal Ministry of Education and Research (BMBF)². The BMBF's tasks include educational research, vocational training and nationwide support programs, through which it directly or indirectly influences the German school system. In these activities, the BMBF regularly cooperates with the federal states and the KMK.

The KMK plays a central role at national level, as it is the body in which the ministers of education and cultural affairs of the federal states work together to achieve common goals. Its tasks include coordinating the work of the federal state ministers of education, ensuring nationwide educational standards and the comparability of qualifications. In addition, it promotes quality assurance in education, facilitates cooperation in education, science and culture, and represents the educational interests of the federal states vis-à-vis the federal government and international actors (Kultusministerkonferenz [KMK], 2015).

School supervision in Germany is structured across three levels: upper, middle, and lower. At the upper level, the Ministry of Education in each of the 16 federal states is responsible for setting educational policy and overseeing the overall implementation. The middle level typically consists of regional school authorities or state education offices that supervise several schools, support school development, and implement state-level directives. The lower level includes local school supervisory bodies, which work directly with individual schools to monitor legal compliance, support school leadership, and oversee quality assurance measures.

School supervisory authorities across these levels are tasked with ensuring that schools follow legal regulations, providing guidance and support to school staff, and promoting educational quality. School management, on the other hand, is responsible for the day-to-day organization of school life, ensuring high-quality teaching, managing personnel, coordinating professional development, and representing the school externally (KMK, 2021).

While this three-tiered structure exists nationwide, the specific organization and responsibilities of supervisory bodies can vary between the federal states due to Germany's federal education system.

6.1.1.2 Data literacy in national curricula

As the term “data literacy” and the corresponding concepts in the curricula in Germany are predominantly located in the subject of computer science, the following description focuses on the computer science curricula of the 16 federal states. The division of responsibilities between the federal government and the states in the German education system is a result of the federal structure of the state (see 5.1.1.1 Compulsory education description). In Germany, education and therefore also the curricula are the responsibility of the states, which leads to differences in content and structure. The curricula are formulated in a competence-oriented manner and allow teachers scope for their own priorities in terms of concrete implementation. This generally allows aspects of data literacy to be integrated into teaching, but they are not explicitly named or systematically anchored. Contrary to the curricula of other subjects, where data literacy is only addressed implicitly, computer science curricula identify specific content, competencies and didactic approaches that correspond to our understanding of data literacy. The following

² It is important to note that the Federal Ministry of Education and Research (BMBF) was dissolved in May 2025; since then, research matters have been transferred to the newly created Federal Ministry of Research, Technology and Space (BMFTR), while education matters are gradually being integrated into the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth (BMFSFJ). As the transition has not yet been completed, we still refer to the BMBF for the compatibility of previous discourses in the context of this report but will adapt and adopt the corresponding designations in the course of the project.



description considers different levels of education and shows how data literacy is anchored in computer science in terms of learning objectives, methods and some examples of implementation.

The relevant curricula are listed in the table below, sorted by federal state:

Level/Federal State	Discipline/ Course	Description
Secondary/Baden-Wuerttemberg	Computer science (as advanced course/supplementary course and as elective subject)	Data literacy is an integral part of computer science curricula and covers topics such as data processing, data protection, algorithms, spreadsheets, computer systems and search engines, particularly in the content areas of 'data and coding' and 'information society and data security'. Didactically, the focus is on modelling, structuring, cooperative work as well as analysing and evaluating. Practical examples such as dealing with personal data, data protection cases and data encryption make the content accessible.
Secondary/Bavaria	Computer science	The computer science curriculum in Bavaria for secondary schools and grammar schools is divided into learning areas with specific competence expectations and associated content for each school type and grade level. The central learning areas are 'Data processing', 'Digital information exchange' and 'Programming'. From Year 9 onwards, the grammar school curriculum is augmented with learning areas on topics such as spreadsheet calculation, data protection and data modelling. Information technology (IT) is offered as a subject at secondary school (Realschule), which is also divided into learning areas and offers a basic education in computer science. In terms of content, it deals with data processing using spreadsheets or coding processes, programming, database systems and the structure and function of data networks.
Secondary / Berlin/Brandenburg	Computer science (compulsory elective subject)	The curriculum for grades seven to ten teaches data literacy through the conceptualization of data and information, the handling of data, its coding and evaluation, and topics related to data protection and data security. The content is structured into subject areas, with the fields of 'information and data and living in and with networked systems covering most elements of data literacy. The curriculum is implemented in a project-oriented, every day and differentiated manner to enable an application-oriented approach. Examples include discussing current data protection issues and creating a proprietary coding format.
Secondary/Bremen	Computer science (draft for testing)	The module 'Data and Information' covers key topics such as the distinction between information and its representation through data, the presentation of data, coding and data processing. The module 'Computer Science, People and Society' deals with elements of data protection and data security. The teaching approach is action- and project-oriented and practical, for example using QR codes or barcodes.
Secondary / Hamburg	Computer science	Data literacy is integrated into the curriculum both through the content area 'Data and Information' and through the integration of the competencies of the KMK strategy 'Education in the Digital World,' which includes the analysis and interpretation of data as well as critical reflection. Specific content includes data processing, topics related to data protection, the creation and use of algorithms, and analysis using spreadsheets. The didactic implementation is project-orientated, application-based and skills-oriented. In practice, the topics can be seen in lesson series on AI, databases, data protection and the presentation of data on the internet.



Secondary / Hessen	Computer science (elective Subject)	In the 'Information and data' section, the difference between data and information, various forms of data presentation and the interpretation of the information presented are mentioned. In addition, data is coded and analysed. Data processing is focused on in "IT systems", while aspects of copyright, privacy and data protection and recognizing risks to data security are reflected in the area of "IT, people and society".
Secondary / Mecklenburg-Western Pomerania	Computer science and media education	Data literacy is an integral part of computer science lessons. Elements of data literacy are included in the content areas 'Data and information', 'Algorithms' and 'Computer science, people and society's as well as in the process areas 'Communicating and cooperating' and 'Presenting and interpreting'. Concrete contents include data processing, algorithms, spreadsheets and search engines. The didactic focus is on exploratory learning, interactive approaches, relevance to students' everyday lives and project work. In year 8, sensor measurements are recorded; in year 9, measured values are processed and interpreted.
Secondary / Lower Saxony	Computer science	The curriculum combines content-related and process-related skills and defines individual learning areas. The learning area 'Data and its traces' in particular focuses on teaching data literacy. The curriculum covers topics such as data organization, data presentation, coding methods, data protection and data security, and analysis using spreadsheets. The focus is on competency-based teaching.
Secondary / North-Rhine-Palatinate	Computer science (compulsory elective subject)	In North Rhine-Westphalia, elements of data literacy are taught in the compulsory elective subject computer science at various types of secondary schools. At grammar schools (Gymnasium), lessons cover topics such as data coding, programming, encryption, data security, artificial intelligence (AI) and the context-dependent interpretation of data. Lessons are project-oriented and application-based, often using sample data. At comprehensive schools, the curriculum includes topics such as calculations with spreadsheets, databases, coding, encryption, artificial intelligence and data security. The didactic implementation is project-oriented with documented data use and application-oriented. In lower secondary schools (Hauptschule), the focus is on spreadsheets, coding, simple encryption and data security. Case studies, visualizations and simple programming are used for teaching purposes. At secondary schools (Realschule), the curriculum includes topics such as data types, spreadsheets, coding, simple encryption, databases (in Year 10) and data security. The teaching approach is project-based and application-oriented. Practical implementation takes place at all school types using school-specific teaching examples.
Secondary / Rhineland-Palatinate	Computer science	The curriculum includes subjects such as differentiating between data and information, data security, binary representation, encryption, data protection and data processing with algorithms, tables and databases - divided into three content areas: Fundamentals of Information Processing, Algorithmic Problem Solving' and 'Use and Modelling of Databases'. To make the course practical, case studies are used, for example on dealing with copyright and usage rights.
Secondary / Saarland	Computer science	The content modules 'Data and information', 'IT security' and 'Algorithms and programming' include elements for training data literacy. Another section, AI - Artificial Intelligence', focuses on machine learning with training data.



		The curriculum deals with the relationship between information and data, coding, data protection, data storage and data encryption. It also includes the modelling of data with algorithms, the representation of data, spreadsheets and data compression. The curriculum provides teaching tips and examples for most topics. Examples include license plates, QR codes, image coding, data protection and data security. The module 'Information and data' refers to possible connections to math, physics or geography.
Secondary / Saxony	Computer science	The curriculum covers grades seven to ten and is divided into individual learning areas. In particular, the learning areas 'Representation of data' and 'Information and data' contain components of data literacy. Specifically, they cover topics such as data as information, data security, spreadsheets, algorithms, big data, databases and data protection. Implementation in the classroom is action-oriented, object-oriented and problem-oriented. In addition, the project-based nature of the subject is emphasized.
Secondary / Saxony-Anhalt	Computer science as compulsory elective subject Modern Media Worlds³ Technology⁴ Learning in the Digital World	In secondary level I in Saxony-Anhalt, data literacy content is taught in various subjects depending on the type of school. In the compulsory elective subject <i>Computer science</i> (grammar school, Year 9), the focus is on the representation of information in data, its technical and legal permanence, the structuring of data, and coding and encryption. In addition, the relationship between data and operating systems is discussed, as are aspects of security and sustainability. In the <i>Modern Media Worlds</i> subject, data protection is the focus in Years 7 and 8. In Years 9 and 10, further topics are added: data security, handling media usage data, using spreadsheets, using Internet databases, and presenting and sorting data. In the <i>subject of technology</i>, knowledge of data storage and data backup as well as the recognition of algorithmic structures is taught. The cross-curricular topic <i>Learning in the Digital World</i> deals with the relationship between information and data, data protection, data security, data management, coding, encryption, and working with spreadsheets and creating diagrams. In addition, data literacy is also taught in a project-oriented manner, for example in the form of theatre projects or the evaluation of surveys.
Secondary / Schleswig-Holstein	Computer science and subject requirements	The curriculum includes elements of data literacy, particularly in the content areas of 'data and information,' 'algorithms,' 'computer science, people and society,' and 'IT security.' The curriculum includes data collection, differentiating between data and information, analysing large amounts of data, spreadsheets and data modelling. Modelling and programming as well as project and activity- based methods are used. Practical examples such as purchase recommendations and the use of search engines anchor the content in everyday life.

³ The subject 'Moderne Medienwelten' (Modern Media Worlds) is one of the compulsory elective subjects in Saxony-Anhalt and can be chosen by students as an optional course.

⁴ The subject called 'Technik' (Technology) is an independent subject in Saxony-Anhalt with its own curriculum.

		Subject requirements: Media skills are compulsory across all subjects, with the aim of being able to process information in a targeted manner.
Primary / Thuringia	Media studies ⁵	Data literacy is only implicitly addressed in the curriculum through the responsible handling of personal data and the importance of data protection.
Secondary / Thuringia	Computer science and media education Computer science Computer science (compulsory elective Subject) Media education and computer science (draft for testing) Framework 'Media literacy in a culture of digitality'	In Thuringia, computer science and media education is taught at various school levels and in different subjects. There are smaller differences in content depending on the type of school and grade level. Secondary level (grades 5/6): Basic knowledge is taught as part of <i>media education and computer science</i>. Students learn to differentiate between data and information, learn about the consequences of changes to data and deal with topics such as data processing, data compression and data backup. Secondary level (grades 9/10): In <i>computer science</i> at grammar School in grades 9 and 10, the focus is on in-depth content such as data concepts, data processing, encryption, data models, spreadsheets and databases. Secondary level (Hauptschule' and 'Realschule', compulsory elective subject computer science): A wide range of content is taught in this <i>compulsory elective subject</i>: Data concepts, data processing, data encryption, data models, spreadsheets, databases, data protection, data compression and the evaluation and reflection of data models. The school subject of <i>Media Education and Computer Science</i> is currently being implemented in secondary schools. The subject is in a trial phase and a draft curriculum for grades 5-10 is available. The content of the subject is divided into three learning blocks, each covering two school years: The following grades are available: 5/6, 7/8 and 9/10. A focus is placed on data literacy, which includes observing data protection when creating presentations, tabulating, evaluating and presenting data, modelling data, working with databases, and handling your own and other people's data securely and responsibly in compliance with applicable data protection rules. Secondary level: The <i>media literacy framework</i> teaches overarching skills in dealing with data. This includes data protection, the use and evaluation of information and data as well as analysing, storing and retrieving it.

Table 6 Germany Report [DL in national curricula]

The analysis of educational curricula clearly reveals a central issue: the absence of binding, nationwide guidelines. In many federal states, computer science is not a mandatory subject but is instead offered as an elective or compulsory elective—often only beginning in the seventh or ninth grade. As a result, students' access to basic computer science education depends heavily on the type of school they attend, the availability of qualified teachers, and the individual commitment of schools. Under these circumstances, a systematic and continuous approach to teaching digital competencies cannot be ensured.

This shortfall is even more pronounced at the primary level. In elementary schools, computer science or digital education is rarely integrated into the core curriculum. Instead, it is typically delivered through isolated projects, extracurricular activities, or content embedded in other

⁵ The course 'Medienkunde' (Media Studies) is a compulsory part of the curriculum at primary schools in Thuringia, teaching children basic media skills from Year 1 onwards.



subjects. This fragmented approach leads to significant disparities in students' foundational digital literacy—both between federal states and among individual schools within the same state.

6.1.1.3 Frameworks for data literacy in education

Regarding national curricula, there is no systematic approach to promoting data literacy in Germany. Nevertheless, most state curricula for computer science have similarly structured approaches that consider both process- and content-related requirements. In many cases, the skills to be acquired are described using the competence model based on the recommendations of the German Informatics Society (GI) (see Gesellschaft für Informatik e. V., 2025). This model includes both process and content areas, active examination which results in the competences that students should acquire in computer science. These are:

Process Areas

MI – Modelling and implementation

- BB – Justifying and evaluating
- SV – Structuring and networking
- KK – Communicating and cooperating
- DI – Presenting and interpreting

Content Areas

- ID – Information and data
- AL – Algorithms
- SA – Languages and automata
- IS – Computer systems
- IMG – Computer science, people and society

The skills described in the process and content areas are always acquired and applied in combination, as process-related skills can only be developed through engagement with computer science content, and subject content is always accessed through process-related activities. The promotion of data literacy is particularly pronounced in the content areas 'Information and Data', 'Algorithms' and 'Computer Science, People and Society', as these areas include the handling and processing of data and the social aspects of data use.

At the federal level, digital competencies are formulated across subjects in the strategy 'Bildung in der digitalen Welt' of the Standing Conference of the Ministers of Education and Cultural Affairs (KMK 2016) and cover several key areas:

- Searching, processing and storing
- Communicating and cooperating
- Producing and presenting
- Protecting and acting safely
- Problem solving and acting
- Analysing and reflecting

Within these areas, data is explicitly used in the competence fields of 'searching, processing and storing' as well as "analysing and reflecting". This involves, among other things, searching for,



filtering, evaluating, storing and critically questioning data. These cross-curricular competencies contribute significantly to the promotion of data literacy, even if the term itself is not explicitly mentioned. The individual countries are obliged to ensure that all pupils acquire the digital competences formulated in the competence framework, including elements of data literacy, by the end of compulsory schooling, whereby implementation in the teaching and education plans of the individual subjects is to take place gradually and is not clearly specified. The framework stipulates that no single subject must cover the entire competence framework. Instead, all subject-specific contributions must complement each other to cover the entire competence framework. Many federal states have special media literacy frameworks or education plans for digital media that are based on the KMK's overarching areas of competence and specify these in a manner specific to each state.

6.1.1.4 Summary

An analysis of data literacy in the curricula of the German federal states shows that data literacy is explicitly and systematically anchored in computer science curricula in particular, while it is either hardly or only implicitly present in other subjects. The curricula are generally competence-oriented and offer teachers scope for concrete implementation, which means that in other subjects it is up to the teacher whether data literacy is taught or not. This means that aspects of data literacy can theoretically be integrated into teaching, but they are not explicitly mentioned or systematically embedded. In contrast, the computer science curricula specify content, competencies and didactic approaches for teaching data literacy.

Germany's federal structure leads to differences in the focus of content and the structure of curricula. Nevertheless, there are many similarities across the federal states with regard to the central elements of data literacy. A central frame of reference for many curricula is the competence model of the German Informatics Society (GI), which outlines both content-related and process-related competences. Data literacy is promoted through a combination of process-related skills such as modelling, evaluating, communicating and presenting with subject-specific content from the areas of 'information and data', 'algorithms' and social aspects of computer science in the area of 'computer science, people and society'.

The specific content covers topics such as data processing, algorithms, spreadsheets, search engines, coding, data protection, data security, encryption, big data and artificial intelligence. In terms of teaching methods, there is a strong focus on project-oriented, action-oriented and everyday learning formats and subjects that enable exploratory, cooperative and application-oriented learning. Practical examples such as recording sensor measurements, using QR codes or developing your own coding formats are used.

A key problem is the lack of binding guidelines: in many federal states, computer science is not offered as a compulsory subject but is available as an optional subject from the seventh or ninth grade onwards. In primary education, computer science or media studies are only offered in a few cases. This makes it clear that in Germany there is no guarantee that all students will receive the same computer science education or any computer science education at all. This depends on the individual choices of the students or the federal state and its regulations. The German education system lacks a clearly structured and binding framework for the development of data literacy that is implemented through cross-curricular integration. Without cross-curricular integration, data literacy remains fragmented and contextless or does not reach some students at all.

At the federal level, the Standing Conference of the Ministers of Education and Cultural Affairs (KMK) has defined digital skills that also include searching, processing, storing, analysing and reflecting on data in their areas of competence. These skills are to be taught across all school subjects. However, it remains unclear how these skills are to be specifically and mandatorily

integrated into the subject curricula and implemented. Integration has not been systematic to date and varies greatly depending on the federal state and subject.

Conclusion

In summary, the analysis of the curricula shows that elements of data literacy are reflected in the German school system through the computer science curricula, although data literacy is not directly mentioned. However, there is a particular lack of stronger and more systematic integration of data literacy in other subjects and clearer visibility in the overarching education plans.

6.1.2 Policy context

6.1.2.1 National educational policy bodies

The allocation of responsibilities between the federal and state levels in the German education system is a result of the federal state structure. In Germany, education is a shared responsibility of the federal states, leading to the establishment of distinct institutional frameworks and strategies for the implementation and promotion of educational goals. At national level, central institutions assume coordinating, supervisory or advisory functions.

Federal Level

Policy body/institution	Brief description	URL
Federal Ministry of Education and Research (BMBF) (Now: Federal Ministry of Research, Technology and Space (BMFTR) and Education in the Federal Ministry of Education, Family Affairs, Senior Citizens, Women and Youth (BMFSFJ))	The Federal Ministry of Education and Research (BMBF) is responsible for shaping and promoting education and research policy in Germany. It develops strategies and programs to improve education systems, supports research projects and innovations, promotes science and technology as well as initial and continuing vocational training.	https://www.bmbf.de
German Institute for Adult Education (DIE)	Research organization working to promote adult education and basic education, including the development of data skills.	https://www.die-bonn.de
German Institute for International Educational Research (DIPF)	Research institution that supports educational policy and conducts educational monitoring, including the analysis of data literacy.	https://www.dipf.de
Standing Conference of the Ministers of Education and Cultural Affairs (of the States in the Federal Republic of Germany) (KMK)	Standing Conference of Education Ministers of the Federal States and coordinates education policy in Germany.	https://www.kmk.org
Standing Scientific Commission on Education Policy (SWK)	An independent advisory body to the KMK that makes recommendations for further development of the education system based on scientific evidence.	https://www.swk-bildung.org
Stifterverband	Initiator of the Data Literacy-Charta and promoter of programs such as 'Data Literacy Education' to integrate data literacy into university curricula.	https://www.stifterverband.org

Table 7 Germany Report [National educational policy bodies – Federal level]

State Level



Federal State	Policy body/institution	Brief description	URL
Baden-Württemberg	Baden-Württemberg Ministry of Education and Cultural Affairs	Responsible for education policy in Baden-Württemberg, including schools and further education.	https://km.baden-wuerttemberg.de
	Centre for School Quality and Teacher Training (ZSL)	Institute for Quality Development in Schools, encourages digital education skills.	https://lis.kultus-bw.de/Startseite
Bavaria	Bavarian Ministry of Education and Cultural Affairs	Responsible for school and further education policy in Bavaria.	https://www.km.bayern.de
	ISB Bavaria - State Institute for School Quality and Educational Research	Supports schools in the implementation of curricula and digital standards.	https://www.isb.bayern.de
Berlin	Department for Education, Youth and Family	Regulates education policy and further education in Berlin.	https://www.berlin.de/sen/bjf/
Brandenburg	Ministry of Education, Youth and Sports	Responsible for the educational institutions and programmes in the state of Brandenburg.	https://mbjs.brandenburg.de
Bremen	Senate for Education and Science	Implement educational initiatives, including digital skills in continuing education.	https://www.bildung.bremen.de
	Bremen State Institute of School (LIS)	Competence centre in the state of Bremen that supports schools in their work and development by providing specialist and educational services.	https://www.lis.bremen.de/
Hamburg	Authority for School and Vocational Training	Responsible for school and vocational training policy in Hamburg.	https://www.hamburg.de/politik-und-verwaltung/behoerden/schulbehoerde
	LI Hamburg - State Institute for Teacher Training	Promote teacher training and digitalisation in education.	https://li.hamburg.de
Hesse	Hessian Ministry of Education and Culture	Responsible for educational reforms and further education in the state of Hesse.	https://kultus.hessen.de
Mecklenburg-Western Pomerania	Ministry of Education, Science and Culture	Provides support for school and adult education in the state of Mecklenburg-Western Pomerania.	https://www.regierung-mv.de/Landesregierung/bm/nieder
	Institute for Quality Development Mecklenburg-Western Pomerania (IQ M-V)	Responsible for teacher education, quality development and the enhancement of digital skills in Mecklenburg-Western Pomerania.	https://www.regierung-mv.de/Landesregierung/bm/Ministerium/Behörden-&-Institutionen/Institut-für-Qualitätsentwicklung-M-V/
	Media Education Centre Mecklenburg-Western Pomerania	Supports schools in Mecklenburg-Western Pomerania in all educational issues concerning the use of media in the classroom and digitalisation.	https://www.bildung-mv.de/unterricht/digitalisierung/medienpaedagogisches-zentrum/



Lower Saxony	Lower Saxony Ministry of Education and Cultural Affairs	Responsible for education policy, including further education and digital education.	https://www.mk.niedersachsen.de/startseite/
	NLQ – Lower Saxony State Institute for Quality	Supports schools and further education institutions in Lower Saxony with training programs.	https://bildungsportal-niedersachsen.de/ueber-uns/nlq Old Website: https://www.nibis.de/startseite_1
North Rhine-Westphalia (NRW)	Ministry of Schools and Education NRW	Provides regulations for education policy and further training opportunities in NRW.	https://www.schulministerium.nrw
	QUA-LiS NRW - Quality and Support NRW	Encourages quality assurance and digitalisation in education and vocational training.	https://www.qua-lis.nrw.de
Rhineland-Palatinate	Ministry of Education Rhineland-Palatinate	Responsible for school and vocational further education policy in Rhineland-Palatinate.	https://bm.rlp.de
	Rhineland-Palatinate State Pedagogical Institute (PL)	Responsible for teacher training, school development and the promotion of digital skills in Rhineland-Palatinate.	https://bildung.rlp.de/pl/
Saarland	Ministry of Education and Culture Saarland	Provides support for educational initiatives and further training in Saarland.	https://www.saarland.de
	Saarland Education Campus	Strengthens the training and further education of educational specialists, promotes networking and cooperation and develops educational programs with a view to the future.	https://www.saarland.de/bildungscampus/DE/home/home_node.html
Saxony	Saxon State Ministry of Culture	Is responsible for education policy in Saxony, including in digital skills development.	https://www.smk.sachsen.de
	State Office for Schools and Education (LASUB)	Provides support for school and adult education, including the integration of digital skills.	https://www.lasub.smk.sachsen.de
Saxony-Anhalt	Ministry of Education Saxony-Anhalt	Responsible for school and further education policy in the state of Saxony-Anhalt.	https://mb.sachsen-anhalt.de
	Saxony-Anhalt State Institute for School Quality and Teacher Training (LISA)	Provides further education and vocational training as well as quality development in the education sector.	https://lisa.sachsen-anhalt.de
Schleswig-Holstein	Ministry of Education, Science and Culture	Promotes education and training also in the field of digital competencies in Schleswig-Holstein.	https://www.schleswig-holstein.de
	IQSH - Institute for Quality Development in Schools Schleswig-Holstein	Provides quality assurance in school and vocational education.	https://www.schleswig-holstein.de/DE/landesregierung/ministerien-behoerden/IQSH/iqsh_node.html

Thuringian	The Thuringian Ministry of Education, Youth and Sport	Responsible for educational strategies and the support of data literacy in Thuringia.	https://bildung.thueringen.de
	Thuringian Institute for Teacher Training, Curriculum Development and Media (ThILLM)	Responsible for teacher training, the development of curricula and digital education programs.	https://www.schulportal-thueringen.de/thillm

Table 8 Germany Report [National educational policy bodies – State level]

6.1.2.2 Educational policies for DL in CE

Policy body/ institution	Resource type	URL	Author(s)	Description
Federal Ministry of Education and Research (BMBF)	Broschure	https://www.bmbf.de/SharedDocs/Publikationen/DE/3/31697_Meilensteine_der_Lernkraeftebildung.pdf?__blob=publicationFile&v=4	Federal Ministry of Education and Research (ed.)	This brochure provides an overview of the diverse measures of the 'Teacher Training Quality Campaign', funded by the Federal Government and the federal states. It illustrates the location-specific focus of the projects and their contribution to the further development of teacher training. The brochure describes the necessary digitalisation-related competences of teachers. Three university projects, developed in the context of the quality offensive for teacher training (QLB), are presented, which aim to train Data Literacy of teachers or prospective teachers. The <i>Cu2RVE project</i> at the University of Hildesheim employs a systematic approach to integrating digital and information skills, including data literacy, into the teacher training curriculum. Individual learning needs are addressed through diagnostic testing at the commencement of the programme and adaptive basic training. Furthermore, practical teaching sequences for digital education are developed, tested and prepared for training and further education. The effectiveness of these measures is currently being investigated through empirical means. The <i>CODIP project</i> at Leuphana University Lüneburg is developing digital training phases with the objective of strengthening teachers' skills in the meaningful use of digital media. A particular emphasis is placed on cultivating data literacy among trainee teachers, defined as their capacity to utilise data in a targeted and reflective manner within the classroom setting. Theory and practice are closely interlinked, and the teaching concepts developed will be embedded in the curriculum in the long term and published as open educational resources. The <i>DiAL:OGe project</i> at Ruhr University Bochum anchors digitalisation as a cross-cutting theme in teacher training. It develops innovative teaching formats, strengthens teachers' media skills and addresses current aspects of digitalisation such as digital literacy in interdisciplinary dialogue spaces. The aim is to integrate digital skills into the Master of Education programme in a sustainable manner. The brochure presents three university projects that systematically embed data literacy and digital skills in teacher training and develop practical, adaptive teaching formats for the sustainable promotion of these skills.



Federal Ministry of Education and Research (BMBF)	Report	https://www.bmbf.de/SharedDocs/Publikationen/DE/3/846628_Kompetenzzentren_fuer_digital_es_und_digital_gestuetztes_Unterrichten.pdf?__blob=publicationFile&v=5	Federal Ministry of Education and Research (ed.)	The paper from the Federal Ministry of Education and Research (BMBF) addresses the central importance of digitalisation for learning and teaching in schools and further education. It emphasises that digital skills are becoming increasingly indispensable for participation in social life, the job market and democratic processes. The document presents the ‘Kompetenzverbund lernen:digital’ project, which promotes new further training opportunities through thematic competence centres and a transfer point in order to make teachers fit for the digital world. The combination of analogue and digital forms of teaching and learning is seen as crucial to successfully shaping the transformation of schools. The DigiSchuKuMPK project, for example, promotes digitally supported, data-based school development and multi-professionalism at all-day primary schools through training courses, close cooperation with teaching staff and continuous analysis and optimisation of implementation processes. The ComeMINT Network project develops and disseminates digitalisation-related training modules for STEM teachers, which promote skills in the area of data literacy, among other things, networks universities, educational stakeholders and practice partners in several federal states.
Federal Ministry of Education and Research (BMBF)	Report	https://www.bmbf.de/SharedDocs/Publikationen/DE/3/861814_QLB_Ein_Blick_zurueck_ein_Blick_nach_vorn_Langfassung.pdf?__blob=publicationFile&v=4	Federal Ministry of Education and Research (ed.)	The final brochure of the Federal Ministry of Education and Research’s ‘Qualitätsinitiative Lehrerbildung’ (QLB) summarises the projects funded over eight years that have improved the quality and structure of teacher training in Germany. It describes how universities have responded to current challenges such as digitalisation, the coronavirus pandemic and teacher shortages through transnational cooperation, practical training, innovative teaching and learning concepts and the strengthening of digital skills. The CODIP project at Leuphana University Lüneburg promotes digitisation-related subject didactic skills and data literacy among (prospective) teachers to improve individualised, digitally supported practice in various subjects. Teaching concepts are developed, trialled, anchored in the curriculum and made available as open educational resources (OER). The DiAL:OG project at Ruhr-Universität Bochum promotes digitalisation-related skills, including data literacy, among student teachers and teaching staff through exchanges in an Innovation Field Lab (IFL). Interdisciplinary dialogue formats, workshops on topics such as learning analytics and big data as well as open educational resources (OER) are developed there in order to sustainably anchor data-based and digital teaching and learning processes in teacher training.
Federal Ministry of Education and Research (BMBF)	Guidance paper	https://www.kmk.org/fileadmin/pdf/Bildung/AllgBildung/Startchancen/2024_08_01-BLV-Anl3_Orientierungspapier-	Federal Ministry of Education and Research (BMBF) (ed.)	The policy paper describes the framework conditions and measures for the targeted use of opportunity budgets as part of the nationwide “Startchancen-Programm”. The aim is to promote equal opportunities in school education, in particular by strengthening basic skills, individual support and data-based school and lesson development. Funding is to be used flexibly on the ground to meet specific needs - from personal development of pupils to professionalization of teaching staff. The program supports the development of data literacy among teachers and school management to

		Chancenbudget-scp.pdf		systematically use educational data for diagnosis, instructional development and school decision-making.
Free Hanseatic City of Bremen Institute for Quality Development in the State of Bremen (IQHB)	Abstracts of the conference - good practice	https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.bildungsbremen.de/sixcms/media.php/13/EMS_E%25202024%2520Bremen%2520Abstracts.pdf&ved=2ahUKEwjM9J2234SNAXUA4ckDHeAcBAEQFnoECBAQAQ&usq=AOvVaw3UHafNx5Anj4_1u9zLD8JK	Thorsten Fahrbach, Irmlind Kammerer, Jan Henning-Kahmann, Julia Blank, Julia Käfer, Evelin Ruth-Herbein & Benjamin Fauth Institute for Educational Analysis Baden-Württemberg (IBBW)	The document contains an overview of the contributions to the 36th EMSE Conference 2024 in Bremen, which will focus on the topic of 'Digitalisation as an object and instrument of school and teaching development'. It lists abstracts of exhibition contributions, workshops and research projects from various aspects of digital education and quality development. The workshop 'Data literacy in digital formative assessments: challenges and digital solutions' organised by the Institute for Educational Analyses Baden-Württemberg (IBBW) focuses on the role of data literacy in the use of digital tools for learning assessment in primary schools. Teachers will receive valuable insights into challenges like data complexity and a lack of support as well as the new digital tool Co-FormAt, which is used to record maths and reading skills in grade 2. The workshop provides an opportunity to share ideas on how digital functions can specifically support teachers in interpreting and utilising formative assessment data.
Gesellschaft für Informatik e. V.	Recommendations	https://dl.gi.de/bitstream/e271f87d-1087-4617-83f5-b0ef98984b04/download	Gesellschaft für Informatik e. V. (ed.)	The recommendations of the Gesellschaft für Informatik take up the results of the 2013 ICILS study and the KMK strategy 'Education in the digital world' and emphasize the need for all (prospective) teachers to acquire basic computer science skills - even those who do not teach computer science as a subject. Teachers of all subjects and school levels are increasingly using IT systems for a variety of professional tasks and are faced with IT-related decision-making situations that require them to act competently. A total of 53 key IT competences have been identified, which should ensure comprehensive general education in IT for teachers and contain elements of data literacy. For the sustainable implementation of these competences, it is recommended that corresponding mandatory courses be integrated into teacher training. Furthermore, it is made clear that the aim is not to train all teachers to become computer science teachers or to replace the computer science degree program, but to provide a sound basic education in computer science that also takes subject-specific and computer science didactics requirements into account. The aim is to enable teachers to meet the challenges of digital transformation responsibly and competently.
Institute for Quality Development in Schools Schleswig-Holstein (IQSH)	Guideline	https://publikationen.iqsh.de/dm-medienbildung/id/02-2023.html	Dr. Maike Abshagen, Sabine Dörnhaus, Werner Hendricks, Thore Olaf Kühn, Jens	This guide describes how teachers can be systematically prepared to teach media literacy; design digitally supported learning environments and integrate digital media into their subject teaching – based on binding subject requirements and current competence frameworks. The guidelines set the goal that teachers should be able to teach subject-specific skills in the digital world. For example, it



		?file=files/Inhalte/PDF-Downloads/Publikationen/Lehren%20und%20Lernen%20in%20der%20digitalen%20Welt_PD_F%20UA.pdf&cid=iso-19-251	Lemke, Jens Lindström, Philipp Möller, Christoph Olsen, Dr. Gesa Ramm, Dr. Ulf Schweckendiek Institute for Quality Development in Schools Schleswig-Holstein (IQSH) (ed.)	mentions that math teachers should understand the importance of statistics and how to deal with large amounts of data. For physical education, the example of using personal measurement data and data protection is mentioned. In principle, it is stated that teachers themselves must have media skills, but how this is to be achieved and whether data skills are included remains open. It is only mentioned that the IQSH offers further training in all areas.
Standing Conference of the Ministers of Education and Cultural Affairs (KMK)	Position paper	https://www.kmk.org/fileadmin/veroeffentlichungen/beschluesse/2021/2021_09_09-Digitale-Weiterbildung.pdf	Standing Conference of the Ministers of Education and Cultural Affairs (ed.)	The position paper of the Standing Conference of the Ministers of Education and Cultural Affairs (KMK) describes the 'Initiative Digitale Weiterbildung' as a strategic framework for shaping general continuing education in a future-proof manner in the context of digital transformation. In this context, the initiative also emphasizes the importance of key skills for teachers and education staff – it aims to establish data handling and data security as an integral part of continuing education.
Standing Scientific Commission on Education Policy (SWK)	Expert opinion	https://www.swk-bildung.org/content/uploads/2024/02/SWK-2022-Gutachten_Digitalisierung.pdf	Standing Scientific Commission on Education Policy (ed.)	The report by the Standing Scientific Commission on Education Policy (SWK) provides recommendations for teacher training. It is suggested that digitalization-related content and computer science basic skills should be implemented in teacher training and teacher training should be geared more towards science. The paper does not provide any concrete proposals for practical implementation and thus remains at a theoretical level.
State Association of Baden-Württemberg in the German Library Association (Dbv)	Flyer	https://rp.baden-wuerttemberg.de/fileadmin/RP-Internet/Karlsruhe/Abteilung_23/DocumentLibraries/Fachstelle_Bibliothekswesen/Publikationen/dbv-Flyer_Lernbegleiter.pdf	State Association of Baden-Württemberg in the German Library Association (ed.)	The flyer from the Baden-Württemberg state association of the German Library Association presents libraries as central educational partners at all stages of life - from early childhood to old age. Specific programs to promote language, reading, media and information skills are presented in seven educational stages. Data literacy is mentioned explicitly as part of library education work: Libraries not only teach the safe handling of information, but also support the critical, reflective handling of data and digital media. In close cooperation with educational institutions, they thus make an important contribution to digital education and educational equality. The flyer demonstrates the potential for libraries to function as collaborative partners in the education of data literacy and the promotion of digital education.



State Institute for Teacher Training and School Development Hamburg	Guideline	https://li.hamburg.de/resource/blob/647134/d6b65848e3ae10716644cde/d-handreichung-lernen-in-der-digitalen-welt-data.pdf	State Institute for Teacher Training and School Development Hamburg (ed.)	The guidelines discuss the skills that teachers need in order to act and teach professionally in and for an increasingly digital world. It addresses the need to integrate competencies related to digital literacy into teacher education in order to prepare teachers for the challenges of the digital world. The guide shows that teachers must be familiar with and able to apply the legal requirements for data protection and copyright and must be able to advise students competently on these issues. They should be able to understand, evaluate and use the functioning of digital systems and the handling of large amounts of data (big data) as well as algorithmic structures for educational purposes. Seminar leaders promote subject-specific exchange on the opportunities and risks of data utilization and social issues surrounding algorithms and artificial intelligence. The qualifications are supported by situational tests and further training in the field of data and basic IT skills. It is emphasized that the responsibility for offering suitable training opportunities and supporting teachers in their professional development lies with seminar leaders and state teacher training institutions. It remains unclear how suitable measures can be designed in concrete terms.
State Institute for Teacher Training and School Development Hamburg	Brochure - good practice	https://li.hamburg.de/resource/blob/654358/29dce3d23cf324a21c3656221b2c7d7a/download-d-broschuer-e-lehrkraefte-tag-data.pdf	State Institute for Teacher Training and School Development Hamburg (ed.)	The document contains an invitation to an interdisciplinary teacher training program. It describes a teacher training program dealing with the competent and ethically responsible use of data in various subjects. The training aims to bring together teachers from subjects such as math, computer science, politics and economics to develop concrete teaching materials and methods that promote data literacy. Interdisciplinary workshops and lectures will enable teachers to combine technical knowledge with ethical issues and prepare students for the challenges of data-driven decision-making.
Stifterverband	Charta	https://www.stifterverband.org/sites/default/files/data-literacy-charta_v1_2.pdf	Schüller, K., Koch, H. & Rampelt, F.	The Data-Literacy-Charta, initiated by the Stifterverband and numerous partners in January 2021, formulates a common understanding of data literacy as a central educational task in a digitalized society. It emphasizes that data literacy – i.e. the ability to critically collect, analyze, evaluate and responsibly use data – is an indispensable key competence of the 21st century. The aim of the charter is to teach data literacy broadly and throughout life – in schools, universities, vocational training and extracurricular education. Data literacy is understood as an interdisciplinary skill that combines technical, application-oriented and socio-cultural perspectives. It promotes independent, evidence-based action, strengthens judgement and ethical awareness, and aims to enable all people to participate actively and reflectively in digital change. Five guiding principles form the core of the charter: access for all, lifelong education, transdisciplinary teaching, systematic coverage of the entire data process, and the connection of knowledge, skills and values with a strong focus on data ethics.

Table 9 Germany Report [Educational policies for DL in CE]

6.1.2.3 Strategic plans for DL in CE

Strategic plan	URL	Author(s)	Description
Brandenburg digital programme	https://digitalesbb.de/wp-content/uploads/2023/10/Digitalprogramm_BB_2025_Online-BF.pdf	State Government of Brandenburg (ed.)	Brandenburg's Digital Programme 2025 is a comprehensive concept for digital transformation that includes measures to enhance digital skills, promote digital society and modernise the digital state. It implicitly includes data literacy in teacher training and further education. The programme aims to enable all teachers in the country to achieve at least level B2 of DigCompEdu by 2024. DigCompEdu addresses data literacy skills, which are therefore indirectly expected of teachers with the aim of achieving the minimum level. However, there are no explicit training courses on data literacy or guidelines for its implementation.
Bremen strategy for digitisation	https://www.bildung.bremen.de/sixcms/media.php/13/L94-19_Digitalisierung.pdf	Senator for Children and Education	The Bremen strategy outlines the overall goal of preparing schools for the digital age by promoting the use of digital tools in education and supporting teachers and students in developing essential digital skills. The Bremen strategy describes the need for teachers to use digital media methodically and didactically in the classroom and to have knowledge of data protection, data security and copyright to ensure safe teaching and to enable pupils to use media and their own data responsibly. No specific training programmes, strategies or other elements of data literacy are mentioned.
Data strategy of the Federal Government	https://www.bildung-forschung.digital/digitalzukunft/shareddocs/Downloads/files/datenstrategie_bundesregierung.pdf?__blob=publicationFile&v=1	Federal Chancellery (ed.)	The Federal Government's Data Strategy aims to increase the social and economic benefits of data, while strengthening data literacy across all areas of society. It acknowledges that data literacy is not yet systematically or comprehensively embedded in schools or higher education institutions. Although initial elements are included in the KMK strategy 'Education in the Digital World', there is a lack of curricular integration in the federal states. Standardised, subject-specific offerings are also lacking in teacher training and higher education programmes. Aim of the strategy: The data strategy aims to provide all students and trainees with basic data literacy skills. Students and trainees should be empowered to collect, analyse, evaluate and use data responsibly and critically. Teaching should be age-appropriate, interdisciplinary and practical to enable participation in an increasingly data-driven society. In the long term, a basic standard of data literacy should be possessed by everyone who completes school or academic education in Germany. To promote data literacy in education and training, Teachers and learners will be provided with targeted materials to promote data literacy, complemented by a central platform of professional development programmes. The AI Campus plays a central role in teaching data literacy.



DigCompEdu Bavaria	https://www.km.bayern.de/gestalten/digitalisierung/unterricht-en-in-der-digitalen-welt/digcompedu-bavaria	Bavarian State Ministry of Education and Cultural Affairs (ed.)	DigCompEdu Bavaria gives a general idea of how to develop and assess digital skills in a systematic way and how to encourage them through the right training and education. It's based on the European reference framework 'DigCompEdu'. Data literacy is centrally anchored in the competence areas of 'digital resources' and 'learning diagnosis and feedback', as both the confident handling of sensitive data and the analysis and interpretation of learning-related data require fundamental data-related skills. To provide individual support to Bavarian teachers in choosing further training courses, a data protection-compliant self-assessment tool for 'DigCompEdu Bavaria' was developed at ALP Dillingen. This tool enables teachers to reflect on their digital sub-skills, including those relating to data literacy, and to select tailor-made further training courses in future.
Digital strategy school NRW - Teaching and learning in the digital world - Implementation strategy until 2025	https://broschüren.nrw/fileadmin/digitalstrategie-schule-nrw/pdf/digitalstrategie_schule_nrw_web.pdf	Ministry for Schools and Education of the State of North Rhine-Westphalia	The NRW Digital Strategy for Schools is a concept for the digital development of schools and teaching up to 2025 that aims to equip students with the necessary digital skills for a digital world. These include skills such as critical thinking, self-directed learning, creative problem-solving and the responsible use of digital media. At the same time, teachers are specifically qualified and supported so that they can use digital technologies in an educationally meaningful way and professionally support digital learning processes The responsibility for handling of data, data protection and data security - as a part of data literacy - is emphasised both at the level of students' skills and at the level of teachers, who receive comprehensive training and support in these areas through targeted further education and training programmes.
Education regions in Bavaria - developing into digital education regions	https://www.km.bayern.de/download/4-23-11/handreichung_digitale_bildungsregion_ansichts.pdf	Bavarian State Ministry of Education and Cultural Affairs (ed.)	The paper is a handbook for the further development of the 'Educational Regions in Bavaria' initiative, with a focus on digital education. It provides suggestions on how existing regional educational structures can be used and further developed to actively shape the digital transformation. The goal of strengthening skills for a digitalised world gives rise to the following areas of action, among others: (1) Cooperation between schools, authorities and IT legal experts to create training courses on data protection and copyright issues, (2) the creation of a regional pool of experts on IT topics, and (3) cooperation with public and academic libraries to teach information literacy, especially in upper secondary education and teacher training. It is not specified which sub-skills are included in IT topics or IT skills.
OER Strategy	https://www.bmbf.de/SharedDocs/Publikationen/DE/3/691288_QER-Strategie.pdf?__blob=publicationFile&v=5	Federal Ministry of Education and Research (BMBF)	The OER strategy of the German Federal Ministry of Education and Research (BMBF) promotes the dissemination and use of free educational materials (Open Educational Resources) to make education more equitable, innovative and accessible. It supports



			teachers and learners in the digital transformation of the education system through open materials and skills. Teachers should receive targeted training in data literacy through offerings such as the AI Campus and freely available OER materials. This will strengthen their 21st century skills and enable them to teach in a data literate way.
Saxony-Anhalt state concept	https://lisa.sachsen-anhalt.de/fileadmin/Bibliothek/Politik_und_Verwaltung/MK/LISA/Unterricht/Projekte_und_Entwicklungsvorhaben/DigitalPaktSchule_LINDIUS/digitale_medien.pdf	Ministry of Education of Saxony-Anhalt (ed.)	In all phases of teacher training, the teaching of media didactics and media education skills is considered mandatory. Media literacy is based on the six areas of competence defined in the strategy of the Standing Conference of the Ministers of Education and Cultural Affairs, 'Education in the Digital World'. These include elements that train data literacy skills. The continuing education concept for teachers follows a modular system: • <i>Module A</i> teaches basic IT skills. • <i>Module B</i> covers interdisciplinary media skills, including the handling of digital data, information processing and data protection. • <i>Module C</i> focuses on subject-specific applications of digital media and tools. The training courses are provided by a support system consisting of media education consultants, the education server, state-wide qualification projects and external partners such as the Media Authority of Saxony-Anhalt, with the aim of strengthening teachers' digital and media education skills in a targeted manner.
Strategy paper 'Education in the digital world'	https://www.kmk.org/fileadmin/Dateien/pdf/PresseUndAktuelles/2017/Strategie_neu_2017_datum_1.pdf	Standing Conference of Ministers of Education and Cultural Affairs (KMK)	This strategy of the Standing Conference of the Ministers of Education and Cultural Affairs establishes a framework for promoting education in the digital world with the aim of preparing all learners for a self-determined, reflective and competent life in a digitally shaped society. At the same time, it addresses the challenges arising from the adaptation of educational plans and lesson development, initial and further teacher training, and the creation of suitable infrastructural, legal and personnel framework conditions. At the centre of the strategy are six newly formulated areas of competence that serve as the basis for the development of curricula, educational media and continuing education: • <i>Searching, processing and storing</i> • <i>Communicating and cooperating</i> • <i>Producing and presenting</i> • <i>Protecting and acting safely</i> • <i>Problem solving and acting</i> • <i>Analysing and reflecting</i> Regarding initial and in-service teacher training, the areas of competence for teaching are described, as well as the guidelines for concrete implementation in all phases of teacher training. The KMK paper points out that training programmes often focus only on the technological aspect and the use of media, and that there is a lack of reflection and personal application. It also recommends the systematic inclusion of social, ethical and economic issues related to digitalisation in



			further education courses. Online-based continuing education programmes that can be accessed anytime, anywhere should promote skills development and ensure that teachers are able to take current developments and data protection requirements into account in their teaching. In addition, it is demanded that teachers and other stakeholders in school development need data literacy for data-based school development and that state institutes or quality agencies of the federal states should support this as well as research - through appropriate training courses.
Strategy paper “Teaching and learning in the digital world - Supplementary recommendation on the ‘Education in the digital world’ strategy”	https://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2021/2021_12_09-Lehren-und-Lernen-Digi.pdf	Standing Conference of Ministers of Education and Cultural Affairs (KMK)	The KMK additions emphasize that digital skills – including basic computer skills – must be firmly anchored in all phases of teacher training. Teachers should not only deepen their subject-specific knowledge, such as computer science or mathematics, but also understand basic digital technologies, such as algorithmic structures in digital media. Training should be continuously adapted to current topics such as big data, artificial intelligence, data protection and virtual reality. The federal states are obliged to develop cross-phase competence frameworks that integrate media education, ethical and media-critical issues in addition to technical skills. Digital self-assessments such as SELFIE should be used more extensively to promote competence development. Training formats should be practical, customisable and adaptable; teachers need time to try things out and a positive culture of learning from mistakes. Cooperation and digital networking are seen as helpful and supportive. Government and external programmes complement each other well, and digital and hybrid formats allow people to participate anytime, anywhere. Universities have a responsibility to strategically integrate digital skills into teacher training programmes and to promote exchange through Open Educational Resources (OER). Priority measures include the interlinking of all training phases, sustainable qualification programmes, the promotion of digital leadership, the clarification of credit transfer modalities for digital formats, and targeted training in data protection and feedback systems.
State concept - media education in Saarland schools	https://www.saarland.de/SharedDocs/Downloads/DE/mbk/Bildungsserver/unterricht-und-bildungsthemen/Medienbildung/dld_landeskonzept-medienbildung.pdf?__blob=publicationFile&v=1	Ministry of Education and Culture (ed.)	State concept for media education in Saarland schools with the aim of strengthening and promoting the digital skills of students and media education in teacher training in order to face the challenges of digitalisation in society. Teachers' own media education (including basic computer skills) will be developed at all stages of teacher training. The State Institute for Education and Media (LPM) is to offer qualification and training programmes to promote teachers' IT skills. The State Institute for Political Education is required to develop strategies to promote informational self-determination, focusing on topics such as big data, fake news and democracy education in the digital age. In addition, the



			working group on media literacy encourages the development of services for students, teachers and parents in the areas of data protection, personal rights and copyright and license law.
Strategic goals of the MBJS	https://mbjs.brandenburg.de/sixcms/media.php/140/bildung%2C_jugend_und_sport_im_digitalen_wandel_26.pdf	Minister for Education, Youth and Sport of the State of Brandenburg (ed.)	The strategy formulates the goal of promoting digitization-related skills of teaching staff in schools. Training programmes are to be developed based on the European Competence Framework for Digital Competence of Teachers (DigCompEdu) with the aim of achieving a minimum level of B1 for all teachers. DigCompEdu also includes elements of data literacy in some parts, which is therefore implicitly required. A monitoring system will be set up to ensure the quality of the training courses. Cooperation between all phases of teacher training will be intensified to better link research and practice. The University of Potsdam is involved, and training systems are being expanded.

Table 10 Germany Report [Strategic plans for DL in CE]

6.1.2.4 Summary

An analysis of federal and state strategy and position papers, as well as related programmes, reveals that the concept of data literacy has yet to be systematically incorporated into compulsory education or teacher training programmes. Data literacy is generally only implicitly addressed in educational policy discourse and is rarely explicitly referenced or defined. The term appears sporadically, if at all, typically in relation to digital education or data-based school development. If elements of data literacy are discussed, the focus in the context of teachers is often on aspects of data protection. However, it is often embedded within broader concepts, such as media education, digital education, and information-related skills. It is often unclear whether data literacy refers to technical skills, statistical understanding, or the reflective use of educational data.

Integration in compulsory education

The systematic integration of data literacy into school education has been inconsistent and largely implicit to date. Although education policy strategies increasingly emphasise the importance of digital skills and media education, there is generally no clear and explicit definition of data literacy for the school context. With its strategy ‘Education in the Digital World’, the Standing Conference of the Ministers of Education and Cultural Affairs (KMK) presents a competence framework that describes digital skills to be acquired across all subjects (KMK, 2017). Within this framework, data literacy is included in some aspects but is not identified as a separate area of competence. The concrete implementation of this framework in the federal states remains largely open. An exception is the charter of the Stifterverband, which explicitly names data literacy as a separate competence and describes it in multiple dimensions (Schüller et al., 2021).

Lack of systematic integration into initial and continuing education

There is currently no comprehensive competence framework that systematically integrates data literacy into teacher training. Some federal states, such as Bavaria, are guided by the European reference framework DigCompEdu, which lists data literacy as part of digital competence (Redecker, 2017). However, the concrete implementation of this framework in initial, continuing and further education⁶ remains unclear. Both the DigCompEdu Bavaria programme and

⁶ Teacher education in Germany is structured in two phases. The first phase consists of university studies, where prospective teachers complete a subject-specific academic degree combined with educational



Brandenburg's digital strategy are based on the DigCompEdu framework, setting a minimum target level of competence for teachers. They offer further training in digital education to help teachers achieve this goal, although it remains unclear to what extent this covers data-related skills (Bayerisches Staatsministerium für Unterricht und Kultus, 2024; Landesregierung Brandenburg, 2022).

Some programmes address the use of data to improve school development. For example, the Federal Ministry of Education and Research (BMBF) promotes data-based school development through its 'Startchancen'-programme (BMBF, 2024). However, these initiatives mostly remain at the institutional level, and specific training for teachers on how to use, analyse and evaluate data for didactic purposes is lacking. Data literacy is promoted mainly in individual projects, for example in the 'Quality Initiative for Teacher Training' or at university level. There is no comprehensive integration into teacher training.

Summary

In summary, it can be said that data literacy has not been given much consideration in teacher training so far. The term has not yet been defined in education policy discourse, and it is absent from binding curricula and qualification programmes. Although the importance of data-driven school development is emphasised, its practical implementation, particularly in teacher training and continuing professional development, lags behind requirements. To establish data literacy as a key competence in the education system in the long term, concrete and binding measures are needed. This includes developing clear competence profiles, integrating data literacy into all training phases, and providing practice-oriented continuing education that covers the technical, professional, and ethical aspects of data handling.

6.1.3 Scientific Research

Summary	Educational level, discipline
Belova, N., & Eilks, I. (2015) The case study examines how advertising for natural cosmetics can be used in secondary school chemistry lessons to promote science-related media literacy. Five learning groups (years 7–11, n=102) from a comprehensive school took part. Surveys and classroom observations showed that the students developed a critical awareness of how scientific data is used selectively or misleadingly in advertising. However, no data collection or analysis was carried out by the students themselves. Advertising proved to be a useful context for promoting critical consumer literacy.	Secondary level I, Chemistry
Bez, S., Poindl, S., Bohl, T., & Merk, S. (2021) The study examines how primary school teachers receive feedback from VERA 3 and what role their ability to use data in the classroom (data literacy) plays in this.	Third grade, primary school
Biehler, R., Frischmeier, D., Podworny, S., Wassong, T., Schulte, C., Opel, S., & Schlichtig, M. (2019) Project on data science in schools (ProDaBi') Aim: Teaching basic concepts of data science Linking mathematics and computer science didactics Focus on data literacy, real data, digital tools and social relevance	Secondary level II, Mathematics and computer science (interdisciplinary)

sciences. This is followed by the second phase, the *Referendariat*, a practical training period at schools lasting 12 to 24 months, which includes both teaching practice and accompanying seminars. Upon successful completion, candidates must pass a state examination to become fully qualified teachers. The structure and duration can vary slightly between federal states due to Germany's decentralized education system.



Teaching practice tested at two grammar schools	
Böhme, R., Brühl, D., Reisemann, K., Munser-Kiefer, M., & Hilbert, S. (2023) Development of digital skills among teachers through modular seminars; focus on data literacy in the area of diagnosis and support; use of digital tools (e.g. AI-based spelling app); linking theory and practice through situated learning and use cases	Higher education at primary school teacher level, including further training for teachers
Buschauer, R., & Wadehul, C. (2020) Importance of data literacy as a central competence Sub-competences: Perceiving, analysing, judging, acting Integration into educational plans and subjects Challenges: Interdisciplinarity, ethics, media education Practical examples: Data literacy in the classroom, projects, learning analyses Goal: Critical and responsible use of data at school	Secondary level 1
Frischemeier, D. (2024) Importance of early data literacy in primary education Integration of the data analysis cycle (PPDAC) to promote statistical thinking and digital skills Use of digital tools for deeper data exploration Presentation of empirical findings Concrete teaching ideas to strengthen data literacy in primary education	Primary level (primary school), specialising in mathematics and statistics didactics. It is aimed at teachers and researchers in the field of primary school education
Grillenberger, A. (2019) The importance of data in the digital society - Insufficient consideration of modern data topics in the classroom - Development of a model for key concepts of data management - Development of a competence model for data literacy - Goal: Integration into the school curriculum - Implementation through didactic reconstruction and lesson development	Secondary School
Grothaus, J., Greubel, A., Dickmeis, L., Herold, A., Elsholz, M., Hennecke, M., & Trefzger, T. (2023) In the “The glass ecosystem” project, students build a closed mini-ecosystem in glass with sensors. They collect, analyze and interpret data in order to understand ecological processes. This teaches data literacy in an interdisciplinary context (STEM).	9th & 10th grade, grammar school and secondary school; subjects: computer science, biology, physics, mathematics - focus on interdisciplinary STEM education.
Hase, A., Kuhl, P., & Greiner, F. (2024) The article discusses the skills teachers need to use digital data from learning platforms for individualized teaching. It combines models of data and digital literacy and proposes the concept of digital data literacy, which includes analytical, critical, and data-protection-aware use of digital tools to support adaptive, evidence-based teaching.	Teacher training, i.e. the initial, further and continuing training of teachers
Hase, A., & Kuhl, P. (2024) The study examines how primary school teachers use data from digital learning platforms to make instructional decisions. It describes the use along the lines of the data-based decision-making model (DBDM). It reveals differences in the depth of data use.	Primary school



Hejtmanek, R. A., Hahn, S., Schulte, K., & Klein, E. D. (2024) The document is a practical guide that systematically develops the concept of data richness. It shows how schools can effectively shape school development through goal-oriented, multi-perspective data use. A central concern is to enable actors from schools and their support systems to build data literacy and use data competently and critically.	General school education (primary to secondary level)
Hillebrand, A., & Bremm, N. (2019) The study shows how in-school training is used as part of a design-based school development project to improve data-based teaching and collaboration in a socially disadvantaged school. Data literacy plays a central role as teachers learn to interpret school data together and translate it into concrete development actions.	Secondary level I (secondary school), School development,
Jehle, N. (2021) Aim to explain the importance, status and promotion of data literacy in education	Focus on teacher training and school education
Jornitz, S., & Macgilchrist, F. (2021) The paper unfolds the ambivalences that permeate data practices in schools. By using the metaphor of visibility, a threefold shift is shown when digital data technologies are used in the classroom. These shifts are described with the term's panopticon, panperspicon and panspectron. In the process, pedagogical and other school practices are transformed in subtle yet far-reaching ways. The argument is demonstrated by analysing an interview with a teacher who reports on the use of digital technologies in her everyday school life..	Comprehensive school
Loth, G., & Döhrmann, M. (2022) This article presents a developmental research project to promote data literacy in 7th grade. Digital worksheets and spreadsheets are used to collect and analyze real data and support participation in inclusive mathematics lessons. Theoretical principles of inclusion, digitalization and data literacy are combined with didactic design principles.	Secondary level I, 7th grade, mathematics (stochastics),
Macgilchrist, F., Hartong, S., & Jornitz, S. (2023) The article offers a critical review of international studies on algorithmic datafication in the school context, analyzes its effects on educational management, teaching and data literacy and develops research desiderata for german educational research. The focus is on the reflection of epistemic effects of data-driven technologies.	School education (primary to secondary level)
Schüller, K., Busch, P., & Hindinger, C. (2019) The study develops a comprehensive competence framework for data literacy as a central key competence of the 21st century. The aim is to support universities in curriculum development. Data literacy encompasses not only technical skills in dealing with data, but also ethical reflection, values and interdisciplinary competences. The paper offers suggestions for operationalising and testing these competencies and contains practice-oriented case studies.	The focus is on higher education (Bachelor's and Master's level), but the relevance is also emphasised for schools, further education and the world of work. The competence framework is applicable across disciplines - examples come from medicine, engineering, sociology, mobility research and psychology. It is emphasised that data literacy is not only relevant for data scientists, but for all disciplines and professions.



Pollak, G., Decker, J.-O., Dengel, A., Fitz, K., Glas, A., Heuer, U., Huang, V., Knapp, D., Knauer, J., Makeschin, S., Michler, A., & Zimmermann, A. (2018) The paper develops a theoretically sound and didactically designed framework concept for anchoring information and media literacy (IML) in university teacher training. As part of the SKILL project at the University of Passau, an IML certificate programme is proposed that understands media literacy as a reflective, action-oriented and culturally embedded skill. Instead of technology-centred approaches, the paper calls for media education that is media-critical, culturally theoretical and professionally oriented in order to meet the demands of pedagogical professionalism in the digital age.	Higher education (university teacher training)
Pukrop, J., & Breiter, A. (2018) Analyses the importance of teachers' data skills. Focuses on understanding, acceptance and use of comparative work. Emphasises the role of graphic design and interactive visualisations. Aim: to identify ways to improve data literacy and feedback systems. Refers to research questions on influencing and developing models of data literacy.	The studies and models relate primarily to teachers at secondary level (school, especially third and eighth grade).
Ruwisch, S. (2021) Focus on statistical thinking in elementary school. Statistical literacy as a basic building block of data literacy. Children should learn to interpret and critically scrutinize data at an early age. Current curricula neglect statistical skills in elementary school. Aim: to develop a critical and reflective attitude towards data from an early age.	elementary school, subject: Mathematics didactics
Wassner, C., Podworny, S., & Biehler, R. (2018) Integrate data literacy into the mathematics curriculum; Promote interdisciplinary data analysis; Students should critically analyse and interpret real data; Software-supported methods (e.g. Fathom) improve motivation and understanding; Challenges: limited curriculum and resources.	Upper secondary level (Sekundarstufe II, Gymnasium)

Table 11 Germany Report [Scientific research]

6.2 Case studies

6.2.1 Description

Case study 1: Datafied - DATA For and In Education	
URL	https://www.dipf.de/de/forschung/projekte/datafied-data-for-and-in-education-die-konstruktion-der-schule-im-prozess-der-datafizierung
Educational level/context	Secondary education level Formal education system, particularly focusing on institutional structures and policy-making It explores the system-wide impact of digital data processes, analyzing how data practices shape schools at multiple organizational levels. The context includes school governance, administration, teaching practices, and educational software, positioning the study at the intersection of pedagogy, technology, and policy.
Description	The project investigates the datafication of the school system as a multidimensional transformation driven by digitalization.



	It analyzes how data is produced, interpreted, and used across different educational stakeholders, including policymakers, school authorities, administrators, teachers, students, and parents. Data is seen as non-neutral, carrying embedded ideas of what constitutes "good education," "good schools," and "good teaching."
Methodology	The research is based on empirical studies conducted at four interconnected interfaces within the school system: School supervision and governance (Hartong, Helmut-Schmidt-Universität) School information systems and management (Jarke/Breiter, ifib). Learning software and classroom practices (Macgilchrist, GEI). Teacher-student interactions in the classroom (Jornitz, DIPF). The project follows a multi-perspective and interdisciplinary approach, linking educational research, sociology, and data studies.
Technology	The study analyzes the technological infrastructure of schools, including: School information systems used in administrative decision-making. Learning software is integrated into classroom teaching. Digital tools that collect and structure student data. Focus is placed on how these technologies influence educational roles, expectations, and interactions The project critically reflects on how data technologies embed normative assumptions about education.
Outcomes	The research provides insights into how data shapes professional identities and roles within the education system. It generates understanding of how data practices restructure relationships among educational actors. Findings contribute to the development of policy recommendations and critical perspectives on data governance in education. The project offers empirical foundations for designing future data practices, helping guide informed decision-making in education policy and school development. It supports reflective discourse on the implications of data-driven decision-making in educational settings.
Case study 2: AID (All is data)	
URL	https://www.empirische-bildungsforschung-bmbf.de/de/Themenfinder-1720.html/projekt/01JD1903A
Educational level/context	Secondary education level It focuses on the formal education sector, specifically within structured school systems. The study investigates the daily practices of teachers and educational professionals, including school social workers, in relation to digital data. It examines how multiprofessional teams conceptualize and implement data literacy in schools. The research explores how data is integrated into cross-curricular learning activities and how these practices contribute to broader school development and media education initiatives.
Description	The project aims to understand and reconstruct how educators engage with data in everyday school life, and to design educational strategies based on empirical insights. It comprises three sub-projects, which focus on: Developing concepts for implementing data literacy in schools. Analyzing current data and algorithm-related practices in pedagogical contexts. Investigating organizational aspects of interdisciplinary educational offerings.
Methodology	A systematic review was conducted to map international discourse on the relationship between data and school development. Empirical methods used in the study include:



	Collection and analysis of educational artifacts. Deployment of a chatbot for data collection over a 10-day period. Conducting digital group discussions and interviews with educators. Analysis of metadata from Learning Management Systems (LMS), especially in relation to grading processes. A participatory research approach was adopted, integrating findings into practical educational designs.
Technology	The study employed various digital tools and systems: A chatbot to track and collect data on educational practices over time. Digital group discussions and interviews to capture educators' perspectives Examination of Learning Management Systems (LMS), focusing on their influence on grading and data processes. Analysis of educational software tools used in schools and their role in shaping teachers' data-related actions.
Outcomes	The project resulted in the creation of educational concepts for data literacy tailored to the school context. Professional development programs and instructional materials were developed to support teachers in integrating data literacy into their teaching. The theoretical framework positions data literacy as a component of media education, emphasizing the contextual and non-neutral nature of data. Future scenarios for data-driven schools were proposed, addressing the transformation of education through data practices. The findings were published in various scientific papers and a comprehensive book that presents multiple perspectives on digital data practices in education.
Case study 3: Digital Sparks	
URL	https://www.digital-sparks.org/
Educational level/context	Secondary Education (from 9th grade)- Formal Education – including hybrid and project-based learning formats Target Region: Germany, Austria, Switzerland, Czech Republic Target Audience: Students (from 9th grade) Teachers across various subjects and school forms Schools engaging in digital, interdisciplinary, and value-based education
Description	Digital Sparks is an open, nonprofit learning platform supporting project-based, digital learning in schools. Sparks are interdisciplinary mini-courses that empower students to explore, create, and share around topics that matter to them – all in a digital, hybrid-friendly environment. Each Spark is based on the methodical flow: Discover → Create → Share and results in a visible learning product.
Methodology	Flexible formats: Can be used as part of a project week, a double lesson, or across multiple days – fully adaptable to the school's schedule. Interdisciplinary and modular: Sparks are designed to fit into different subjects and educational goals. Learner-centered: Students define their own focus topics, develop ideas, and implement them creatively. Team-based and reflective: Focuses on collaboration, problem-solving, empathy, and digital literacy. Sparks are co-designed by educators, domain experts, and learning designers to ensure pedagogical quality and innovation.



Technology	Digital App / Platform: Easy sign-up and intuitive use. Teachers select a Spark, invite students, and guide them through digital project work Hybrid-ready: Suitable for classroom or remote learning Only requires internet, updated browser, and one digital device per two students Homeschooling requires devices with camera and microphone. Didactic tools: Interactive content and practice-oriented features support motivation and relevance Integrated learning platform supports digital teaching and learning seamlessly
Outcomes	>250 schools, >10,000 students, >2,000 student projects Enhanced digital skills: Critical thinking, ethical reflection, and creative digital work Empowerment through creation: Students develop and present their own products Increased engagement: Positive feedback on visual design, structure, and tool integration School development: Sparks are aligned with educational goals and framework curricula (in progress) <u>Products:</u> Flexible Sparks: Ready-to-use learning journeys for schools Digital App: Core platform for spark creation and implementation Learning Products: Individual student creations in response to open-ended questions Alignment with curricula: Integration with subject goals and framework plans is ongoing
Case study 4: KI Campus: Data Literacy for Primary School	
URL	https://ki-campus.org/courses/dlgrundschule
Educational level/context	Primary Education Formal Education Target Audience: (Prospective) primary school teachers aiming to teach data literacy to children Entry Level: Beginner – no prior knowledge required <u>KI-Campus:</u> Vision: A society that is competent in Artificial Intelligence. Mission: To strengthen AI competencies through free, digital learning opportunities for everyone. KI-Campus is Germany's learning platform for Artificial Intelligence. It offers free online courses, podcasts, videos, and tools to enhance AI and data literacy.
Description	This course offers a basic introduction to data literacy tailored specifically for primary education. It consists of five modules, each focusing on a key aspect of working with data, such as understanding, storing, analyzing, and critically assessing data. The modules are embedded in a narrative framework to illustrate real-world applications and challenges in a child-friendly manner. The course enables educators to implement foundational data literacy content in the primary school classroom.
Methodology	The course uses storytelling as a didactic method to introduce and contextualize data-related concepts. Each module includes interactive teaching materials for immediate use in class. The course is asynchronous and self-paced, designed for individual learning.



	Focuses on hands-on learning, critical reflection, and practical classroom application.
Technology	Hosted on KI-Campus, a digital platform for AI and data literacy learning. Includes digital learning content, downloading materials, and online exercises. Developed and maintained by the DaLiK project team at the University of Bamberg.
Outcomes	Learners will be able to: Identify and distinguish between various types of data and their significance. Critically collect and evaluate data in classroom contexts. Understand the basics of machine learning and evaluate its opportunities and risks. Assess the trustworthiness of data and digital products. Use data responsibly and reflectively, especially regarding privacy and data protection. Apply all these themes didactically in a way that is age-appropriate for primary students. Certificate of Completion: Not explicitly mentioned; the course is labeled as an entry-level, non-credit offer.
Case study 5: Unblack the Box	
URL	https://unblackthebox.org/aktivitaeten/vortraege-und-publikationen/
Educational level/context	Multiple levels of education, including: Schools Higher education Early childhood education Non-formal and informal education settings Teacher education and professional development It operates within the formal and non-formal education sectors, offering resources for classroom and extracurricular contexts. The context includes the increasing influence of digital technologies, platforms, and AI in educational settings, focusing on how these affect pedagogical and institutional practices.
Description	A network initiative founded in 2019, bringing together experts from: Educational science Sociology Educational informatics Media and health education School and university teachers The initiative promotes a holistic and critical engagement with data technologies in education, especially in response to growing digitalization and datafication. It provides tools and knowledge to support educators and institutions in making informed, reflective decisions—without requiring extensive technical expertise. <u>Activities include:</u> A regularly updated website with research and project information A bi-monthly newsletter with resources, tips, and commentary Downloadable teaching materials, toolkits, and instruments for critical tech engagement (e.g., EdTechReflektor) Developed teaching concepts for workshops in schools, universities, and beyond Workshops and presentations at national and international events Collaborations with educational institutions around technology implementation and development

	Ongoing creation of professional development content
Methodology	The methodological approach is transdisciplinary and practice-oriented, emphasizing active collaboration with educational actors.
Technology	The initiative focuses on a critical understanding of educational technologies, including: - Devices and digital infrastructure - Learning platforms and software - Learning analytics and AI applications It critiques the ideological promises attached to edtech—such as efficiency, personalization, or equity gains—by highlighting the embedded power structures and assumptions. Tools developed by the initiative aim to “unblackbox” the inner workings and social implications of these technologies, making them accessible for reflection and design.
Outcomes	The initiative contributes to enhancing critical digital literacy and data awareness in educational contexts. It supports educators in critically reflecting on and shaping their use of digital technologies. UNBLACK THE BOX helps shift the educational discourse from usage-focused training to structural and socio-technical critique of digital tools. It empowers institutions and teachers to maintain an agency over digitalization processes and to purposefully integrate or even preserve analog methods when appropriate. It strengthens the democratic and reflective function of education in a datafied society. Materials & Resources produced by the initiative include: - The Alternative Checklist: A set of 12 reflective questions to support institutions in developing a conscious and responsible approach to digital technologies in education. - The EdTechReflektor: A practical instrument for pedagogical reflection on digital learning media and technologies. - Guide for Critical Data Education: An online manual designed to support the promotion of critical data literacy in educational practice. - Teaching Concepts: Open-access instructional concepts and workshop formats for use in higher education, schools, and non-formal education. - Video Clips: Curated video segments presenting UNBLACK THE BOX content for continued learning and dissemination. - Podcasts: Audio content for critical exploration of digitalization in education—suitable for listening and sharing.

Table 12 Germany Report [Case studies]

6.2.2 Summary

The five case studies **DATAFIED** (DATA For and In Education), **AID** (All Is Data), **Digital Sparks**, **KI-Campus** (Data Literacy for Primary School) and **Unblack the Box** provide valuable insights into how digital technologies and data logic are being embedded into education. Together, they reflect a dynamic landscape where critical reflection, innovative practice, and political engagement are needed to navigate the challenges of datafication in schools and learning environments.

The **DATAFIED** research project investigates how data practices affect the structure and governance of education. The findings indicate that schools are increasingly shaped by the logic of data from school inspections and management software to teaching materials and classroom practices. Teachers and administrators are often unaware of the normative assumptions built into educational technologies, which may subtly steer pedagogical decisions. The study emphasizes that data does not simply reflect educational reality but actively reshapes roles, accountability, and power relations within schools.



The interdisciplinary research project **AID** investigated how data shape everyday educational practices in schools. In the context of digital transformation, the generation, linking, and use of data have become central to all areas of life, presenting new challenges for educators. The project examined how data influence school life, how they are embedded in teaching and learning, and how teachers and multi-professional teams interpret and apply data literacy in cross-curricular work. Researchers from TU Kaiserslautern, FernUniversität in Hagen, and the Institute for Information Management Bremen reconstructed how educational professionals interact with data and explored organizational dynamics in interdisciplinary learning settings. Key activities included developing school-relevant data literacy concepts, analyzing everyday data practices, and studying the role of data in school organization, using methods such as a chatbot, digital focus groups, and artifact analysis. The findings showed that data significantly influence pedagogical actions and school structures, and that data are shaped by context, interpretation, and socio-cultural factors. The project produced practical training materials and a final book publication, contributing to media literacy discourse and providing tools for implementing data literacy in schools.

Digital Sparks, developed by the Education Innovation Lab, is a platform offering interdisciplinary, project-based learning experiences for students from grade 9 onwards. Each "Spark" consists of a learning journey structured around the phases "Discover – Create – Share", culminating in student-designed digital products. Teachers report high student motivation, and schools across Germany, Austria, Switzerland, and the Czech Republic use the platform. Sparks not only foster digital and collaborative skills, but also support student agency, encouraging learners to address real-world challenges with creative solutions.

The introductory course **Data Literacy for Primary School** developed by the **KI-Campus** and the University of Bamberg helps (future) primary school teachers foster data literacy among young learners. The course is structured around five accessible modules and uses storytelling to explore core concepts such as data collection, analysis, ethics, and data security. Key findings suggest that even early education can and should address critical and ethical dimensions of data use. The course is designed to be easily integrated into classroom practice and requires no prior technical expertise.

Unblack the Box is a network initiative focused on promoting critical, reflective engagement with digital technologies in educational settings. It argues that many educational stakeholders lack the tools to question or understand the inner workings of data-based systems, which remain "black boxes." Through materials like the EdTechReflektor, a Critical Data Education Guide, and teaching concepts, the initiative empowers educators to examine how algorithms, platforms, and digital infrastructures shape learning processes and institutional decisions. It advocates for a more holistic, cross-disciplinary understanding of digital transformation.

These five cases collectively demonstrate that datafication in education is not a neutral process, it carries normative, ideological, cultural, and political implications. Whether in classrooms, policies, or platforms, digital systems are embedded with assumptions that shape behavior, redistribute responsibility, and influence decision-making.

Across the initiatives, a strong consensus emerges fostering critical data literacy is as essential as technical proficiency. From primary schools to youth centers to teacher education, learners must be equipped to understand not only how technologies work, but also why they are designed the way they are and especially by whom for whom.

Moreover, these projects show the power of open, creative, and participatory approaches to digital learning. Whether through innovative research, modular online courses, or collaborative classroom projects, each initiative offers methods to help learners and educators understand digital data and its implication.



6.3 Survey

Umfrage zur Datenkompetenz in der allgemeinen Schulbildung

Diese Umfrage wird im Rahmen des Erasmus+-Projekts zur „**Stärkung der Bildung durch Förderung von Datenkompetenz in der allgemeinen Schulbildung (DATA-READY)**“ (ERASMUS-EDU-2024-POL-EXP) durchgeführt.

Das DATA-READY-Projekt zielt darauf ab, Empfehlungen zur Verbesserung der Datenkompetenz von Schüler:innen in der allgemeinen Schulbildung zu entwickeln, umzusetzen und zu erproben. Gemeinsam mit Verbundpartner:innen aus Zypern, Griechenland, Polen und Portugal entwickeln, pilotieren und evaluieren wir einen umfassenden und innovativen europäischen Rahmen für Datenkompetenz im Bildungswesen sowie Fortbildungsprogramme für Lehrpersonen.

Ziel dieser Umfrage ist es, die Ansichten, Praktiken und Einstellungen von Lehrpersonen, Schulleitenden und weiteren Bildungsakteur:innen zur Nutzung und Verbesserung der Datenkompetenz in der Pflichtschulbildung in Deutschland zu erfassen. Die Umfrage wird in allen fünf Partnerländern durchgeführt und hilft dem Konsortium, den Status Quo im Europa hinsichtlich datengestützter Bildungspraktiken zu verstehen.

Ihre Teilnahme an diesem Forschungsprojekt ist von großem Wert. Das Ausfüllen der Umfrage dauert nicht länger als 10 Minuten.

Vielen Dank im Voraus für Ihre Teilnahme!

Das DATA-READY-Projektteam

bastiaj@uni-mainz.de [Konto wechseln](#)



 Nicht freigegeben

* Gibt eine erforderliche Frage an

Datenschutz *

Die im Rahmen dieser Umfrage erhobenen Daten werden ausschließlich zu Forschungszwecken verwendet. Die Antworten werden vertraulich behandelt und sind vollständig anonym. Die Daten werden sicher gespeichert und sind nur dem Forschungsteam zugänglich.

Unser Konsortium erfüllt die Anforderungen der Datenschutzgrundverordnung (DSGVO) bezüglich Schutzes und Verarbeitung personenbezogener Daten.

Haftungsausschluss

Das Projekt „DATA-READY“ wird gefördert durch die Europäische Union. Die geäußerten Ansichten und Meinungen stammen ausschließlich von den Autor:innen und spiegeln nicht notwendigerweise die der Europäischen Union oder der Exekutivagentur Bildung und Kultur (EACEA) wider. Weder die Europäische Union noch die EACEA übernehmen Verantwortung für den Inhalt.

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☐ Zustimmung

☐ Ablehnen

Figure 52 German Survey [Screenshot]



The national survey in Germany was accessible through this link:

https://docs.google.com/forms/d/e/1FAIpQLScaq9PqUINF_Ftoulruj5veRHVfMqd4DuuzXPctzFVt3GVrKg/viewform?usp=header

6.3.1 Demographic Data (Section A)

The table below represents the demographic data for the 105 participants.

Most of the respondents identify themselves as female (n = 59), followed by male participants (n = 46). This gender distribution indicates a slight overrepresentation of women in the sample.

Geschlechterverteilung

105 responses

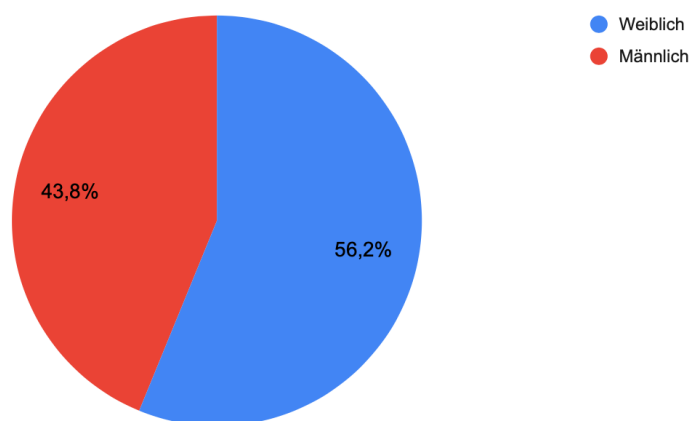


Figure 53 German Survey [Gender]

Figure 2: Gender distribution

The age distribution of the sample indicates a strong concentration in the younger age segments. Specifically, 47.6% of respondents are between 18 and 21 years old, and an additional 41.9% fall within the 22 to 29 age group. The remaining participants are distributed across older age groups, but they represent only a small proportion of the sample. Overall, the data reveals a clear predominance of young adults, with older cohorts significantly underrepresented. This strong presence of younger participants is partly due to the inclusion of early-career teachers who are still completing their training alongside their professional duties.

Altersverteilung

105 responses

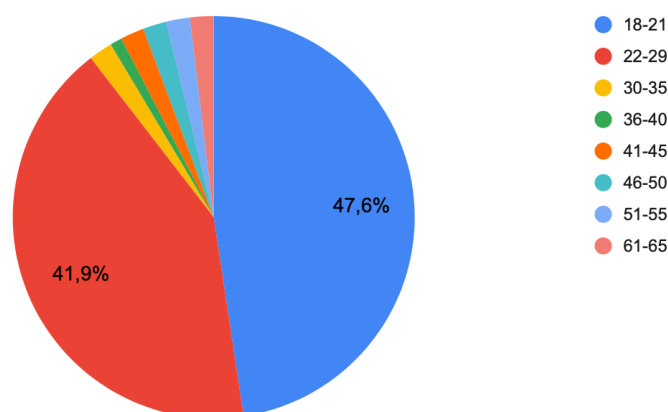




Figure 54 German Survey [Age]

Figure 3: Age distribution

Regarding the highest educational qualifications, the majority of respondents ($n = 76$) hold the *Allgemeine Hochschulreife* (general university entrance qualification). A smaller number have completed a Master's degree ($n = 16$) or a Bachelor's degree ($n = 13$). This distribution indicates that the sample largely comprises individuals who have completed secondary education and may currently be pursuing higher academic qualifications. The relatively low number of respondents with completed university degrees suggests that the sample primarily reflects an early-career demographic profile, even though all respondents are actively working as teachers.

Höchster Bildungsabschluss

105 responses

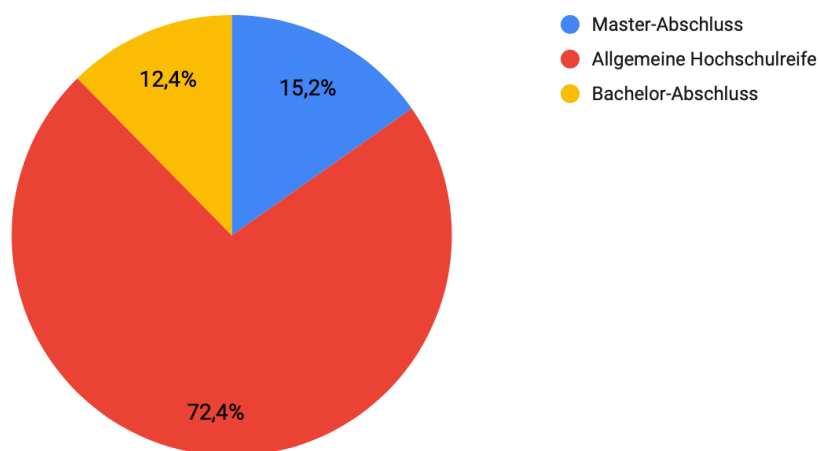


Figure 55 German Survey [Educational level]

Most participants report moderate levels to higher levels of digital proficiency: Level 2 ($n = 25$), Level 3 ($n = 48$), Level 4 ($n = 24$). The lowest and highest levels - Level 1 and Level 5 - are less frequently represented, with 7 and 1 participant(s), respectively. Overall, the data suggest a moderately digitally literate sample, with over 22,9% of participants demonstrating advanced information technology skills.

IT-Kompetenzniveau

105 Antworten

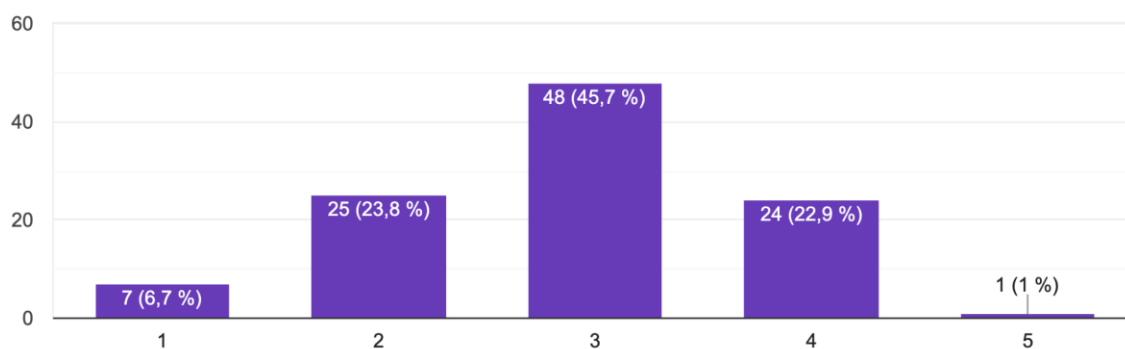


Figure 56 German Survey [ICT level]

When asked about training in data literacy, 76 out of 105 participants (a total of 72.4%) reported having received none. Only 9.5% engaged in informal learning, such as self-study or peer exchanges. A further 8.6% had received formal training through in-school professional development, and 5.7% had participated in university-based programs. The remaining respondents cited other forms of training. Most participants lack formal preparation in data literacy, relying instead mostly on informal means to acquire these skills.

"Haben Sie eine Schulung zur Nutzung von Daten oder zu Datenkompetenz erhalten?"

105 responses

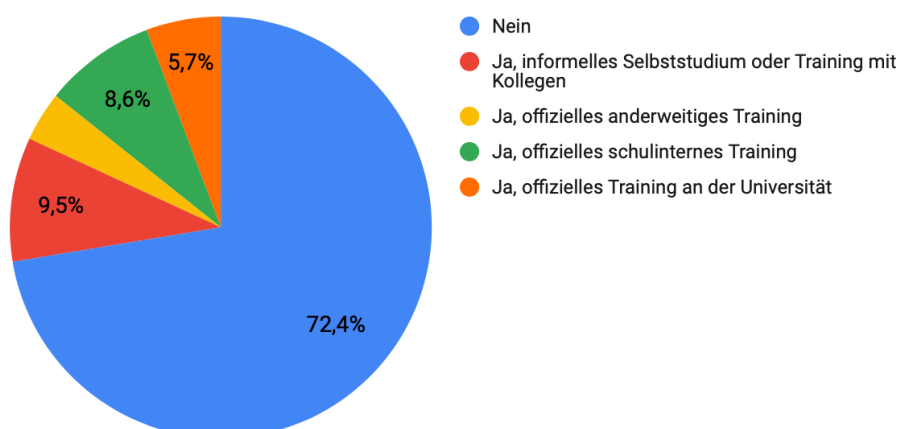


Figure 57 German Survey [Have you received training related to data use or Data Literacy?]

The next question focused on participants' current roles within the education sector, serving as the basis for more role-specific follow-up questions. The distribution was as follows:

- Teachers: 97 respondents
- School Principals: 4 respondents
- Representatives of Educational Authorities: 4 respondents

The data indicate that most participants (92.4%) are practicing teachers, underscoring the survey's strong emphasis on classroom-level experience. While school principals and representatives of educational authorities each comprise a smaller portion of the sample, their inclusion provides valuable insights from leadership and governance perspectives.

Aktuelle Tätigkeit im Bildungswesen

105 responses

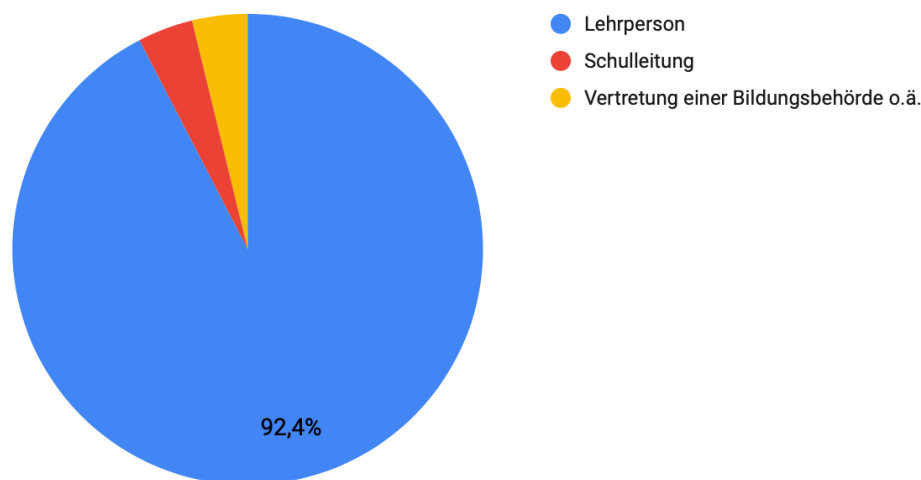


Figure 58 German Survey [Select your current role in education]

The following tables and figures represent details related to each role's demographics.

Section A: Demographic Data [Teacher]

Participants with the role of “teacher” (n = 97) were asked to indicate up to three of their primary teaching subjects. They could select from a predefined list - German, Mathematics, Foreign Languages, Social Studies/General Studies, Religion/Ethics, Natural Sciences (Biology, Physics, Chemistry), Music, Visual Arts, Physical Education, and Information Technology - or specify other subjects not listed.

The most frequently selected subject was Foreign Languages (n = 36), followed by Social Studies/General Studies (n = 29). Physical Education, German, and Natural Sciences each received 25 votes, forming the third-largest group of responses. Religion/Ethics (n = 17) and Visual Arts (n = 6) were less commonly mentioned. Only two participants indicated Information Technology as a primary subject; Music also received two responses, making these the least represented fields.

In terms of educational level, Lower Secondary Education Teachers (n = 49) made up the largest subgroup, accounting for approximately half of all teacher respondents.

The table below presents the demographic data for all 97 participants identified with the teacher role.

Teaching Experience (years) (Lehrerfahrung)		School type (Schulart)	
<1-3	89	Primary-school (Grundschule)	22
4-6	6	Lower Secondary Education (Sekundarstufe I)	49
7-11	0	Upper Secondary Education (Sekundarstufe II)	26
12-19	0		
20-30	1		
31+	1		
School region (Schulstandort)		School size (Schulgröße)	
Urban/Semi-urban (Stadt/nah)	62	Small (Klein, unter 300 Schüler:innen)	15
Rural (Ländlich)	35	Medium (Mittel, 300-800 Schüler:innen)	53
		Big (Groß, 800 Schüler:innen)	29

Table 2: Demographic Data [teacher]

Most teachers (n = 89; 91.8%) reported having less than one year to a maximum of three years of teaching experience. A smaller group (n = 6; 6.2%) indicated between four and six years of experience. Only two participants reported more than 20 years of teaching experience. These findings point to a predominantly young and early-career cohort of educators.

Lehrerfahrung

97 Antworten

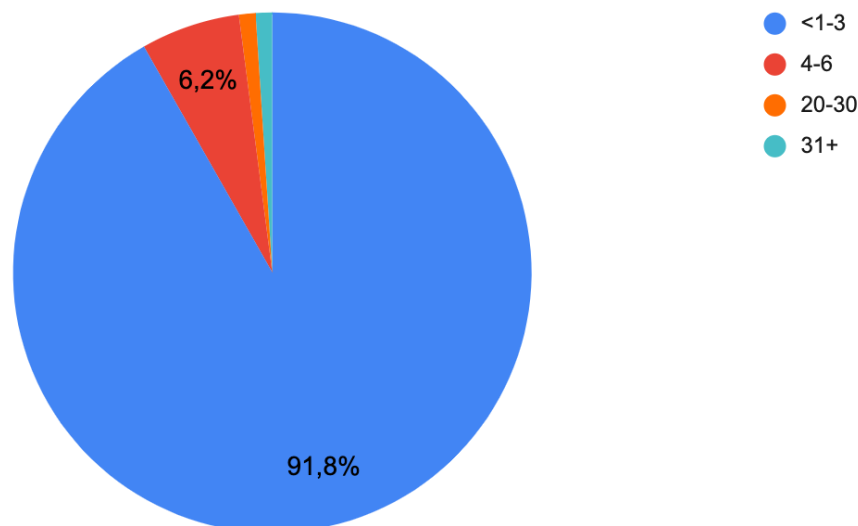


Figure 59 German Survey [Teacher: Teaching Experience (years)]

The sample is divided into three groups by teaching level, with lower secondary education representing the largest share (n = 49; 50.5%). The remaining half is split relatively evenly between primary education (n = 22; 22.7%) and upper secondary education (n = 26; 26.8%).



Schulart

97 Antworten

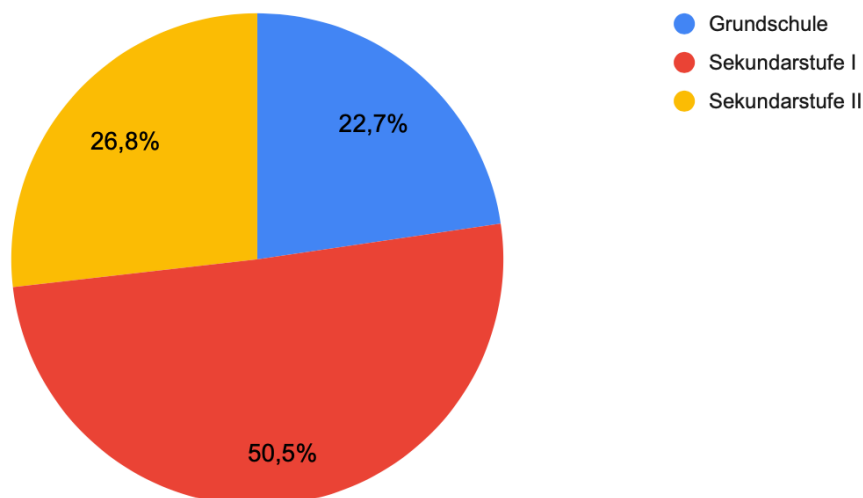


Figure 60 German Survey [Teacher: School type]

Most participants are based in urban or semi-urban areas (n=62, or 63,9%). With 36,1% (n=35) the rural regions are also well presented in the sample.

Schulstandort

97 Antworten

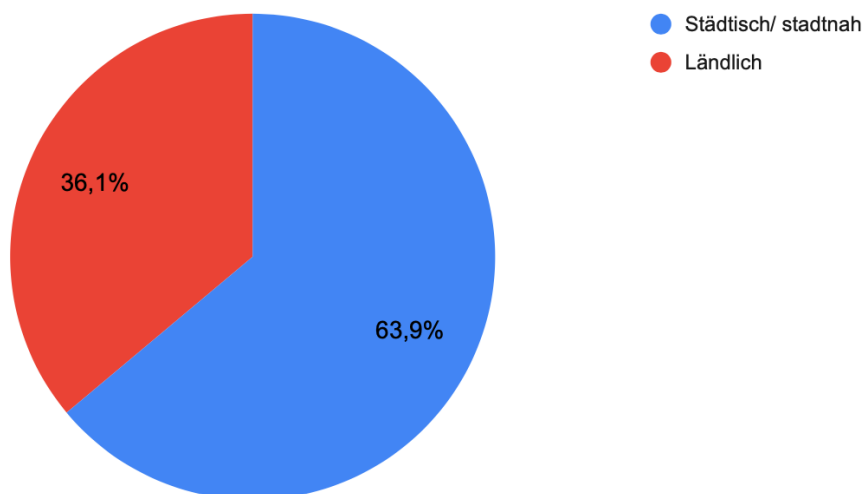


Figure 61 German Survey [Teacher: School region]

Over half of the teachers (n = 53, or 54,6%) work in medium-sized schools, while another 29,9% (n = 29) are based in big institutions. A minority of participants (n = 15, or 15,5%) teach in small schools. This size variation is significant, as it may influence digital infrastructure availability, staff collaboration potential, and the implementation of data-driven practices.



Schulgröße

97 Antworten

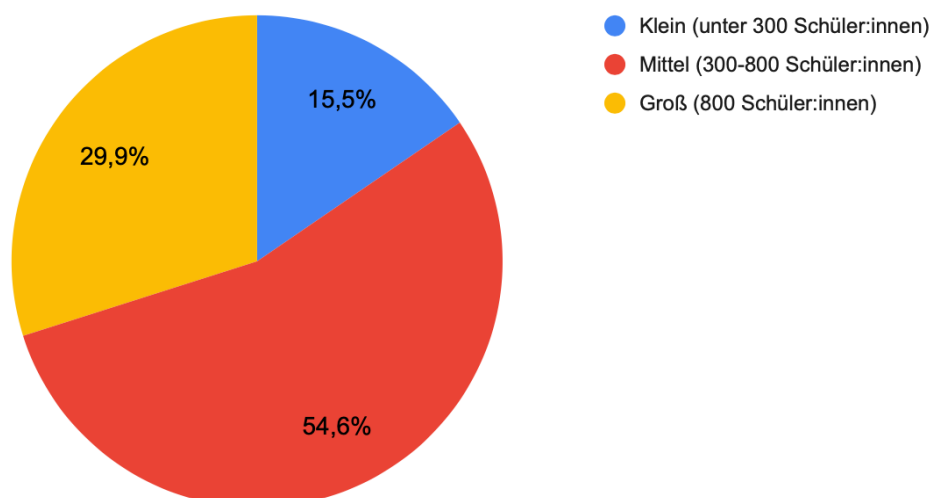


Figure 62 German Survey [Teacher: School size]

Finally, participants were asked to indicate the total number of teachers currently employed at their school. The responses ranged from 8 to 200 teachers, reflecting a wide variance in school size across the sample. A large portion of schools (n=65) fall within the 30–80 teacher range, suggesting that medium-sized schools dominate the dataset.

A smaller (n=15) subset of responses (e.g., 8-20 teachers) likely corresponds to very small or rural schools, including possibly specialized units. At the opposite extreme, a few entries (n=11) report very large schools with 100+ teachers, indicative of urban or centralized educational institutions.

These findings highlight the diversity of educational settings represented in the sample, ranging from small rural schools to large urban institutions. Such variability in school size may influence both the organizational culture and the availability of resources, including opportunities for professional development, peer collaboration, and digital infrastructure for data-related practices.

Section A: Demographic Data [Administrator]

The table below represents the demographic data for the 4 participants with the administrator's role.

Table 3: Demographic Data [Administrator]

Teaching Experience (years) (Lehrerfahrung)		School type (Schulart)	
<1-3	0	Primary school (Grundschule)	0
4-6	2	Lower Secondary School (Sekundarstufe I)	4
7-11	2	Upper Secondary School(Sekundarstufe II)	0
12-19	0		
20-30	0		
31+	0		
School region (Schulstandort)		School size (Schulgröße)	
Urban/Semi-urban(Stadtnah)	4	Small (Klein, unter 300 Schüler:innen)	0
Rural (Ländlich)	0	Medium (Mittel, 300-800 Schüler:innen)	4
		Big (Groß, 800 Schüler:innen)	0

Half of the administrators (n = 2, or 50%) report 4-6 years of experience in school leadership. The other half (n = 2, or 50%) report 7-11 years.

Jahre mit Schulleitungserfahrung

4 Antworten

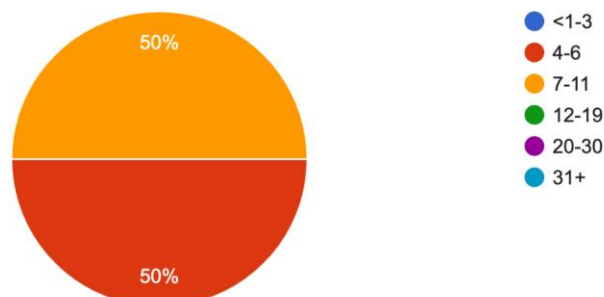


Figure 63 German Survey [Administrator: Experience in school leadership (years)]

All of the administrators work in Lower Secondary Education (n=4).



Schulart

4 Antworten

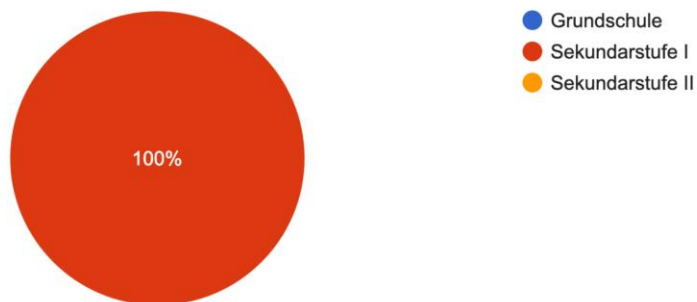


Figure 64 German Survey [Administrator: School type]

All of the administrators (n=4) work in urban or semi-urban schools.

Schulstandort

4 Antworten



Figure 65 German Survey [Administrator: School region]

All of the administrators (n=4) work in medium-sized schools.

Schulgröße

4 Antworten

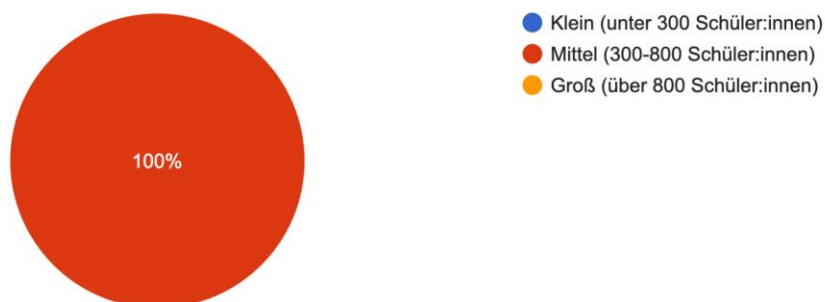


Figure 66 German Survey [Administrator: School size]

Finally, administrators were asked to indicate the number of teachers employed at their school. The responses reveal substantial variability in school staffing levels, ranging from 38 to 105 teachers.

Section A: Demographic Data [Educational Authority Representative]

The table below represents the demographic data for the 4 participants with the Educational Authority Representative's role.

Table 4: Demographic Data [Educational Authority Representative]

Teaching Experience (years) (Lehrerfahrung)		Level of Authority	
<1-3	4	Local (Lokal)	0
20-30	0	Regional (Regional)	4
31+	0	National (National)	0

The data show that all representatives (n = 4) have lower teaching experience - up to three years.

Jahre an Führungserfahrung im Bildungsbereich

4 Antworten

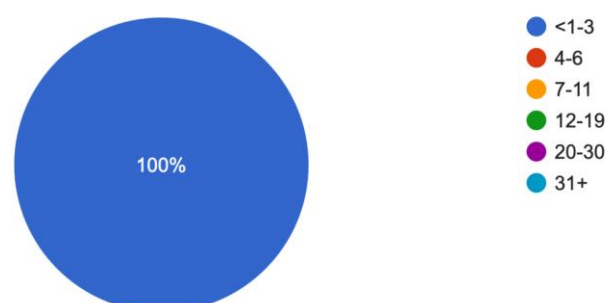


Figure 67 German Survey [Educational Authority Representative: Experience in school leadership (years)]

All representatives (n = 4) are employed at the regional level of educational authority.

Ebene der Behörde

4 Antworten

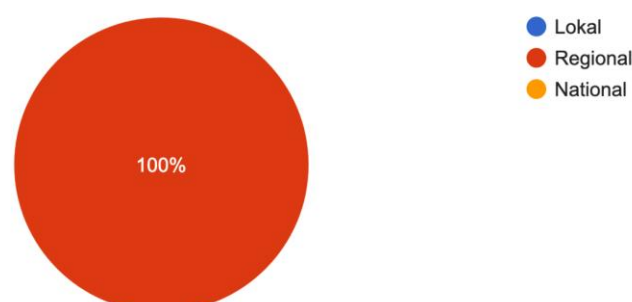


Figure 68 German Survey [Educational Authority Representative: Level]

Finally, participants serving in educational authorities reported a range of roles, reflecting both administrative and pedagogical functions. The most frequently reported role was Employee (n=2). Other positions such as Staff unit for media education and Advisor appeared only once each.

6.3.2 Understanding and Awareness of Data Literacy (Section B)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Stimme überhaupt nicht zu), 2 = Disagree (Stimme nicht zu), 3 = Neither Agree Nor Disagree (Neutral), 4 = Agree (Stimme zu), 5 = Strongly Agree (Stimme voll und ganz zu).

The first statement was: *“I understand the following concepts:”*

Six specific literacies were assessed: Data Literacy, Digital Literacy, AI Literacy (Artificial Intelligence Literacy), Information Literacy, Statistical Literacy and Learning Analytics.

1. Ich verstehe folgende Konzepte:

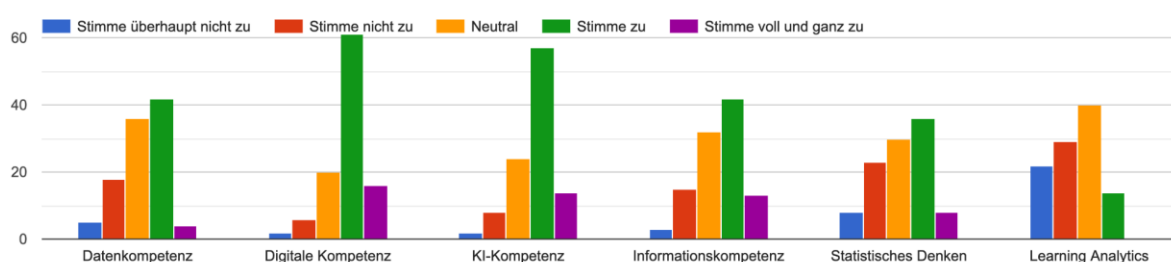


Figure 69 German Survey [Understanding of concepts]

A qualitative review of the responses reveals the following trends:

- Digital Literacy and AI Literacy show consistently high levels of agreement. Most participants selected either *Agree* or *Strongly Agree*, indicating a general sense of familiarity and confidence with these concepts.
- Data Literacy received a more mixed response, with a high number of *Agree* selections, but also a noticeable share of *Neutral* and *Disagree*. This suggests it is relatively well understood, though not as clearly or confidently as Digital or AI Literacy.
- For Statistical Literacy and Learning Analytics, there is a noticeable spread across the full Likert range. A considerable number of participants selected *Neutral*, *Disagree*, or even *Strongly Disagree*, indicating mixed levels of understanding or uncertainty.
- Information Literacy had one of the highest concentrations of lower agreement levels, including many *Neutral*, *Disagree*, and *Strongly Disagree* responses. This suggests that this concept is less clearly understood or perhaps interpreted inconsistently across respondents.

The following statement was: *“Data Literacy is connected to the following concepts:”*.

Five specific literacies were assessed: Digital Literacy, AI Literacy (Artificial Intelligence Literacy), Information Literacy, Statistical Literacy and Learning Analytics.

2. Datenkompetenz ist verbunden mit folgenden Konzepten:

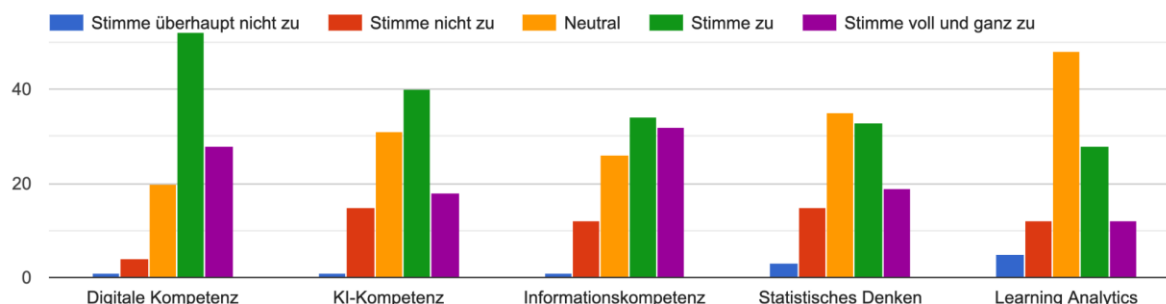


Figure 70 German Survey [Connection of concepts]

The responses show a strong consensus that Data Literacy is closely linked to Digital Literacy. A large majority of participants selected “Agree” or “Strongly Agree,” with only a negligible number disagreeing. This highlights a widespread recognition that foundational digital skills are essential for understanding and working with data. The digital environment is seen as the primary context in which data is accessed, managed, and interpreted.

AI Literacy is also broadly associated with Data Literacy, though opinions are slightly more divided.

While many participants chose “Agree” or “Strongly Agree,” there was a noticeable increase in neutral responses and some disagreement. This suggests that although the relevance of AI is acknowledged, not everyone feels fully confident in their understanding of its connection to data skills. This points to a need for further clarification and educational development in this area.

Information Literacy showed similarly high levels of positive agreement.

Most respondents agreed that the ability to critically assess information sources is fundamental to data understanding. The parallel between data and information is clearly drawn, especially in terms of ethical reflection and critical evaluation.

Statistical Literacy, while receiving overall agreement, revealed more ambivalence. There were significantly more neutral and disagree responses compared to the other categories. This suggests that statistics might still be perceived as a more technical or specialized area, not universally seen as core to general data literacy. It may reflect a perception gap regarding the role of statistical reasoning in data interpretation.

Learning Analytics received the most varied responses.

While there is still a majority agreement, the highest proportion of neutral responses was recorded in this category. This may indicate unfamiliarity with the concept or uncertainty about its relevance to general data literacy. It highlights a need for more integration and explanation of Learning Analytics in data literacy education.

The statement “I understand the potential uses and applications of data to support learning, assessment, research, and decision-making in education.” followed.



3. Ich sehe die möglichen Anwendungsbereiche von Daten zur Unterstützung von Lernen, Bewertung, Forschung und Entscheidungsfindung im Bildungskontext

105 Antworten

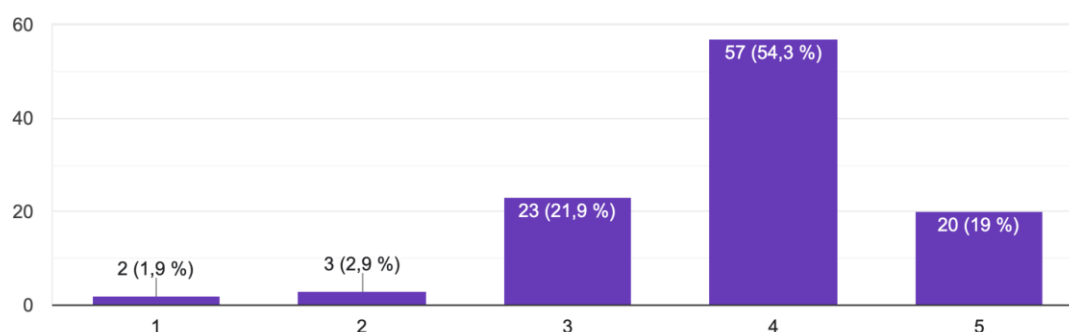


Figure 71 German Survey [I understand the potential uses and applications of data to support learning, assessment, research, and decision-making in education]

The data reveals a predominantly positive perception among respondents regarding their understanding of data applications in the educational context. Specifically, 73.3% of participants selected either "Agree" (54.3%) or "Strongly Agree" (19.0%), indicating a high level of self-reported awareness and confidence in the potential of data to inform and enhance practices related to learning, assessment, research, and decision-making.

A noteworthy proportion of participants (21.9%) selected "Neither Agree nor Disagree", suggesting a segment of the sample that remains ambivalent or uncertain. This may be attributed to a lack of exposure to practical applications of educational data, limited institutional support, or varying levels of digital/data literacy. As such, this group may benefit from targeted professional development to strengthen their conceptual and practical engagement with data use in education.

Conversely, a relatively small percentage of respondents expressed disagreement with the statement (Disagree: 2.9%; Strongly Disagree: 1.9%). While this minority view may reflect differing pedagogical orientations or contextual barriers to implementation (e.g., lack of access to relevant tools, resources, or training), its limited size suggests that explicit resistance to the use of data in educational processes is not widespread within the sample.

The statement "I recognize Data Literacy as an essential element of teachers' modern role." followed.



4. Ich verstehe Datenkompetenz als ein wesentliches Element der modernen Rolle von Lehrpersonen

105 Antworten

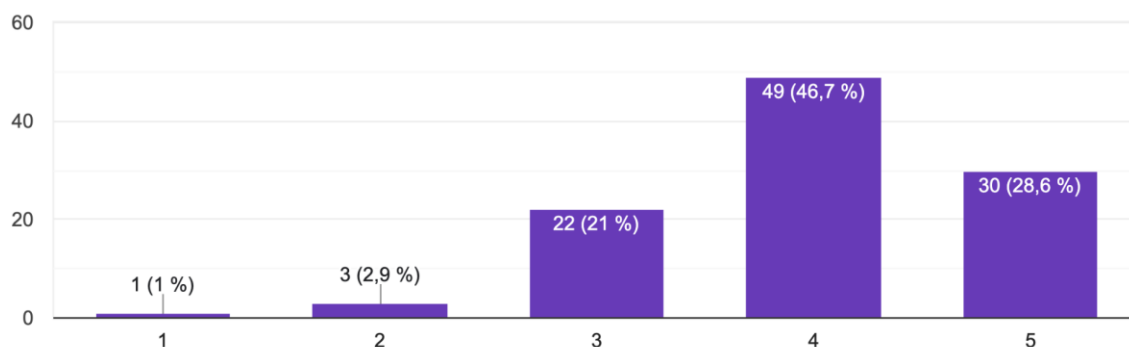


Figure 72 German Survey [I recognize Data Literacy as an essential element teachers' modern role]

The responses reflect a strong positive orientation toward the integration of Data Literacy into the contemporary role of educators. A total of 75 participants (71.3%) expressed agreement with the statement ("Agree" – 46.7% or "Strongly Agree" – 28.6%), underscoring a widespread recognition of the relevance of data competencies in the professional responsibilities of teachers.

However, it is noteworthy that 22 participants (21.0%) chose "Neither Agree nor Disagree". This neutral stance, representing about one-fifth of the sample, may indicate limited familiarity with the concept of Data Literacy or uncertainty regarding its practical implications for everyday teaching practice. Such neutrality suggests an opportunity for further professional development or clearer institutional guidance regarding the application of data-informed pedagogical strategies.

Only a small fraction of respondents expressed disagreement ("Disagree": 2.9%; "Strongly Disagree": 1.0%), amounting to 4 participants (3.8%). This indicates that explicit resistance to the inclusion of Data Literacy in the teacher's role is minimal. Most educators, even if not fully confident, appear open to the concept and its potential.

The statement "I recognize the legal issues associated with data in education." followed.

5. Ich sehe einen Zusammenhang zwischen Daten und rechtlichen Fragen im Bildungsbereich

105 Antworten

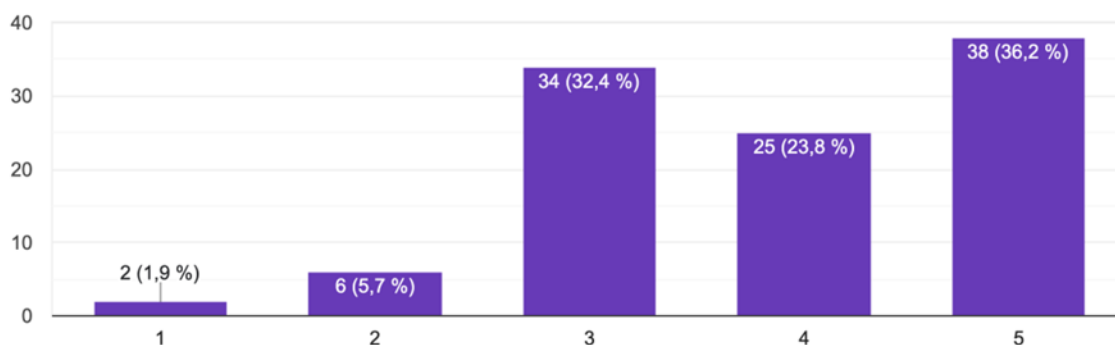


Figure 73 German Survey [I recognize the legal issues associated with data in education]

The statement “I recognize the legal issues associated with data in education.” elicited a generally positive response from participants, with 63 individuals (60.0%) indicating agreement - specifically, 25 (23.8%) selected “Agree” and 38 (36.2%) selected “Strongly Agree”. This reflects a substantial awareness of the legal dimensions associated with data use in educational settings, such as privacy regulations, data protection, and institutional compliance.

A significant portion of the sample - 34 respondents (32.4%) - selected “Neither Agree nor Disagree”, suggesting a moderate level of uncertainty or a lack of clear understanding regarding relevant legal frameworks. This may point to gaps in professional development, limited exposure to institutional policies, or insufficient emphasis on legal considerations in educators' training.

Only 8 participants (7.6%) expressed disagreement with the statement (“Disagree”: 5.7%; “Strongly Disagree”: 1.9%). This small minority may represent individuals who have not yet encountered situations that require legal awareness in data handling or who may not perceive legal issues as central to their professional responsibilities.

Overall, the findings suggest that while a majority acknowledges the importance of legal considerations in data use, there remains a notable segment of the population that may benefit from targeted training or institutional support to deepen their understanding and engagement with legal and regulatory aspects of educational data practices.

The statement “I recognize the ethical issues associated with data in education.” followed.



6. Ich sehe einen Zusammenhang zwischen Daten und ethischen Fragen im Bildungsbereich

105 Antworten

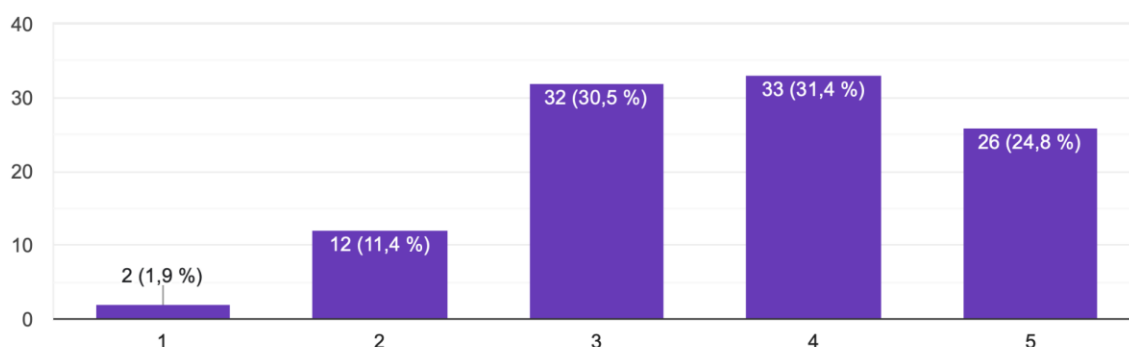


Figure 74 German Survey [I recognize the ethical issues associated with data in education]

The statement “I recognize the ethical issues associated with data in education.” elicited generally positive responses, though with a more balanced distribution compared to legal concerns. 59 participants (56.2%) expressed agreement – 33 (31.4%) selected “Agree” and 26 (24.8%) selected “Strongly Agree”. This indicates that over half of the respondents acknowledge the relevance of ethical considerations such as fairness, consent, bias, and the responsible use of educational data.

A significant portion of participants – 32 respondents (30.5%) – selected “Neither Agree nor Disagree”, reflecting a notable level of ambivalence or limited confidence in navigating ethical dimensions of data use. This may be due to the abstract nature of ethical principles, lack of concrete training or guidelines, or uncertainty in applying ethics to real-world data scenarios.

Additionally, 14 participants (13.3%) expressed disagreement (“Disagree”: 11.4%; “Strongly Disagree”: 1.9%), which, while not dominant, is more pronounced than in the legal domain. This could suggest a need for more targeted efforts to raise awareness and support ethical literacy among educators, particularly as ethical challenges in educational data use become more pressing.

Overall, while the data suggests a growing recognition of ethical issues in education, the relatively high neutrality and disagreement rates highlight an area where professional development and institutional engagement could be strengthened.

The statement “I recognize the privacy issues associated with data in education.” followed.



7. Ich sehe einen Zusammenhang zwischen Daten und Fragen des Datenschutzes im Bildungsbereich
105 Antworten

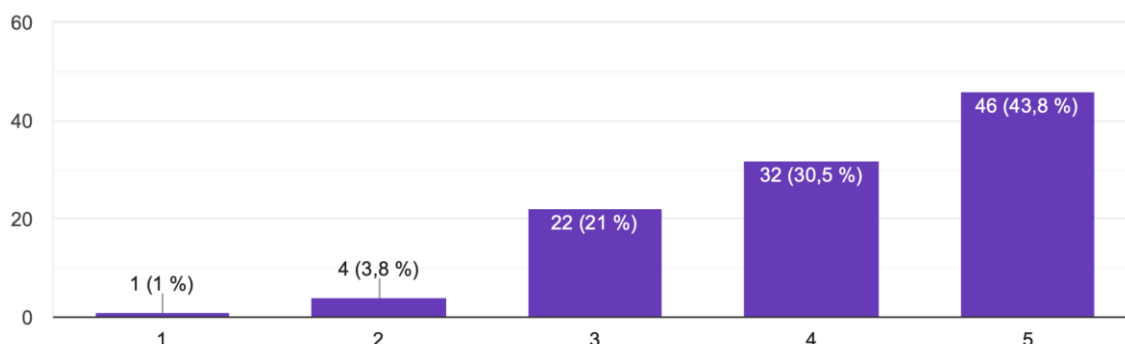


Figure 75 German Survey [I recognize the privacy issues associated with data in education]

The statement “I recognize the privacy issues associated with data in education.” was met with strong agreement by the majority of respondents. 78 participants (74.3%) selected either “Agree” (30.5%) or “Strongly Agree” (43.8%), signaling a widespread recognition of data privacy as a key concern within educational contexts. This reflects heightened awareness of the importance of protecting student information and adhering to privacy standards in an increasingly digital educational landscape.

A smaller but noteworthy portion of the sample – 22 respondents (21.0%) – selected “Neither Agree nor Disagree”, indicating a moderate level of uncertainty or lack of familiarity with data privacy principles. This may suggest that while the issue is broadly acknowledged, practical understanding or application in day-to-day teaching may still be limited for some.

Only 5 respondents (4.8%) expressed disagreement (“Disagree”: 3.8%; “Strongly Disagree”: 1.0%), representing a small minority. This suggests that explicit rejection of privacy concerns is rare, and that the concept is generally accepted as a critical component of data use in education.

Overall, the results point to a solid foundation of privacy awareness among educators, though continued training and policy clarification may help support those who remain unsure about how to effectively implement privacy measures in practice.

Across the three dimensions – legal, ethical, and privacy – the responses indicate a strong general awareness among participants regarding the implications of data use in education:

- A combined total of 200 out of 315 responses (63.5%) across the three statements selected either “Agree” or “Strongly Agree”, reflecting substantial recognition of the importance of responsible data handling.
 - Legal: 60.0% agreement
 - Ethical: 56.2% agreement
 - Privacy: 74.3% agreement
- However, 88 responses (27.9%) were neutral (“Neither Agree nor Disagree”), suggesting that a significant number of participants remain uncertain—particularly regarding ethical issues, where neutrality was highest (30.5%).
- Only 27 responses (8.6%) across all three items expressed disagreement (“Disagree” or “Strongly Disagree”), with ethical considerations receiving the most dissent (13.3%).



These findings suggest that while privacy concerns are most widely recognized, there is still a meaningful need for deeper professional development and institutional clarity – particularly around legal and ethical frameworks – to ensure confident, informed engagement with data practices in education.

6.3.3 Knowledge and Skills (Readiness) in Data Literacy (Section C)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Stimme überhaupt nicht zu), 2 = Disagree (Stimme nicht zu), 3 = Neither Agree Nor Disagree (Neutral), 4 = Agree (Stimme zu), 5 = Strongly Agree (Stimme voll und ganz zu).

The first statement was: “I know of data analysis methods, techniques and tools”.

8a. Ich kenne Methoden, Techniken und Werkzeuge der Datenanalyse

105 Antworten

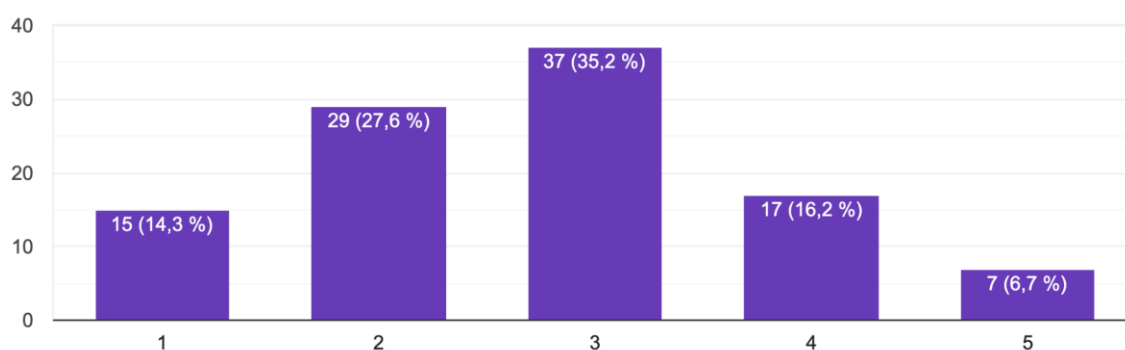


Figure 76 German Survey [I know of data analysis methods, techniques and tools]

The results demonstrate a distribution skewed toward the middle and lower levels of agreement, reflecting moderate to limited confidence among participants regarding their familiarity with data analysis methods. Specifically, the most frequently selected response was "Neither Agree Nor Disagree," chosen by 37 participants (35.2%), suggesting uncertainty or limited exposure to data analysis techniques. Furthermore, a substantial proportion of respondents, 44.7%, explicitly expressed disagreement with the statement, comprising 29 participants (27.6%) selecting "Disagree," and an additional 15 participants (14.3%) selecting "Strongly Disagree." This highlights that nearly half of the sample does not feel confident in their knowledge of data analysis tools and methods.

Conversely, positive self-assessments were notably limited. Only 17 participants (16.2%) chose "Agree," while a mere 7 respondents (6.7%) selected "Strongly Agree." Combined, this indicates that just 22.9% of respondents overall perceive themselves as proficient or adequately familiar with data analysis methods.

These findings clearly underscore a significant need for targeted professional development initiatives aimed at enhancing foundational knowledge in data analysis. Given that more than 80% of participants did not express clear agreement, it is evident that technical competence in this area remains an ongoing challenge for many educators.



The statement “I know how to use digital tools to manage and organize data effectively.” followed.

8b. Ich weiß, wie man digitale Werkzeuge einsetzt, um Daten effektiv zu verwalten und zu organisieren

105 Antworten

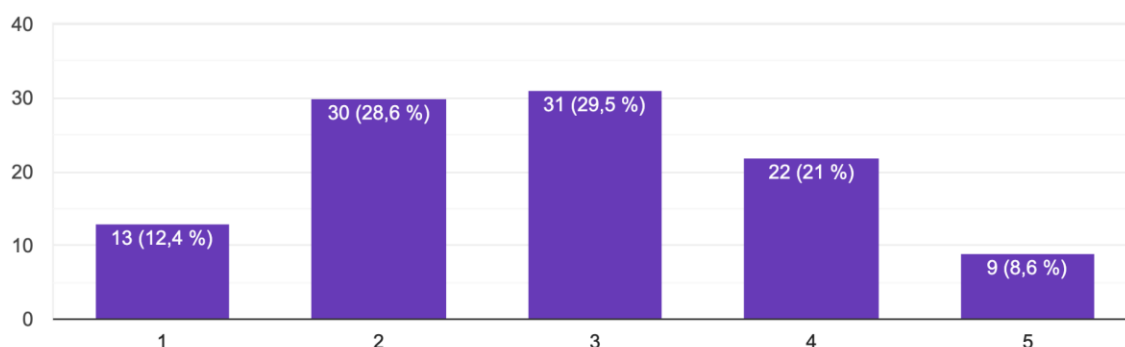


Figure 77 German Survey [I know how to use digital tools to manage and organize data effectively]

The statement "I know how to use digital tools to manage and organize data effectively" elicited varied responses, predominantly concentrated in the middle and lower agreement categories. A total of 43 participants (40.9%) explicitly indicated disagreement, comprising 13 respondents (12.4%) who selected "Strongly Disagree" and 30 respondents (28.6%) who chose "Disagree." These findings suggest a significant portion of the sample feels insecure or lacks confidence in their ability to effectively utilize digital tools for data management.

Furthermore, the most frequently chosen response was "Neither Agree Nor Disagree," indicated by 31 participants (29.5%), highlighting that nearly one-third of respondents remain uncertain or ambivalent about their proficiency in data management skills.

Conversely, a relatively small percentage of participants, 31.6%, expressed clear agreement with the statement: 22 respondents (21.0%) selected "Agree," while only 9 respondents (8.6%) chose "Strongly Agree." These figures reveal that although some educators perceive themselves as capable in this domain, the majority either lacks confidence or is uncertain about their skills. Consequently, these results underscore a significant opportunity to implement targeted professional development initiatives aimed at improving educators' practical competencies in digital data management.

The statement “I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information.” followed.



9. Ich weiß, wie man Diagramme, Tabellen und Grafiken liest, interpretiert und mit anderen Informationen verknüpft

105 Antworten

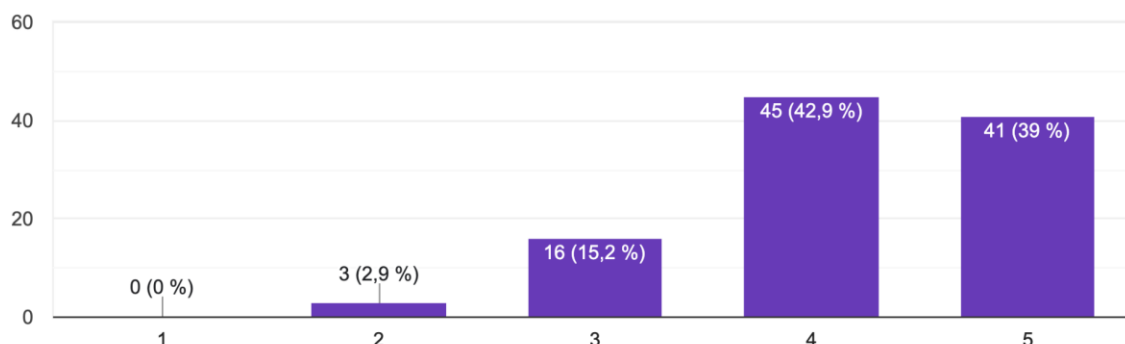


Figure 78 German Survey [I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information]

The statement "I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information" elicited overwhelmingly positive responses from the participants. A substantial majority, comprising 86 respondents (81.9%), agreed with this statement: 45 participants (42.9%) chose "Agree," while 41 respondents (39.0%) selected "Strongly Agree." In contrast, only a small segment of the sample, 16 participants (15.2%), chose "Neither Agree Nor Disagree," indicating some degree of uncertainty or ambivalence regarding their data interpretation skills.

Disagreement was notably rare: only 3 participants (2.9%) chose "Disagree," and none selected "Strongly Disagree." This distribution strongly indicates a high level of confidence among respondents in their ability to interpret visual data formats and effectively correlate them with broader informational contexts. Compared with earlier questions assessing technical proficiency in digital tool use, this result suggests that while many participants may face challenges in practical data manipulation, comprehension and interpretation of visual data representations constitute a clear and well-developed strength within this group.

The statement "I know how to create charts, tables, and graphs to organize and visually present data." followed.

10. Ich weiß, wie man Diagramme, Tabellen und Grafiken erstellt, um Daten visuell darzustellen

105 Antworten

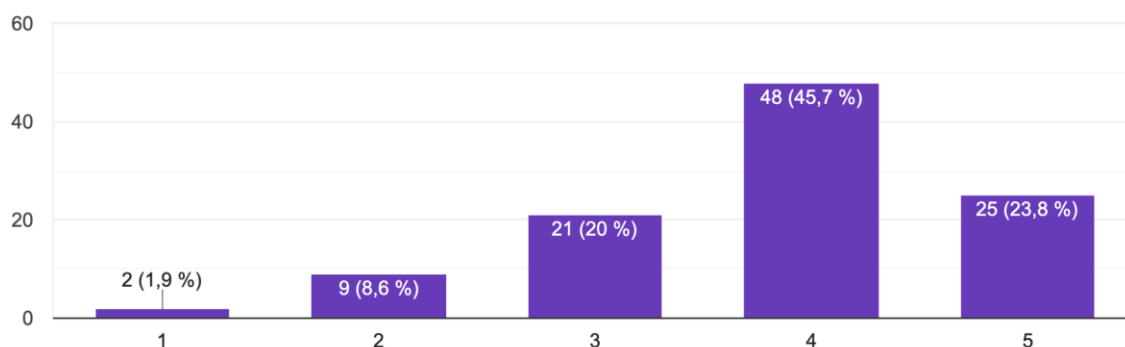


Figure 79 German Survey [I know how to create charts, tables, and graphs to organize and visually present data]

The statement "I know how to create charts, tables, and graphs to organize and visually present data" elicited strong agreement among participants, reflecting a generally high level of confidence regarding foundational data visualization skills. Specifically, a total of 69 respondents (65.7%) indicated positive agreement, with 48 participants (45.7%) selecting "Agree" and an additional 25 respondents (23.8%) choosing "Strongly Agree."

In comparison, 21 participants (20.0%) chose "Neither Agree Nor Disagree," indicating a moderate segment of respondents who either remain uncertain or possess less-developed skills in this area. Meanwhile, explicit disagreement was limited, with only 11 participants (10.5%) responding negatively—9 participants (8.6%) selected "Disagree," and just 2 participants (1.9%) indicated "Strongly Disagree."

These results clearly demonstrate that while many participants may face challenges regarding advanced data analysis techniques (as indicated in earlier items), basic skills in producing visual data representations, such as charts, tables, and graphs, are notably more established. Consequently, these competencies present a valuable foundation upon which professional development initiatives can build, supporting educators in progressing towards more sophisticated analytical methods and workflows.

The statement "I know how to make use of data to solve problems and make decisions related to my work." followed.

11. Ich weiß, wie man Daten nutzen kann, um arbeitsbezogene Probleme zu lösen

105 Antworten

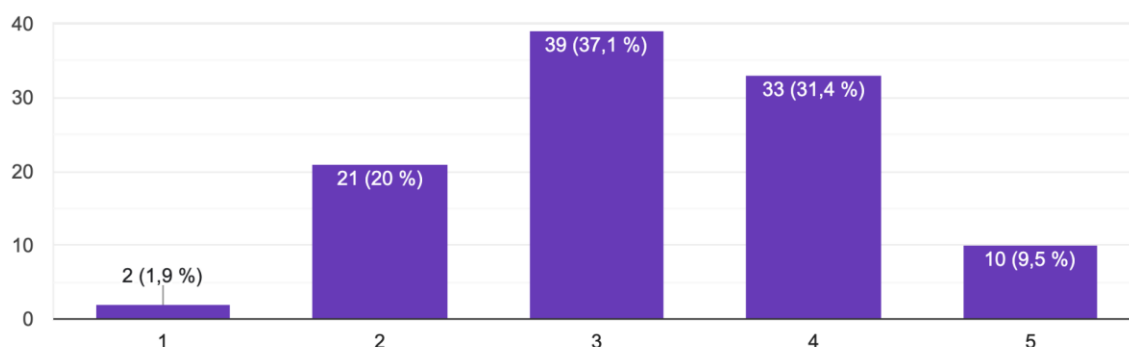


Figure 80 German Survey [I know how to make use of data to solve problems and make decisions related to my work]

The statement "I know how to make use of data to solve problems and make decisions related to my work" elicited responses indicating a moderate level of confidence among respondents, characterized by a relatively balanced distribution across agreement, neutrality, and disagreement categories. Specifically, a total of 43 participants (40.9%) expressed agreement, comprising 33 respondents (31.4%) selecting "Agree" and 10 respondents (9.5%) choosing "Strongly Agree."

Notably, the largest single response category was "Neither Agree Nor Disagree," selected by 39 participants (37.1%), underscoring substantial uncertainty or ambivalence about their capabilities in applying data for problem-solving or decision-making within their professional context.

Moreover, explicit disagreement was evident among 23 participants (21.9%), including 21 respondents (20.0%) who selected "Disagree" and 2 participants (1.9%) who chose "Strongly Disagree." Thus, while there is a core group of respondents confident in their practical application of data, a notable proportion remains hesitant or uncertain.

Compared to participants' more established skills in basic visualization and interpretation of data (as demonstrated in earlier statements), applied data usage for decision-making seems relatively less developed. This finding highlights a critical area for targeted professional development, emphasizing the importance of training and support programs to enhance practical, data-driven problem-solving and decision-making competencies among educators.

6.3.4 Current Practices and Implementation (Section D)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Stimme überhaupt nicht zu), 2 = Disagree (Stimme nicht zu), 3 = Neither Agree Nor Disagree (Neutral), 4 = Agree (Stimme zu), 5 = Strongly Agree (Stimme voll und ganz zu).

The first statement was: "I explore and collect data for my work (i.e. surveys, assessment results, participation statistics, etc.)."



13. Ich sammle und analysiere Daten für meine Arbeit (z. B. Umfragen, Bewertungsergebnisse, Teilnahme-Statistiken etc.)

105 Antworten

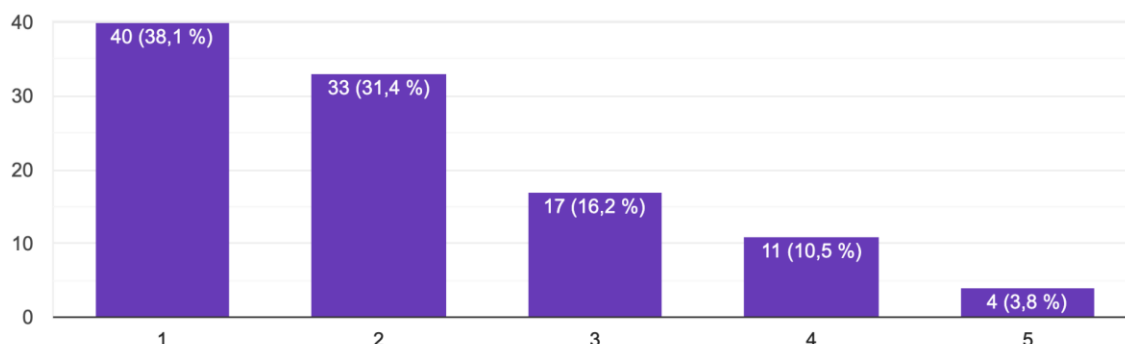


Figure 81 German Survey [I explore and collect data for my work (i.e. surveys, assessment results, participation statistics, etc.)]

The statement “I explore and collect data for my work (i.e. surveys, assessment results, participation statistics, etc.)” revealed a relatively low level of engagement with active data practices among participants. Most respondents positioned themselves on the lower end of the agreement scale, with 40 individuals (38.1%) selecting “Strongly Disagree” and another 33 (31.4%) choosing “Disagree.” This indicates that nearly 70% of the sample do not consider data collection and analysis a current part of their professional routine, suggesting a significant gap between conceptual understanding of data and its actual implementation in everyday practice.

Only a small proportion of participants indicated strong or full agreement, with 11 respondents (10.5%) selecting “Agree” and just 4 (3.8%) choosing “Strongly Agree.” This small minority likely represents individuals who are already integrating data-informed approaches into their workflows. Meanwhile, 17 participants (16.2%) selected “Neither Agree Nor Disagree,” pointing to a group that may be ambivalent or unsure about what qualifies as data collection in their work context.

Taken together, the results suggest that while participants may understand data-related concepts on a theoretical level, few are currently applying them through active data gathering or analysis. This highlights a key area for development: supporting educators not only in acquiring data literacy but also in implementing it meaningfully within their professional contexts.

The statement “I assess and use data in my work” followed.

14. Ich bewerte und nutze Daten in meiner Arbeit

105 Antworten

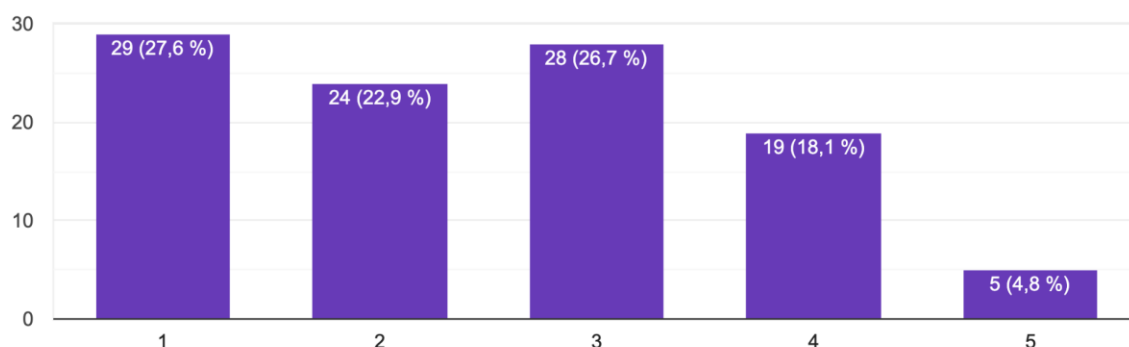


Figure 82 German Survey [I assess and use data in my work]

The statement “I assess and use data in my work” received mixed responses, with a tendency toward lower levels of agreement. A significant portion of participants indicated that data assessment and use are not yet a regular part of their professional practice. Specifically, 29 respondents (27.6%) selected “Strongly Disagree” and 24 (22.9%) chose “Disagree,” suggesting that just over half of the sample lacks confidence or routine engagement in using data meaningfully within their work context.

Meanwhile, 28 participants (26.7%) opted for “Neither Agree Nor Disagree,” pointing to a large group of respondents who may be unsure of how to assess or apply data, or who do so only sporadically. In contrast, only 19 individuals (18.1%) expressed agreement and just 5 (4.8%) selected “Strongly Agree,” indicating that a relatively small minority actively and confidently uses data for evaluative or decision-making purposes.

Taken together, the results reflect a substantial gap between potential and practice: while many participants may recognize the relevance of data in theory, their self-reported ability or opportunity to apply it in a professional setting appears limited. This underscores a clear need for support structures that can help educators move from conceptual awareness to applied, data-informed practice.

The statement “I analyze and synthesize data for addressing a problem or question” followed.

15. Ich analysiere und erzeuge Daten zur Lösung von Problemen oder Bearbeitung von Fragen

105 Antworten

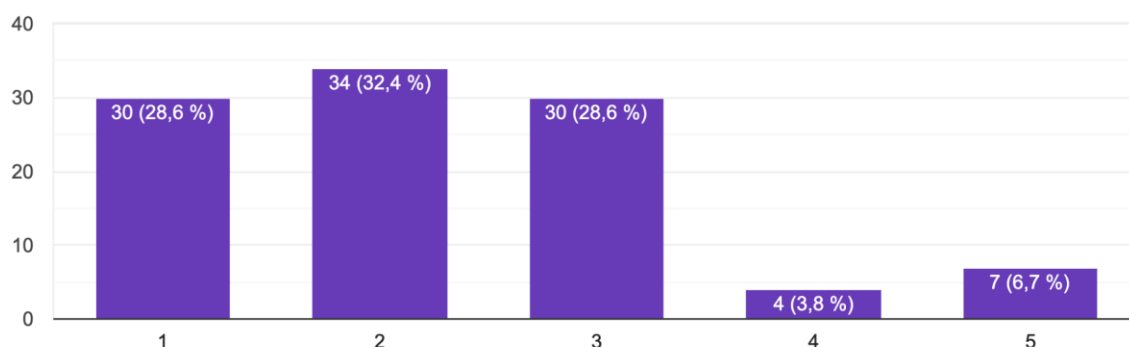


Figure 83 German Survey [I analyze and synthesize data for addressing a problem or question]

The statement “I analyze and synthesize data for addressing a problem or question” received predominantly negative or neutral responses, indicating that this is an area of considerable uncertainty or underdevelopment among respondents. A combined 61% expressed disagreement, with 30 participants (28.6%) selecting “Strongly Disagree” and 34 (32.4%) selecting “Disagree.” This points to a widespread lack of confidence or experience with the more advanced or applied aspects of data handling—namely, drawing conclusions from data to address concrete challenges or inquiries.

An additional 30 respondents (28.6%) selected “Neither Agree Nor Disagree,” reinforcing the sense that many participants are either unsure of their own skills or have limited opportunities to engage in this kind of analytical work.

Only 11 participants (10.5%) expressed agreement, with 4 (3.8%) choosing “Agree” and just 7 (6.7%) indicating “Strongly Agree.” These figures suggest that only a small subset of the sample currently applies data in a problem-oriented or solution-driven way.

Altogether, the data underscores a significant development need: while foundational or interpretive skills may exist, the capacity to use data actively in analysis and synthesis for decision-making or inquiry is not yet widespread. Targeted training and clearer integration into professional contexts may help bridge this gap.

The statement “I use data visualizations in my work” followed.

16. Ich verwende Datenvisualisierungen in meiner Arbeit

105 Antworten

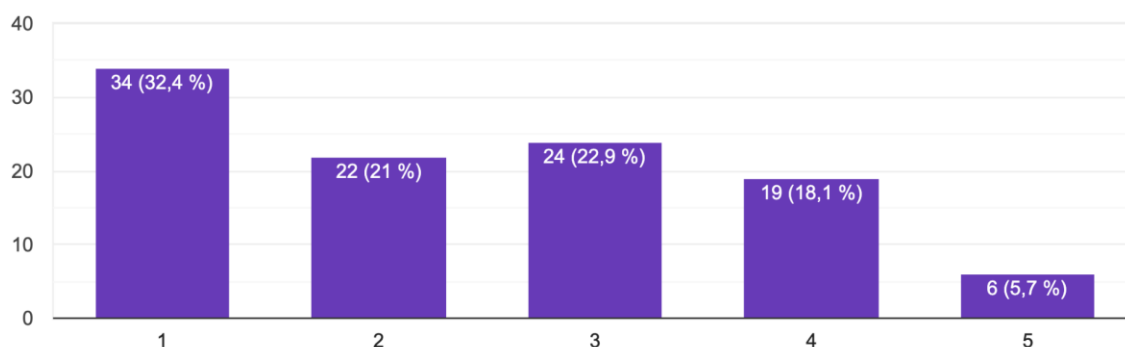


Figure 84 German Survey [I use data visualizations in my work]

The statement “I use data visualizations in my work” received predominantly negative to neutral responses, indicating that data visualization is not yet widely integrated into participants’ professional practices. A combined total of 53 participants (50.4%) selected the two lowest categories - 34 (32.4%) “Strongly Disagree” and 22 (21.0%) “Disagree” - suggesting that the majority of respondents either do not use visualizations or feel unconfident doing so.

Meanwhile, 24 participants (22.9%) selected “Neither Agree Nor Disagree,” implying uncertainty or occasional, inconsistent use. In contrast, only 19 respondents (18.1%) chose “Agree” and just 6 (5.7%) selected “Strongly Agree,” meaning that less than a quarter of the sample views data visualization as a regular or confident aspect of their work.

These results suggest that, despite moderate confidence in interpreting visual data (as seen in earlier responses), the active creation and application of data visualizations remains underdeveloped. This gap highlights the need for hands-on training or practical frameworks that help educators and professionals not only understand but also apply visual tools to support communication, analysis, and decision-making.

The statement “I collaborate with colleagues on interpreting educational data” followed.



17. Ich interpretiere gemeinsam mit Kolleg:innen Daten aus Lehr-/Lernkontexten

105 Antworten

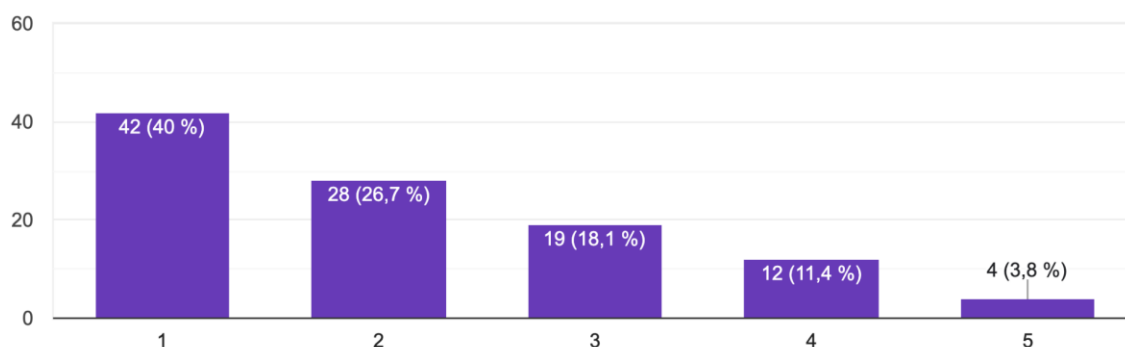


Figure 85 German Survey [I collaborate with colleagues on interpreting educational data]

The statement “I collaborate with colleagues on interpreting educational data” revealed a strikingly low level of agreement among participants, suggesting that collaborative data practices are largely underdeveloped in the current professional context. A total of 70 participants (66.7%) selected the lowest two agreement levels—42 (40.0%) “Strongly Disagree” and 28 (26.7%) “Disagree”—indicating that most respondents rarely, if ever, engage in joint interpretation of teaching and learning data with their peers.

An additional 19 participants (18.1%) selected “Neither Agree Nor Disagree,” reinforcing the impression that collaborative data reflection is not a widespread or well-supported practice. In contrast, only 12 participants (11.4%) selected “Agree” and a mere 4 (3.8%) chose “Strongly Agree,” showing that very few individuals experience or prioritize this type of professional exchange.

These results highlight a critical gap not only in practical data use but also in the collaborative culture surrounding data-informed reflection. While individual competencies may exist, the data suggests that institutional structures, time, or support for collegial dialogue around educational data are lacking. Fostering such collaboration could significantly enhance the pedagogical impact of data use by enabling shared interpretation, feedback, and informed decision-making across teams.

The statement “I share data with students, parents, teachers, administration and others” followed.



18. Ich teile Daten aus Lehr-/Lernkontexten mit Schüler:innen, Eltern, Kolleg:innen, Schulleitung oder weiteren Beteiligten

105 Antworten

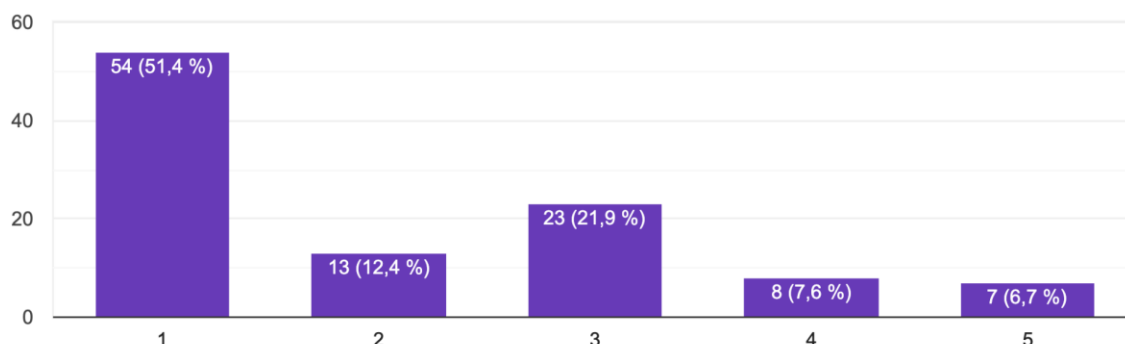


Figure 86 German Survey [I share data with students, parents, teachers, administration and others]

The statement “I share data with students, parents, teachers, administration and others” received the most pronounced negative response among the items reviewed. More than half of all participants—54 respondents (51.4%)—selected “Strongly Disagree,” and another 13 (12.4%) selected “Disagree.” This indicates that a clear majority of respondents do not currently engage in sharing educational data with relevant stakeholders.

Only a small portion of the sample expressed any level of agreement: 8 participants (7.6%) chose “Agree,” and just 7 (6.7%) selected “Strongly Agree.” The remaining 23 respondents (21.9%) selected “Neither Agree Nor Disagree,” suggesting that a modest group is either ambivalent or unsure about what data sharing entails or whether it falls within their professional responsibility.

These results point to a critical disconnect between data-informed practices and communication structures. While previous items have shown some levels of data familiarity or application in isolated contexts, the step toward external transparency and collaboration through data sharing appears to be largely absent. Whether due to cultural, structural, or regulatory barriers, this outcome emphasizes the need for clearer protocols, training, and support around ethical and purposeful data sharing in educational settings.

6.3.5 Attitudes and Dispositions Towards Data Literacy (Section E)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Stimme überhaupt nicht zu), 2 = Disagree (Stimme nicht zu), 3 = Neither Agree Nor Disagree (Neutral), 4 = Agree (Stimme zu), 5 = Strongly Agree (Stimme voll und ganz zu).

The first statement was: “In my opinion, data enhance: Learning, Teaching, Assessment”.

19. Ich bin der Meinung, dass Daten folgende Bereiche verbessern:

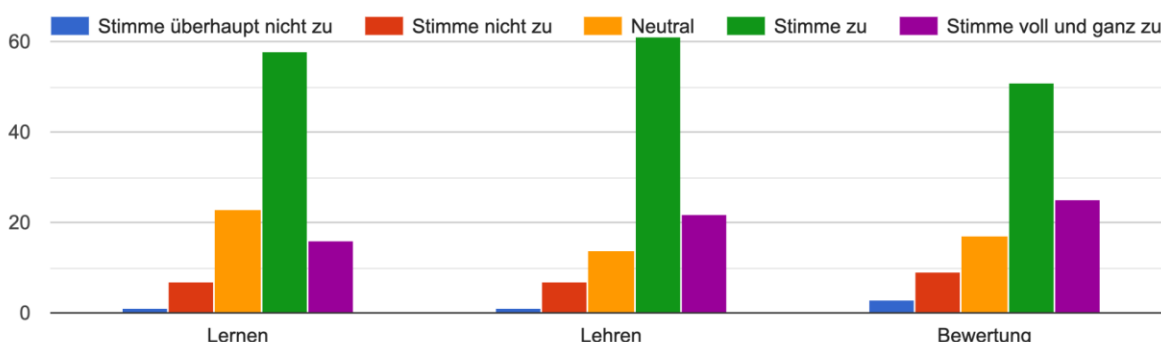


Figure 87 German Survey [In my opinion, data enhance: Learning, Teaching, Assessment]

The statement “In my opinion, data enhance: Learning, Teaching, Assessment” received strong overall endorsement across all three areas, with “Agree” and “Strongly Agree” making up the clear majority of responses in each case.

For Learning (German: Lernen), 58 participants selected “Agree” and another 16 chose “Strongly Agree”, indicating a high level of belief in data's potential to support student learning. Neutral responses were also substantial, with 23 participants, while only a small number selected disagreement levels.

In the area of Teaching (German: Lehren), agreement was even more pronounced: 61 participants marked “Agree”, and 22 chose “Strongly Agree”, reflecting the highest concentration of positive responses among the three dimensions. This suggests that educators particularly recognize the value of data for informing and improving instructional strategies.

When it comes to Assessment (German: Bewertung), support remained strong, though slightly more balanced. Approximately 51 participants selected “Agree” and 25 “Strongly Agree”, while neutral and disagreement responses were somewhat more frequent than in the other two categories. This may reflect the nuanced role data plays in assessment practices, which can be both beneficial and complex.

In summary, the majority of respondents view data as a valuable resource for enhancing educational processes, particularly in teaching and learning. The results point to a generally positive orientation toward data use, even though practical application—as seen in previous items—may still lag behind perceived potential.

The statement “I believe that data enhance personalization and differentiated teaching” followed.



20. Ich bin der Meinung, dass Daten zur Personalisierung und Differenzierung im Unterricht beitragen

105 Antworten

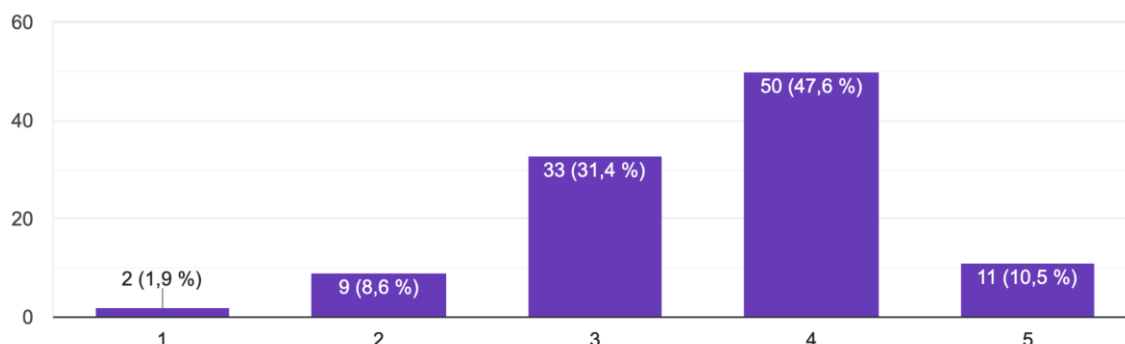


Figure 88 German Survey [I believe that data enhance personalization and differentiated teaching]

This distribution reveals a generally positive - though somewhat cautious - attitude among educators. More than half of respondents (58.1%) indicated agreement that data support instructional differentiation. However, the relatively large proportion of neutral responses (31.4%) suggests a degree of uncertainty or ambivalence. This could stem from a lack of access to effective tools, insufficient training in data use, or structural limitations within schools that prevent meaningful personalization despite the availability of data.

Notably, only 1.9% of participants strongly disagreed, and 8.6% disagreed, indicating limited outright resistance to the use of data for personalization. Still, the fact that “Strongly Agree” was not visibly represented suggests that while teachers may recognize the potential benefits of data use, full confidence or consistent implementation is not yet widespread. These results call for further professional development and policy support to move educators from tentative agreement to active and empowered practice in data-informed differentiation.

The statement “I believe that data-driven methods improve educational equity” followed.



21. Ich bin der Meinung, dass datengestützte Methoden die Bildungsgerechtigkeit verbessern

105 Antworten

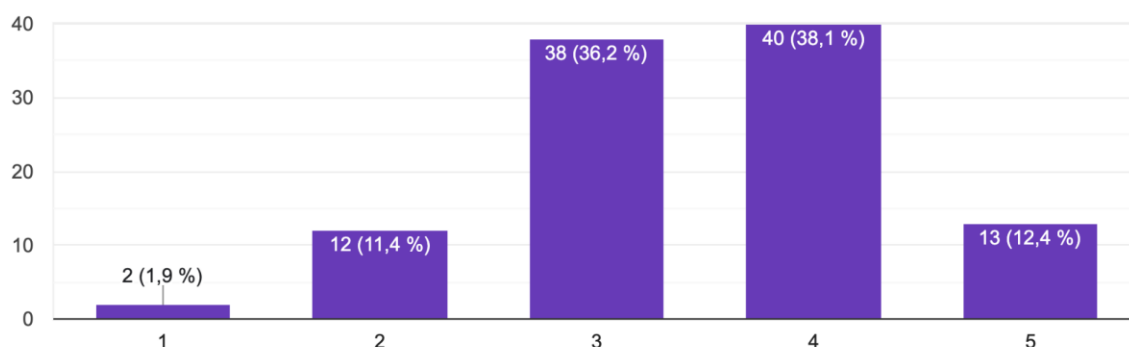


Figure 89 German Survey [I believe that data-driven methods improve educational equity]

Figure 36 explores educators' perceptions of whether data-driven methods can contribute to greater educational equity. The results show an optimistic attitude among respondents. A total of 38.1% agreed with the statement, and 12.4% strongly agreed, together making up just over 50% of participants who expressed a positive stance. This suggests that more than half of the surveyed educators see data as a potentially effective tool for identifying and addressing disparities in the education system.

However, a significant portion of responses reflect uncertainty or reservation. Notably, 36.2% of participants selected "Neutral," making it the second most frequently chosen response. This high level of neutrality may indicate ambivalence or a lack of clear experience with equity-oriented data use. Educators in this group might agree in principle with the idea that data can support equity but remain unconvinced by their practical encounters with data systems - perhaps due to lack of training, insufficient data quality, or unclear institutional strategies for addressing equity through data.

At the other end of the spectrum, 11.4% disagreed and 1.9% strongly disagreed with the statement, totaling 13.3% expressing doubt or opposition. While this is a minority, it represents an important critical perspective. These educators may question whether data can be reliably used to foster equity or might be concerned about unintended consequences, such as reinforcing systemic bias through poorly contextualized metrics.

The statement "I believe that data-driven methods increase teachers' workload" followed.



22. Ich glaube, dass datengestützte Methoden die Arbeitsbelastung von Lehrpersonen erhöhen

105 Antworten

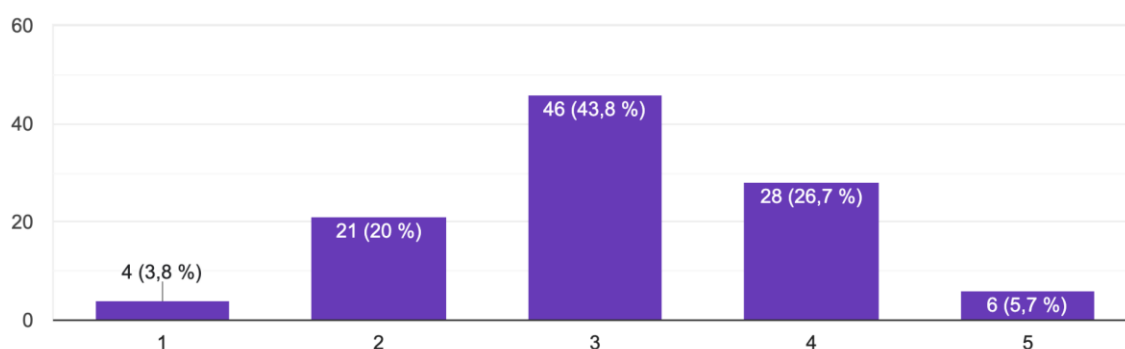


Figure 90 German Survey [I believe that data-driven methods increase teachers' workload]

The responses to Figure 37 show that many educators perceive data-driven methods as contributing to additional workload. 26.7% of respondents agreed and 5.7% strongly agreed with the statement, meaning that about one-third see data use as a source of extra demands in their daily practice. This likely reflects experiences with documentation, data entry, or system navigation that are not fully integrated into teaching routines.

The largest group, 43.8%, responded neutrally. This suggests a degree of uncertainty - possibly because the impact of data on workload depends on how it is implemented in different school contexts. Some teachers may experience both benefits and burdens simultaneously.

At the same time, 20.0% disagreed and 3.8% strongly disagreed. These educators likely see data as manageable or even supportive of their work. Overall, the figure points to a divided perception: while some teachers feel burdened, many remain ambivalent, and others experience data use as non-disruptive. Effective implementation and clearer role definitions may help address workload concerns.

6.3.6 Policy and Curriculum Perspectives (Section F)

Participants were asked to indicate their level of agreement with a number of statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Stimme überhaupt nicht zu), 2 = Disagree (Stimme nicht zu), 3 = Neither Agree Nor Disagree (Neutral), 4 = Agree (Stimme zu), 5 = Strongly Agree (Stimme voll und ganz zu).

The first statement was: “Educational system sufficiently promotes Data Literacy in schools”.



23a. Das Bildungssystem fördert Datenkompetenz in Schulen ausreichend

105 Antworten

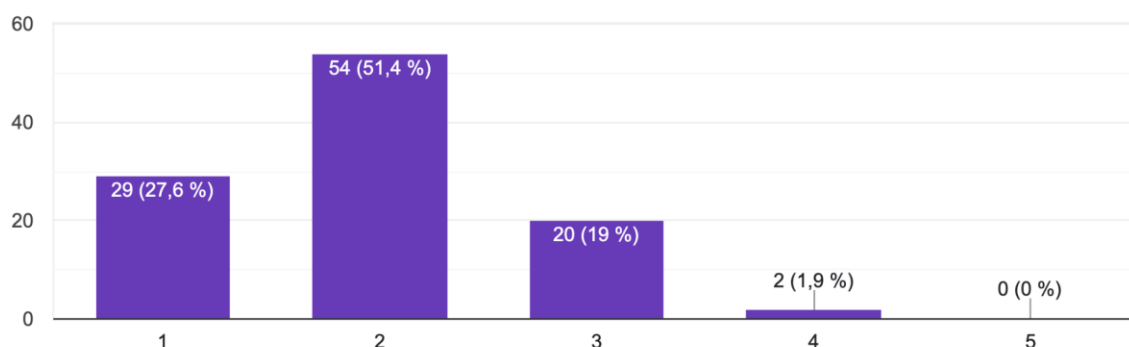


Figure 91 German Survey [Educational system sufficiently promotes Data Literacy in schools]

Figure 38 reveals a critical view of how well the education system promotes data literacy in schools. A clear majority of respondents express skepticism: 51.4% disagree and 27.6% strongly disagree with the statement. Together, this 79% majority reflects widespread dissatisfaction or disillusionment with the institutional efforts currently in place.

Only 1.9% agreed with the statement, and no respondents selected “Strongly Agree,” which underscores the perceived lack of effective systemic promotion. The remaining 19.0% of responses were neutral, suggesting that some educators may not have enough insight into system-level initiatives to judge them clearly - or that implementation is too inconsistent to generalize.

Overall, the results reflect a strong call for action at the policy level. From the perspective of most respondents, data literacy has not yet been meaningfully prioritized in the educational system. Without more coordinated strategies, support structures, and visible commitments from authorities, this foundational competency is unlikely to reach all schools and educators effectively.

23b. Lehrpläne integrieren wirksam Konzepte zur Förderung der Datenkompetenz

105 Antworten

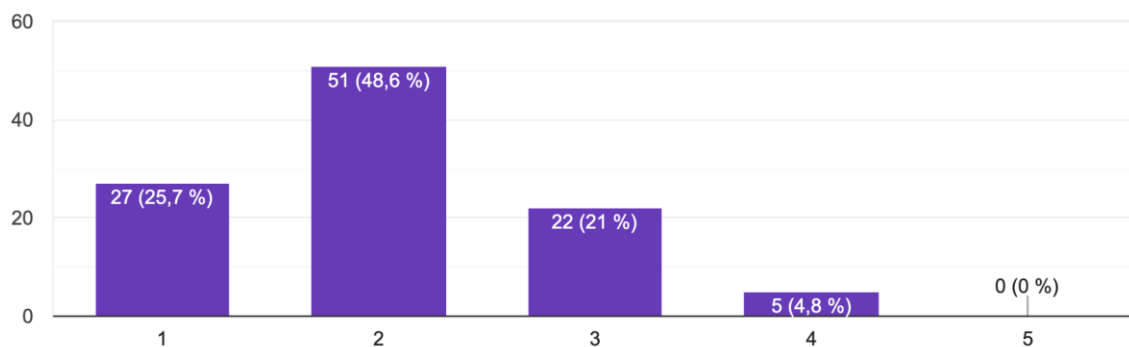




Figure 92 German Survey [School curricula effectively integrate Data Literacy concepts and methods]

The results in Figure 39 reflect clear dissatisfaction with how school curricula currently address data literacy. A total of 74.3% of respondents disagreed with the statement, with 48.6% selecting “Disagree” and 25.7% choosing “Strongly Disagree.” This strong negative majority suggests that most educators do not see data literacy as meaningfully embedded in curricular content or learning objectives.

Only 4.8% agreed, and no respondents selected “Strongly Agree.” This lack of strong endorsement reinforces the perception that data literacy is either marginal or inconsistently addressed in current curricula. Meanwhile, 21.0% remained neutral, potentially indicating that some teachers are unaware of curriculum content related to data or have mixed experiences depending on subject area or school context.

Overall, the responses point to a significant gap between the growing importance of data skills in education and the degree to which they are formally integrated into curricula. This disconnect signals the need for curriculum development that more explicitly and systematically incorporates data literacy as a cross-disciplinary competence.

The statement “School administrators play a critical role in successful Data Literacy integration” followed.

24. Schulleitungen spielen eine entscheidende Rolle bei der erfolgreichen Vermittlung von Datenkompetenz

105 Antworten

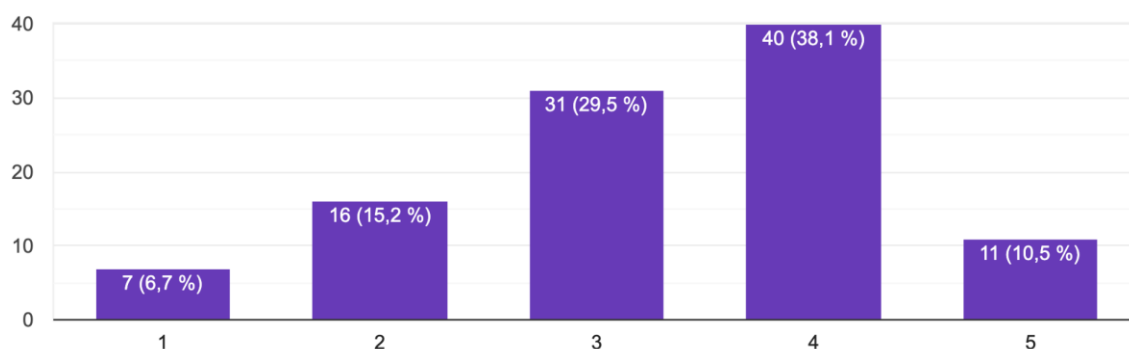


Figure 93 German Survey [School administrators play a critical role in successful Data Literacy integration]

Figure 40 reflects a generally positive assessment of school administrators' importance in advancing data literacy. A majority of respondents recognize their role: 38.1% agreed, and 10.5% strongly agreed that school leaders are critical to the successful implementation of data literacy. This combined 48.6% endorsement suggests that educators see principals as key enablers of a school-wide data culture.

At the same time, 29.5% of participants selected the neutral option, indicating that for many, the effectiveness of school leadership in this area remains uncertain or variable. These responses



may reflect differences across schools: while some administrators actively support data practices, others may lack focus or capacity in this area.

Dissenting views were less common, with 15.2% disagreeing and 6.7% strongly disagreeing. Although this is a minority, it suggests that some educators either do not experience administrative support or question whether school leadership truly influences success in data literacy efforts. Overall, the data points to the central - but unevenly realized - role of school administrators in enabling meaningful and sustained data use in education.

The statement “Teachers have adequate knowledge to address ethical considerations related to educational data (privacy/security/responsible use)” followed.

25. Lehrpersonen verfügen über ausreichendes Wissen, um ethische Aspekte im Umgang mit Daten aus Lehr-/Lernkontexten zu berücksichtigen (z. B. ...utz, Datensicherheit, verantwortungsvolle Nutzung)

105 Antworten

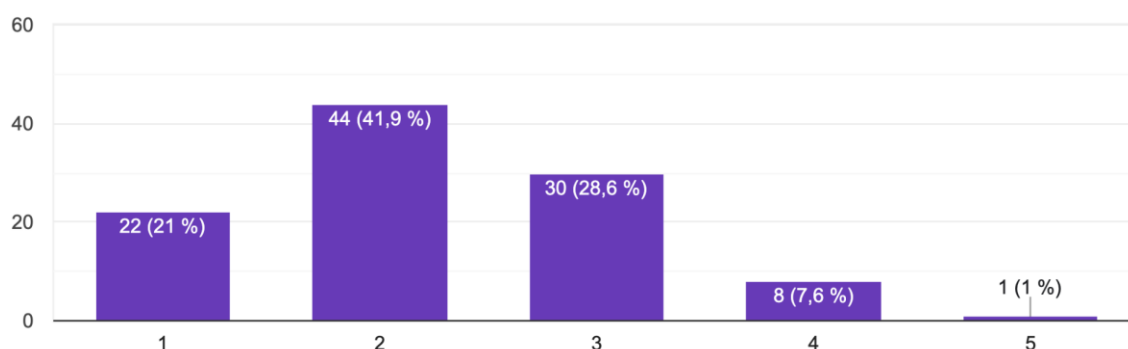


Figure 94 German Survey [Teachers have adequate knowledge to address ethical considerations related to educational data (privacy/security/responsible use)]

The responses to Figure 41 indicate that a majority of educators doubt their own preparedness to address ethical aspects of educational data, such as privacy, security, and responsible use. 41.9% disagreed and 21.0% strongly disagreed with the statement, totaling 62.9% in explicit disagreement. This points to a clear gap in teacher training or confidence in navigating data ethics - an increasingly important area as data use becomes more embedded in schools.

Only 7.6% agreed and 1.0% strongly agreed, signaling that few teachers feel well-equipped in this field. The 28.6% who responded neutrally may be uncertain about the expectations or lack clarity on what constitutes adequate knowledge.

Overall, the data show that ethical competencies related to data use are not yet firmly established in professional practice. These results suggest an urgent need for targeted professional development and clearer guidance on ethical standards in the educational use of data.

The statement “Teachers have adequate autonomy to implement data-driven methods” followed.

27. Lehrpersonen haben ausreichend viel Autonomie, um datengestützte Methoden umzusetzen

105 Antworten

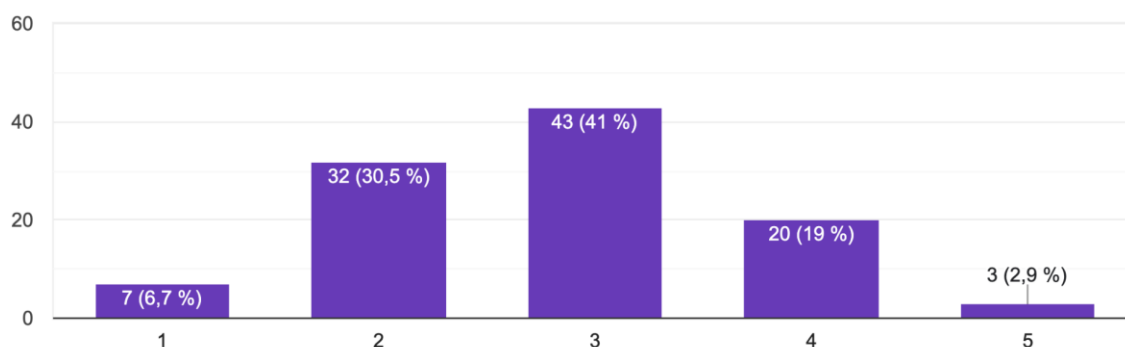


Figure 95 German Survey [Teachers have adequate autonomy to implement data-driven methods]

The responses to Figure 42 reflect mixed perceptions about teacher autonomy in the context of data use. A plurality of respondents (41.0%) selected the neutral option, indicating considerable uncertainty or variability in how autonomy is experienced across different schools or systems. This large neutral share suggests that, for many educators, the space to make autonomous decisions about data use may depend on leadership style or institutional culture.

Critically, 30.5% disagreed and 6.7% strongly disagreed with the statement, meaning over a third of respondents feel they lack sufficient autonomy to use data-driven approaches effectively. This could reflect experiences where top-down mandates, rigid systems, or limited discretion reduce teachers' ability to apply data meaningfully in practice.

Only 19.0% agreed and 2.9% strongly agreed, indicating that relatively few teachers feel fully empowered in this area. Overall, the results highlight a need for clearer institutional support and more flexible frameworks that enable teachers to make context-sensitive decisions in data use.

The next statement was: “School curricula sufficiently cover:”

Five aspects were available: Data collection skills, Data analysis skills, Data interpretation skills, Data visualization skills, Data communication skills.

28. Die Lehrpläne decken in ausreichendem Maße folgende Kompetenzen ab:

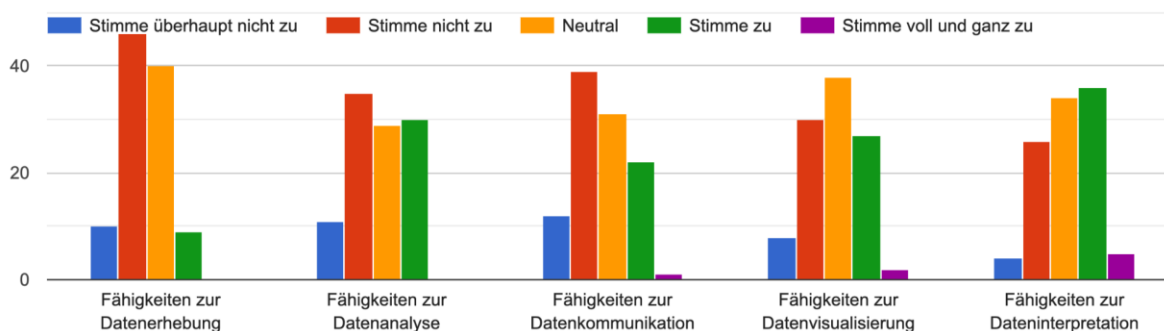


Figure 96 German Survey [School curricula sufficiently cover Data collection skills, Data analysis skills, Data interpretation skills, Data visualization skills, Data communication skills]

The statement “School curricula sufficiently cover the following competencies” was evaluated across five key areas of data literacy. The overall results reveal a strong perception among respondents that current curricula do not adequately address these essential skills.

For data collection skills, more than half of the participants expressed disagreement, with 10 respondents selecting “Strongly Disagree” and 46 choosing “Disagree.” Only 9 respondents agreed that this competency is sufficiently covered, while 40 remained neutral. This indicates a significant gap at the most foundational level of the data cycle.

Data analysis followed a similar pattern: 11 participants strongly disagreed, and 35 disagreed, while 29 remained neutral and 30 expressed some level of agreement. Again, over 40% expressed clear doubts about the curriculum’s sufficiency in this area.

When it comes to data communication, 12 respondents strongly disagreed and 39 disagreed— together comprising nearly half of the sample. Only 23 respondents agreed, with 31 remaining neutral. This suggests that the ability to effectively convey data findings is another area where current curricula fall short.

For data visualization, responses were slightly more balanced, though still indicative of underrepresentation. A total of 38 participants expressed disagreement, while only 29 agreed. A considerable 38 respondents selected “Neutral,” pointing to possible uncertainty or variability in curricular coverage across institutions.

Finally, data interpretation received the most positive responses, but even here, only 36 participants agreed and 5 strongly agreed that this competency is well addressed. In contrast, 34 remained neutral and 30 expressed disagreement to some extent.

Taken together, these findings underscore a systemic issue: respondents perceive a widespread lack of curricular support for essential data literacy competencies. While some areas show slightly more balanced opinions, in all five domains a substantial proportion of participants either disagreed or expressed uncertainty about the adequacy of coverage. These results highlight the need for educational policy and curriculum development to more explicitly integrate data skills as a core component of modern learning.

The next statement was: “School curricula approach the use of Data Literacy:”

Two options were available: With STEM/ STEAM/ STEAME activities and With project-based learning across disciplines.

29. Die Lehrpläne fördern Datenkompetenz wie folgt:

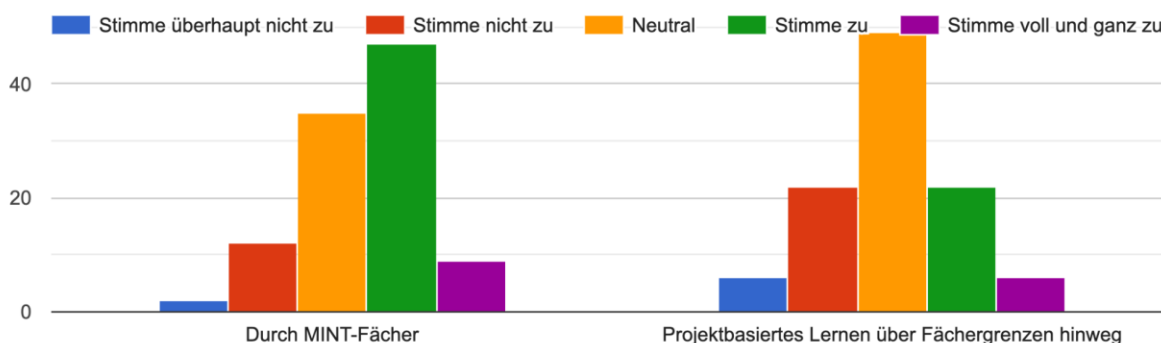


Figure 97 German Survey [School curricula approach the use of Data Literacy with STEM/STEAM/STEAME activities and With project-based learning across disciplines]

The statement “School curricula approach the use of Data Literacy” was presented with two distinct dimensions: (1) through STEM subjects (German: MINT) and (2) via cross-disciplinary project-based learning. The response patterns reveal a contrast in how participants perceive the effectiveness of these approaches within existing curricula.

When asked whether data literacy is supported through STEM subjects, the overall response was relatively favorable. A combined total of 56 respondents (53.3%) agreed or strongly agreed with the statement—47 (44.8%) selected “Agree” and 9 (8.6%) chose “Strongly Agree.” Meanwhile, 35 participants (33.3%) remained neutral, and 14 (13.3%) expressed disagreement (3 *strongly*, 11 *somewhat*). This suggests that STEM is widely seen as a natural and somewhat effective pathway for fostering data literacy, though the high rate of neutral responses may indicate variability depending on the specific context or subject implementation.

In contrast, perceptions were more mixed regarding project-based learning across disciplines. While 22 respondents (21%) agreed and 6 (5.7%) strongly agreed, a notable 49 participants (47.6%) selected “Neutral”, the highest concentration of neutrality across any item in this section. In addition, 28 participants (26.7%) expressed disagreement (6 *strongly*, 22 *somewhat*). This suggests that while project-based approaches are recognized in theory as a vehicle for interdisciplinary learning, they may not yet be widely implemented or clearly linked to data literacy in practice.

Overall, the responses point to a more established recognition of data literacy within STEM education, while highlighting untapped or underutilized potential in cross-curricular project-based learning. The high number of neutral responses in both areas also signals that many educators may lack clear visibility into how curricula explicitly integrate data literacy, underlining the need for greater transparency, support, and exemplars in this domain.

6.3.7 Training and Professional Development Needs (Section G)

Participants were asked to indicate their level of agreement with a number of statements.



Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Stimme überhaupt nicht zu), 2 = Disagree (Stimme nicht zu), 3 = Neither Agree Nor Disagree (Neutral), 4 = Agree (Stimme zu), 5 = Strongly Agree (Stimme voll und ganz zu).

The first statement was: “I believe that developing Data Literacy will significantly contribute to my professional development”.

30. Ich glaube, dass die Förderung von Datenkompetenz wesentlich zu meiner beruflichen Weiterentwicklung beiträgt

105 Antworten

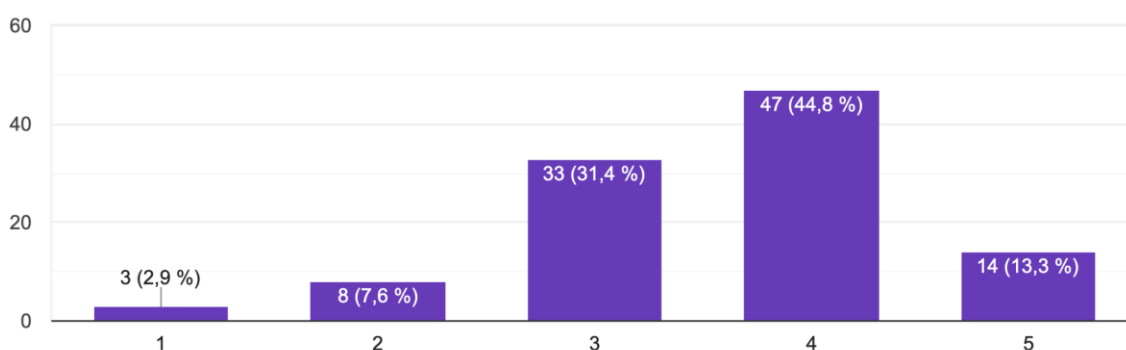


Figure 98 German Survey [I believe that developing Data Literacy will significantly contribute to my professional development]

The results for Figure 45 reflect a clear professional interest in the value of data literacy. A combined 58.1% of respondents agreed (44.8%) or strongly agreed (13.3%) that strengthening their data literacy skills would significantly contribute to their own professional development. This majority suggests that teachers view data competence not only as a practical tool but also as an essential aspect of their evolving professional role.

A further 31.4% of participants selected the neutral response. This may reflect uncertainty about what "developing data literacy" entails in concrete terms or how directly it translates into career advancement or pedagogical improvement. Given the rapid changes in educational data use, some respondents may also feel that institutional structures or training opportunities are not yet in place to make full use of this potential.

Only 7.6% disagreed and 2.9% strongly disagreed, indicating minimal skepticism. Overall, the data illustrates that most educators recognize the strategic importance of data literacy for their own growth, even if some await clearer frameworks or stronger support to realize its full benefits.

The statement “I am interested in professional development related to Data Literacy” followed.



31. Ich bin an Fortbildungen zur Datenkompetenz interessiert

105 Antworten

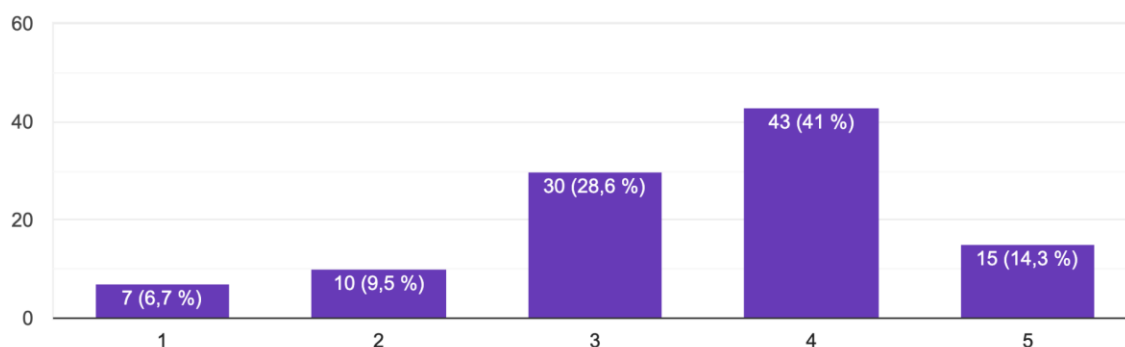


Figure 99 German Survey [I am interested in professional development related to Data Literacy]

The responses to Figure 46 reflect broad, but not universal, support for the idea that data literacy should be a compulsory component of teacher training. A combined 55.3% of respondents agreed (41.0%) or strongly agreed (14.3%) with the statement. This majority suggests that many educators recognize the relevance of data skills for their profession and would welcome formal structures to ensure that all teachers are equipped accordingly.

However, 28.6% of participants selected the neutral option, indicating a substantial degree of uncertainty. This may reflect differing views on whether mandatory approaches are appropriate, or concerns about how such training would be designed, delivered, or resourced. For some, data literacy may still seem context-dependent or secondary to other professional priorities.

In contrast, 9.5% disagreed and 6.7% strongly disagreed with the idea. These responses suggest a minority that either questions the value of mandatory training or is cautious about further top-down requirements. Overall, the results show a profession that sees clear value in data literacy—but also calls for thoughtful implementation that considers local needs, existing workloads, and meaningful application in practice.

The statement “The available professional development programs address my needs regarding data use” followed.



32. Die verfügbaren Fortbildungsangebote decken meinen Bedarf im Umgang mit Daten ab

105 Antworten

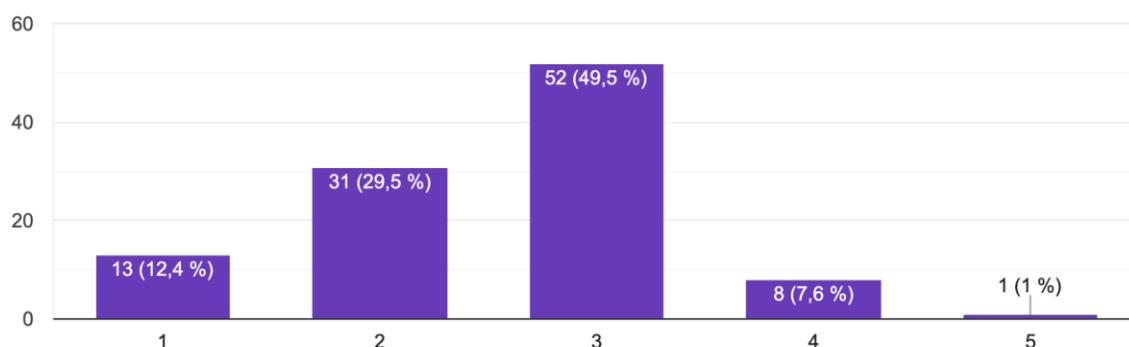


Figure 100 German Survey [The available professional development programs address my needs regarding data use]

The responses to Figure 47 indicate that current professional development programs are largely perceived as inadequate in supporting teachers' needs related to data use. Only 8.6 % of respondents agreed (7.6 %) or strongly agreed (1.0 %) with the statement, suggesting that very few feel well supported in this area by the training opportunities currently available to them.

In contrast, 29.5 % disagreed and 12.4 % strongly disagreed, amounting to a combined 41.9 % who actively reject the idea that existing programs meet their data-related needs. This points to a clear gap between professional expectations and what is offered in terms of continuing education or training.

Most notably, 49.5 % of respondents chose the neutral option. This high proportion likely reflects a lack of transparency, awareness, or consistency in professional development offerings. It may also indicate that data use is addressed only marginally or superficially in many programs. Overall, the results suggest a strong demand for more targeted, relevant, and accessible professional learning formats that support teachers in developing practical competencies for educational data use.

The next statement was: "What type of support do you need to effectively implement Data Literacy methods in your curriculum?"

33. Welche Art von Unterstützung benötigen Sie, um Datenkompetenz wirksam in der Lehre zu vermitteln?

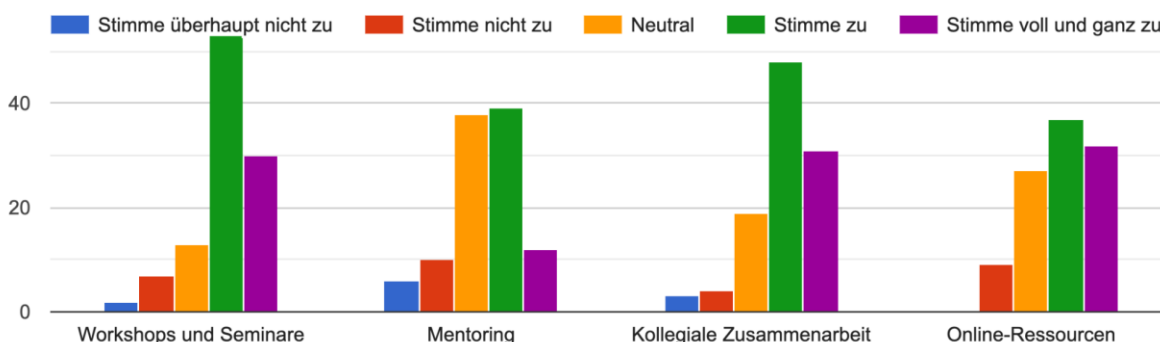


Figure 101 German Survey [What type of support do you need to effectively implement Data Literacy methods in your curriculum?]

The statement “What type of support do you need to effectively implement Data Literacy methods in your curriculum?” explored participants’ preferences across four key support formats: workshops and seminars, mentoring, peer collaboration, and online resources. The results highlight a clear demand for structured, collaborative, and accessible professional development opportunities.

Workshops and seminars received the strongest agreement. A total of 83 respondents either agreed (53) or strongly agreed (30) that these formats would help them effectively integrate data literacy into teaching. Very few respondents expressed disagreement (2 “Strongly Disagree”; 7 “Disagree”), indicating broad enthusiasm for in-person or guided learning environments. Only 13 were neutral, suggesting overall clarity in the perceived value of workshops.

Mentoring was rated slightly lower, though still favorably: 39 respondents agreed and 12 strongly agreed. However, this category also had the highest neutral response, with 38 participants (36.2%) indicating ambivalence. This might suggest uncertainty about the availability, structure, or effectiveness of mentoring in their context, even though the idea is viewed positively overall.

Peer collaboration was also highly selected, with 48 respondents agreeing and 31 strongly agreeing—amounting to a combined 75.3% positive response. Only 7 respondents expressed any level of disagreement, and the low neutral count (19) reinforces that collegial exchange is seen as a particularly valuable means of professional development for data literacy.

Lastly, online resources garnered considerable support as well, with 37 respondents agreeing and 32 strongly agreeing. Neutral responses were somewhat higher here (27), which could reflect the variability in quality, accessibility, or relevance of digital materials. Nevertheless, this remains a preferred support format for the majority of participants.

Overall, the findings underscore a strong desire for interactive, participatory learning formats—particularly peer-based collaboration and structured workshops—alongside supplementary digital tools. While mentoring shows promise, it may require clearer implementation models to gain broader trust.

The next statement was: “What are your current training needs?”.

Seven aspects were available: Understand basic Data Literacy concepts, Acquire skills in data analysis methods, Acquire skills in interpreting complex data visualizations, Organize classroom interventions with my students, Get familiar with data-driven decision making in school, Understand the ethical use of educational data, Know how to integrate data literacy with other literacies.

34. Welche konkreten Fortbildungsbedarfe haben Sie aktuell?

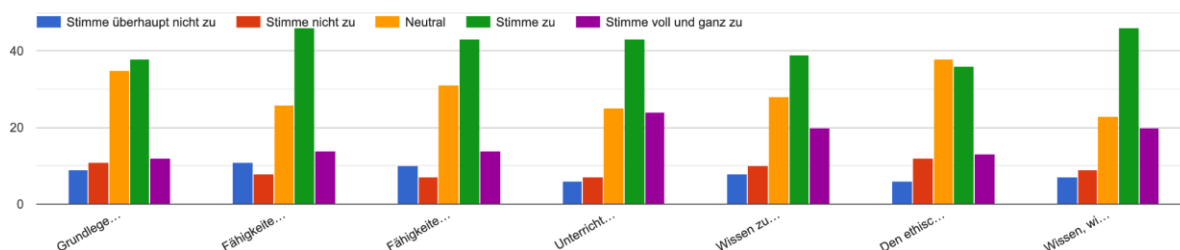


Figure 102 German Survey [What are your current training needs?]

The responses reflect strong and consistent interest across nearly all categories, indicating broad-based recognition of the need to enhance competencies in both foundational and applied aspects of working with data in education.

The highest levels of agreement were seen for the training need “Organize classroom interventions with my students”, with approximately 43 of respondents selecting “Agree” and another 24 choosing “Strongly Agree”. Closely following this was the expressed need to “Know how to integrate data literacy with other literacies” (46 agreed/ 20 strongly agreed).

There was similarly strong interest in interpreting complex data visualizations and understanding basic Data Literacy concepts, each drawing agreement from roughly 40% to 45% of participants, with notable proportions also selecting the highest level of agreement. These findings highlight that both conceptual clarity and interpretive skillsets are viewed as essential by educators.

Training needs were also high for data-driven decision-making in schools, where over 60% of participants selected *Agree* or *Strongly Agree*.

While the need to understand the ethical use of educational data received slightly lower but still significant agreement, it nonetheless suggests awareness of the importance of responsible practices—likely connected to broader concerns around privacy and legal compliance.

Across all seven aspects, neutral responses ranged from 20% to 30%, and negative responses were minimal, reinforcing the conclusion that educators are aware of their professional development gaps and are ready to engage with targeted training offerings. The consistently high levels of interest across categories suggest that a multifaceted, well-structured training program would be well received and could have broad impact.

6.3.8 Challenges and Obstacles (Section H)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Stimme überhaupt nicht zu), 2 = Disagree (Stimme nicht zu), 3 = Neither Agree Nor Disagree (Neutral), 4 = Agree (Stimme zu), 5 = Strongly Agree (Stimme voll und ganz zu).

Focusing on the challenges and obstacles, the relevant statement was: “Which of the following do you think constitute challenges and obstacles for Data Literacy in education?”

Seven were mentioned: Insufficient resources (i.e. labs, equipment, software, etc.) for data-driven activities, insufficient time for data-driven activities, Insufficient training programs in Data Literacy, Resistance among educators towards adopting Data Literacy methods, Lack of support or encouragement from school administrators, Unclear national policies regarding Data Literacy implementation, Ethical concerns and privacy issues in educational data handling.

35. Welche der folgenden Aspekte sehen Sie als Hürden für die Entwicklung von Datenkompetenz in der Bildung?

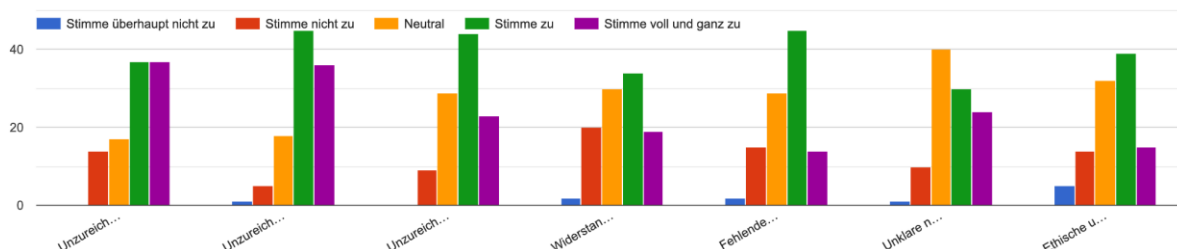


Figure 103 German Survey [Which of the following do you think constitute challenges and obstacles for Data Literacy in education?]

The statement “Which of the following do you think constitute challenges and obstacles for Data Literacy in education?” prompted respondents to evaluate seven potential barriers. The results clearly demonstrate that multiple systemic and structural issues are perceived as significant hurdles to implementing Data Literacy effectively in educational contexts.

The most prominent challenges identified were insufficient time and insufficient resources for data-driven activities. Both categories garnered strong agreement: over 40% of respondents selected “Agree” and approximately 35–40% selected “Strongly Agree”. These results reflect a common concern that educators lack the bandwidth and infrastructural support—such as labs, tools, and dedicated time—to integrate Data Literacy meaningfully into their teaching practice.

Similarly, insufficient training programs were flagged as a key barrier. Approximately 70% of participants agreed to some extent that the current professional development landscape does not adequately prepare educators to teach or apply Data Literacy, emphasizing the need for expanded and better-aligned training opportunities.

Perceived lack of support from school administrators and unclear national policy also stood out. Around 55–60% of respondents expressed agreement or strong agreement with these as barriers. This suggests that top-down structural and policy alignment is missing, and educators may feel unsupported or unclear about expectations related to data use in education.

Notably, resistance among educators toward adopting data-informed practices was also seen as a meaningful concern, although to a slightly lesser degree than time or resources. Still, about half of respondents expressed some level of agreement here, indicating that mindset shifts or cultural resistance may be present within some faculties or institutions.

Finally, ethical and privacy concerns were acknowledged by over 50% of respondents as a barrier. This reflects broader global concerns about the responsible use of educational data and underscores the need for clear ethical guidelines and privacy protections.

Taken together, these results point to a multilayered set of challenges—ranging from operational (time, tools), to institutional (training, leadership support), to structural (policy clarity), and ethical. Addressing these barriers will likely require coordinated efforts across teacher education, school leadership, and policymaking domains.

6.3.9 Future Intentions (Section I)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Stimme überhaupt nicht zu), 2 = Disagree (Stimme nicht zu), 3 = Neither Agree Nor Disagree (Neutral), 4 = Agree (Stimme zu), 5 = Strongly Agree (Stimme voll und ganz zu).

The relevant statement was: “In the future, I intend to use data more frequently in my work for”.

Six options were mentioned: Administrative tasks, Instructional design, Communication and collaboration, Assessment and feedback, Counseling and parent engagement, Broader management responsibilities.

36. In Zukunft beabsichtige ich, Daten häufiger in meiner Arbeit zu nutzen für:

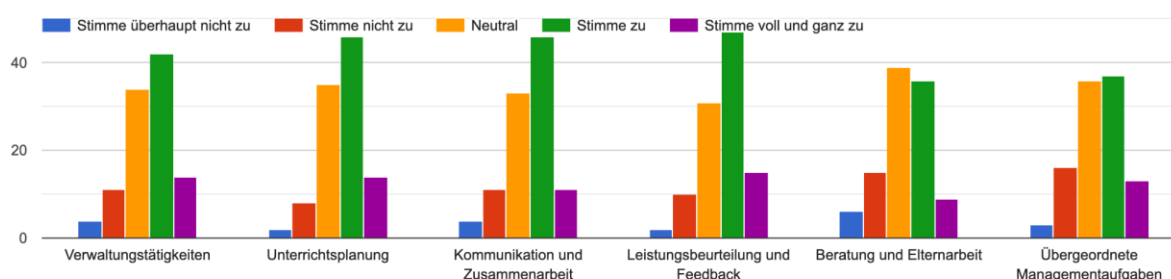


Figure 104 German Survey [In the future, I intend to use data more frequently in my work for:]

The statement “In the future, I intend to use data more frequently in my work for” elicited a strong overall willingness among respondents to increase their engagement with data across a range of professional contexts. Six specific areas were evaluated, each receiving majority support in the form of “Agree” or “Strongly Agree” responses.

Assessment and feedback emerged as the leading domain, with more than 45% of participants selecting “Agree” and around 15% indicating “Strongly Agree”. This suggests that educators see significant value in data use for evaluating student performance and providing targeted feedback, likely due to its immediate pedagogical impact.

Similarly high levels of intention were expressed for instructional design and communication and collaboration, both of which received over 40% agreement and 10–15% strong agreement. These results reflect a growing recognition that data can support more informed, responsive, and collaborative teaching strategies.

Administrative tasks also ranked high, with approximately 40% of respondents agreeing with the intention to increase data use, and 12–15% strongly agreeing. This suggests a broader shift in attitude toward streamlining and optimizing administrative responsibilities through data.

Counseling and parent engagement and broader management responsibilities showed slightly more varied responses. While around 35–38% selected “Agree” and another 10–13% “Strongly Agree”, these categories also attracted relatively more neutral or disagreeing responses. This could imply that while many educators recognize the potential for data in these areas, some still feel uncertain about practical implementation or see it as outside their primary responsibility.



Overall, these results paint a forward-looking picture: the majority of respondents show a clear intent to integrate data more purposefully into multiple facets of their educational practice, particularly in instructional, evaluative, and organizational roles. The findings suggest momentum for future development—though also highlight areas, such as parental communication and management, where support and clarity may still be needed.

6.3.10 Open-ended Questions (Section J)

The last question was open-ended: In your opinion, what are the most important factors for implementing successful data-driven methods in education in Germany?

The successful implementation of data-driven methods in German schools depends on an interplay of several factors, including technical infrastructure, teacher training, institutional frameworks, and a broader cultural shift in how data is approached within the educational environment. The 20 qualitative responses reveal a strong consensus: the transformation must be holistic and well-supported at multiple levels.

Many respondents pointed to the technical foundations as a key prerequisite. Without standardized and functional systems, schools are left on their own, often lacking both the capacity and the resources to act effectively. One participant noted, *“There must be ready-to-use, easy-to-operate, and adaptable systems, so that those involved see added value rather than an extra burden.”* This sentiment reflects the widespread concern that the responsibility for technical implementation should not fall on individual schools, especially when existing tools often fail to meet diverse pedagogical needs. Another echoed this, emphasizing the importance of consistency: *“Uniform systems on teachers’ devices are essential.”*

Time and workload relief also emerged as essential conditions for successful change. Teachers stressed that meaningful engagement with data tools is only possible if space is created in their day-to-day practice. One respondent put it succinctly: *“Time needs to be created for it, and teachers need to be trained.”* The demand for dedicated time was often paired with the call for increased financial and human resources to avoid adding pressure to an already strained workforce.

Crucially, there was a strong emphasis on training and qualifications. Respondents repeatedly called for mandatory and comprehensive professional development, particularly in areas such as data handling, digital tools, and ethical issues. One teacher emphasized the need for consistency: *“All teachers should be trained to the same level and equipped with digital devices and media so that everyone has equal opportunities.”* Another highlighted the gaps in initial teacher preparation, saying: *“There needs to be better preparation during teacher training—this currently does not exist sufficiently.”* These comments reveal the need for both short-term interventions and long-term integration of data literacy into pre-service teacher education.

In addition to infrastructure and professional development, many participants underlined the necessity of clear frameworks and institutional support. One response called for *“a well-designed framework that offers orientation and clearly addresses key questions,”* underscoring the desire for strategic guidance that goes beyond vague policy suggestions. Importantly, this guidance should not be limited to educators alone but involve *“the entire school community, including administrative staff, students, and parents.”* This broader inclusion was seen as crucial for cultivating a shared understanding of the value and application of data in education.

Underlying all of this is the need for a shift in mindset and school culture. Several teachers called for more openness to new approaches, including a willingness to reflect on personal limitations. As one put it: *“Openness to acknowledging one’s own lack of skills”* is an important first step toward growth. Others stressed that raising awareness of the topic’s relevance must precede



content training: *“Teachers first need to understand the relevance of the topic—then comes content competence.”*

Taken together, these insights show that a successful transition to data-informed education is not a matter of isolated initiatives or technical fixes. It requires a comprehensive strategy that aligns infrastructure, training, leadership, and a supportive culture. As one respondent summarized, *“Education must change.”*

6.3.11 Summary

This survey explored educators’ perceptions, competencies, practices, and needs related to data literacy in the German education system. A total of 105 individuals participated, the majority of whom were young, early-career teachers with fewer than three years of experience. Most respondents (over 72%) reported having received no formal training in data literacy, and although many demonstrated moderate digital skills, only around 22.9% reported advanced proficiency.

Participants showed a relatively strong understanding of concepts such as digital literacy and AI literacy. Data literacy was also recognized, though with less confidence, while statistical literacy and learning analytics were less familiar. Nevertheless, 73.3% of respondents expressed confidence in the potential of data to enhance educational processes, and 71.3% saw data literacy as a key component of modern teaching. Awareness of legal (60%) and ethical (56.2%) aspects was also present, although not yet universal.

In terms of practical skills, a significant gap emerged: while more than 80% of participants felt confident interpreting charts and tables, fewer than one-third knew how to manage data with digital tools or conduct data analysis. Active use of data—such as collecting, visualizing, and sharing it—was reported only by a small number of participants. Collaboration with colleagues or stakeholders in interpreting and communicating data was also rare.

Despite these practical limitations, attitudes towards data use in education were generally positive. A large majority believed that data can enhance learning, teaching, and assessment. At the same time, institutional support was seen as lacking: 79% stated that the education system does not adequately promote data literacy, and 74.3% said curricula fail to meaningfully integrate relevant competencies. Only 8.6% felt that current professional development opportunities met their needs in this area. These results highlight the urgent need for system-level improvements—particularly better training, leadership engagement, and policy guidance.

Regarding professional development, participants expressed strong interest in workshops, peer collaboration, and online resources. Key content needs include applying data literacy in the classroom, data-informed decision-making, understanding ethical principles, and integrating data literacy across disciplines. Major obstacles identified were a lack of time, insufficient resources, limited training opportunities, unclear national policies, and inconsistent administrative support.

Looking ahead, many educators indicated a clear intention to increase their use of data in practice—especially in areas like assessment, instructional design, and administrative tasks. These findings suggest a profession that is open and willing to grow, but currently under-supported.

In conclusion, while theoretical awareness of data literacy is widespread, practical application remains limited. A successful transition to data-informed education requires a coordinated strategy that links teacher training, technical infrastructure, institutional leadership, and supportive school culture. With the right structures and resources, educators are ready to embrace data as a tool for improved teaching, learning, and equity.



6.4 Focus group

As part of the focus group, the perspectives of ten experts were obtained (4 members of school management, 3 teacher educators, 2 teachers with functions in the area of digital school development and digital education, 1 person from education administration). The results of the interviews for the individual research questions are summarized descriptively below and illustrated using quotes from the interviews.

6.4.1 Understanding (Section A)

1. How would you define data literacy? What key skills and competencies do you associate with it?

The interviewees predominantly define “data literacy” as a multi-layered competence: Central aspects to which several statements refer are the ability to interpret and use data meaningfully, the critical handling of data sources and quality, and the application of the knowledge gained in a professional and social context.

A recurring motif is the understanding of data literacy as confidence in dealing with data, regardless of its origin or format: “I must be able to deal with this data in the sense of my job.” The focus here is on the ability to process and evaluate data and to derive consequences for one's own actions.

Several voices emphasize that technical knowledge, for example about programming logic, algorithms or the functioning of AI, alone is not sufficient to capture data literacy. Instead, a reflexive dimension is emphasized, as well as the ability to be critical when dealing with data. It is important to “classify data into meaning structures and critically question them” as well as to reflect on how data gaps, lack of context or incorrect data collection can distort interpretation and consequently to be able to deal competently with incomplete or misleading data.

In addition, the importance of a basic understanding of different types of data was emphasized, especially personal and personal-obtainable data in conflict between privacy, publicity and digital offerings. The aim is to create an awareness of “where data traces are created, how they can be limited and what data we voluntarily use to pay for things in everyday life”. Data literacy must also include “an awareness of the value and use of one's own personal data”. The associated ability to weigh up convenience and data protection is described as “quite an achievement for people of all ages”, highlighting a socio-political dimension in addition to the functional and ethical aspects listed above. Data literacy is understood here in a broader sense than purely cognitive or analytical skills and requires the conscious embedding of data in social and political contexts.

It is striking that several participants initially expressed difficulties in formulating a definition of data literacy, which indicates the complexity and multi-layered nature of the term. References were frequently made to terms such as “statistical literacy”, “information literacy” or “digital literacy”, whereby some voices consider “data literacy” to be the more comprehensive or overarching term or also a component of “media literacy”.

2. Do you believe data literacy should be an essential competence for teachers and students today? Why or why not?

The overwhelming majority of the participants agree with the statement that data literacy is an essential skill for school leaders, teachers and students. In the context of an increasingly digitized society and world, the term is understood as part of a necessary basic education in the 21st century.



Data literacy was explicitly named here as a key competence, in some cases even analogous to traditional cultural techniques such as reading, writing and arithmetic. One interviewee, for example, refers to the classification of media and data literacy as a “fourth cultural technique” and emphasizes that it is a skill that “you can’t avoid”.

Other voices also emphasize the increasing importance of data-related skills in school, work and society, especially considering digital environments, algorithmic systems and data-driven decision-making processes. At the same time, it is pointed out that data literacy requirements vary depending on the target group: While students should learn basic understanding and a critical attitude, teachers and school leaders need in-depth knowledge of data protection, evaluation and digital strategy development.

At the same time, it is noted that fundamental concepts such as the difference between “data”, “information” and “knowledge” are hardly ever addressed in lessons, not even in computer science, depending on the federal state.

6.4.2 Views (Section B)

3. How would you view the generation and use of data in compulsory education overall?

The participants express a differentiated and sometimes ambivalent relationship to the collection and use of data in the school context. While many see potential for quality development, individualization and optimization of school processes, fundamental criticism of the implementation, targeting and practical relevance of data was also expressed:

A central common understanding is that data is only useful if concrete educational or organizational action can be derived from it: “The decisive factor for me is not the data, but what can be derived from the data”. Data is seen as a potentially helpful management tool, for example, to support students, improve teaching or to organize everyday school life. Furthermore, the importance of data-based reflection in the classroom was emphasized, especially with regard to statistical statements, media criticism and the evaluation of information. This is not only seen as part of a democratic education, but also as a response to disinformation, AI-generated content and algorithmic distortions. At the same time, however, it is also criticized that existing data is often not used or only insufficiently translated into concrete measures. Some interviewees describe positive examples from practice, such as the deployment planning of teachers or the distribution of lessons. Data is seen here as a democratizing element that promotes transparency, traceability and fairness. Thereby, even seemingly simple surveys, such as request surveys or feedback tools, can contribute to building trust and increasing efficiency.

Numerous voices express criticism of the structural implementation of data use in the education system. There is often a lack of functioning digital infrastructures, standardized interfaces or clear responsibilities, for example between schools, school authorities and ministries. Data is sometimes too fragmented, not interoperable or only accessible to a limited extent. At the same time, there are complaints that pedagogically relevant data, for example on learning behavior, health data or social factors, is too rarely recorded and reflected upon. Teachers also increasingly have to act as “data managers”, which places new demands on their training and further education.

A recurring topic is the handling of sensitive personal data, particularly regarding grades, health data, family backgrounds or digital communication channels. According to the interviewees, there are major uncertainties and knowledge gaps among teachers about what is possible or permissible in compliance with data protection regulations. It is emphasized that mandatory training and clear role concepts are necessary to ensure a sense of responsibility and legal certainty when handling data.



In summary, the statements oscillate between educational opportunities, organizational challenges and data protection requirements.

4. In your opinion, what types of data do teachers use in schools?

The participants named a variety of different types of data that are collected and used in everyday school life. Overall, a broad spectrum can be identified, ranging from classic administrative and performance data to pedagogical-diagnostic information to organizational and participatory data:

The most frequently mentioned types of data include formal administrative data such as student numbers, address data, absenteeism, class lists and grades. This data forms the basis for organization, supervision, school statistics and report cards. They are also used for course selection, graduation decisions and timetabling. Electronic class registers and digital school portals are also used in this context, increasingly also in data protection-compliant state solutions. Pedagogical data was also mentioned, for example to document counseling sessions, support measures or individual learning development.

Of relevance here is the use of digital student files to track development processes, learning difficulties or behavioral problems. At the same time, it is emphasized that this data is primarily used situationally and not systematically. Support reports, grade reports and comparative tests are also mentioned, although it is pointed out that they are often used at an institutional rather than an individual level.

Regarding lessons, the use of classic performance data such as grades from class tests, vocabulary tests or participation is the main topic of discussion. The use of data for internal organization, planning and communication is diverse. This includes, for example, requests for the distribution of lessons and working hours, resource planning for events (e.g. school concerts), room allocations and committee work. Data is not only used functionally here, but also to create commitment and a culture of participation.

5. In your opinion, how do teachers use that data?

Only very vague statements were made regarding the actual handling of data. Instead, purposes and motives for the use of data by teachers were mentioned:

Data is primarily used by teachers for performance assessment, diagnostics, organization and documentation. It is also mentioned that teachers also feed in data in the run-up to pedagogical conferences in order to identify at an early stage which students are in particular need of discussion. This is described as efficiency-enhancing preparatory work.

However, it is critically noted that this data is often used subjectively and inconsistently. One interviewee described, for example, that the participation grades of 30 students cannot actually be validly recorded: "With a class size of 30 people, a single teacher hardly has a chance to really evaluate all students individually and objectively".

At the same time, the use of data is often unsystematic, capacity-limited and characterized by uncertainties in dealing with data protection and application competence. Teachers are often unsure which data may be collected, processed or passed on and how, which sometimes leads to unnecessary restraint or incorrect use.

Particularly in sensitive student data, there is a mixture of half-knowledge, uncertainty and informal practices. It is also clear that structural factors such as workload or lack of time significantly limit the use of differentiated data.

Regarding alternative assessment methods, such as individualized feedback or AI-supported learning assessment, several interviewees stated that these are possible but not (yet) established. According to the interviewees, the use of external educational data (e.g. from PISA



studies or other large-scale educational analyses) hardly plays a role in everyday school life. Access to such data is not didactically prepared and is, if at all, informally received via media reports, without any concrete impetus for action in the classroom: “What teachers know about PISA, they know like everyone else from the media”.

6. In your opinion, what are the ethical implications of using student data? How do you evaluate the credibility and accuracy of data used in compulsory education?

The interview statements on the ethical dimension of data use in the school context provide a differentiated picture:

There is a broad consensus regarding the relevance of data protection. Several interviewees pointed out that students are not always transparently informed about who is allowed to view or process which data of them. The issue of informed consent was raised several times. Particularly in the case of minors, the ethical question arises as to whether and to what extent they can or must actively consent when personal data is processed.

Particularly against the backdrop of digital transformation and the use of cloud-based systems (e.g. iCloud), cross-border risks and possible consequential problems are pointed out. One concise example describes the potential impact of a harmless school essay on future international mobility: “If a student insults Trump in an essay and it is on a US server, this can cause problems later when studying abroad”. Here, the importance of technical and legal infrastructure that guarantees national data protection standards was emphasized. This becomes particularly relevant in the context of automated evaluation systems and AI-supported analyses.

A warning is issued here against unreflective trust in algorithmic suggestions that could distort the teacher's perspective: “Even if I receive suggestions, I have to critically examine them: How influenceable am I?” In this context, however, it also became clear that ethical responsibility is sometimes delegated to institutions or platform operators (“The education portal is from the state, so it will already be data protection compliant”), which can lead to a loss of individual reflection.

Another key area of tension revealed the extent to which personal data can lead to assumptions or stigmatization. Several interviewees urged caution, for example with regard to the overinterpretation of individual information (e.g. ADHD diagnosis, origin, family problems), which could unilaterally shape the image of students. Here, ethical decisions in the school context are situated in the balance between the need for protection and educational benefit. Several statements also highlight that ethical evaluation is heavily dependent on the underlying educational ideal. One interviewee formulated this as a tension between humanistic education and performance-oriented optimization: “If I take a humanistic educational ideal as a basis, datafication reaches its limits earlier”.

The participants' opinions on the question of the credibility and accuracy of data reveal an ambivalent position. While the technical reliability of internal school data is predominantly viewed positively (“I trust the data that we collect ourselves the most and the other data, I have to think critically about that first”), there are considerable doubts about the validity of performance assessments and the comparability of data from different contexts. Several interviewees emphasized the systematic vagueness of performance assessments, especially in the area of grading. The assessment practice appears to be partly arbitrary and context dependent.

This criticism is aimed less at technical errors and more at the limitations and pedagogical shortcomings of conventional forms of assessment. Furthermore, the mistrust is directed partly against the guidelines of higher-level authorities and partly against the statistical validity of large-scale surveys. At the same time, this shows a high level of professional reflection, which indicates



a conscious examination of the handling and interpretation of data. In this context, there is also a warning against blindly trusting or exaggerating data, as it must always be interpreted, classified and contextualized: “Blindly trusting data is not that clever either. Data can also be completely incorrect.”

7. In your opinion, what are the main barriers and challenges of data literacy in compulsory education?

The promotion of data literacy is considered by participants to be hindered by a variety of structural, institutional and individual barriers:

The first central barrier mentioned in almost all interviews is the chronic lack of time in everyday school life, which makes the integration of additional content such as data literacy seem almost impossible: “Well, I don't see that anyone can do it.” A lack of resources, too few training opportunities and little institutional anchoring mean that data literacy hardly goes beyond add-on offers (“It simply doesn't take place in practice. And then there's just rampant growth.”). The lack of a clear time slot in the curriculum, particularly in schools with a strong focus on subject teaching such as grammar schools, also makes implementation more difficult: “Everything we decide to do, we have to assign to a subject. [...] And then comes the question: who is responsible?”. In addition to the lack of time, there are also problems with the distribution of responsibilities. The lack of clarity about which subject or which group of actors is responsible for teaching data literacy leads to a state of diffusion of responsibility (“If everyone does it, no one really does it.”). On an individual level, there are obstacles in the professional attitude of teachers, such as uncertainty, skepticism or the feeling of being overwhelmed: “If you are not affine [...], you develop a defensive attitude.” Or: “I'm going to retire in seven years anyway, I'm not going to do this to myself anymore.” Cultural issues such as the attitude towards data protection, technical equipment or parental beliefs (e.g. regarding smartphone regulations) are also cited as obstacles, not least due to the heterogeneity of the stakeholders involved.

6.4.3 Professional Development (Section C)

8. What type of support and training do you believe that teachers need to effectively implement data-driven educational practices?

The interviewees describe a broad spectrum of requirements and challenges associated with the professionalization of teachers in the context of data-based action. First, the statements refer to a broad spectrum of competence requirements that go beyond purely technical skills. Teachers would need to learn to collect and interpret data and use it in an action-oriented way. This also includes the critical reflection and classification of data. Media competencies and digital competencies must be understood and acquired as an integral part of data-based action. Finally, legal principles need to be acquired: data protection, copyright and the sensitive handling of student data in particular require sound knowledge of data protection law.

In addition to content requirements, many experts also emphasize the importance of a cultural change within the school system: many teachers avoid data-based work for fear of losing control, insecurity or a lack of self-confidence in dealing with digital systems. Based on this, overcoming fears and reservations is becoming increasingly relevant. Here, support from the school leader is cited as crucial in order to establish an innovation-friendly, error-friendly and collaborative attitude. Finally, data literacy is only built up sustainably if teachers recognize a benefit for themselves and their pedagogical work, not just as “another topic”. “You only do work for things you are passionate about. And data protection is not particularly sexy.”

9. Would you prefer training sessions focused specifically on data literacy or integrated within broader pedagogical topics such as digital literacy or problem-based learning? Why?



The question of whether training courses on data literacy should be more targeted and subject-specific or integrative and embedded in broader contexts reveals a largely homogeneous consensus.

A recurring aspect in the responses is the subject-specific orientation as a necessary condition for a high level of acceptance and expected benefits on the part of teachers. Several participants refer to the strongly subject-specific thinking among teachers, particularly at grammar schools, where there is little room for interdisciplinary approaches in terms of school organization and culture: “If it's not subject-specific, then many people think: Aha, that's an additional training offer. What do I need that for?”. The subject-specific framework makes it easier for teachers to recognize concrete connection possibilities for their own lessons, which is seen as the key to sustainable implementation. Subject-specific didactic training courses were also reported to be more popular among teachers.

Regardless of the formal subject classification, the importance of concrete, application-related case studies are emphasized. The relevance of data-related competencies should be made tangible through practical use cases in everyday teaching or school contexts (“If it's too abstract, you take note of it and then it gets lost again in everyday life.”) Such contextualized training should enable teachers to make direct transfers into their practice. In particular, the experience of “this directly benefits me” is cited as crucial for sustainable motivation and implementation.

On a conceptual level, however, the need for a broader approach is also emphasized. Particularly against the backdrop of highly heterogeneous levels of competence in the teaching staff, but also to increase connectivity, several participants are in favor of a modular structure: “I would say: from the general to the specific. First an overview, then targeted in-depth study according to interest.” Such a structure would make it possible to teach basic digital and legal skills before addressing specialized applications. This view is particularly supported by people who place the topic more in a systemic or educational policy context. In this context, overarching perspectives such as media education, children's rights or school development are also mentioned as meaningful ways of embedding data literacy.

Regarding the specific training design, this should take place on a regular basis and be consistent. One-off training courses are not sufficient; structured, repeated and practical embedding is required. A low-threshold approach is also emphasized: training formats must be “idiot-proof”, digitally supported and compatible with working hours. Terms such as “data literacy” often act as a deterrent: “If the whole thing sounds a bit softer without technical terms, it is more popular.” Many interviewees criticize cumbersome and analogue training formats. The desire for digital, flexible and location-independent offerings was evident.

6.4.5 National Policy and Curriculum Integration (Section D)

10. In your opinion, is the educational system able to support and promote data literacy for teachers and students?

Asked to what extent the existing education system facilitates the promotion of data literacy among teachers and students; the mood is ambivalent. The answers fluctuate between structural criticism, limited optimism and pragmatic ideas for further development:

A dominant aspect in the interviews is the overloading of the system and the resulting impossibility of effectively integrating new content such as data literacy. Several participants described how the focus in everyday life cannot be on teaching digital or data-related skills because social and educational requirements are becoming increasingly relevant. The lack of institutional anchoring in the curriculum is also criticized several times (see below). At the same time, some interviewees emphasize the system's openness to innovation in principle - at least in theory. The system is flexible enough to enable data literacy, but this option is rarely actively used



and is dependent on authorities: "The system allows quite a lot of freedom. [...] If the school board wanted to, it could be accommodated." Finally, the metaphor of the "buffet" used by one interviewee paints an interesting picture: A wide range of offers exist, e.g. in the form of working groups, further training or materials, but these often remain unused. The problem lies less in a lack of resources than in access, time and prioritization.

11. What is your opinion on the current national education policy regarding data literacy? Are there any gaps or inconsistencies you have identified that you would like to comment on?

Overall, assessments of national education policy in relation to data literacy are critical to disillusioned.

The most frequent point of criticism concerns Germany's federal education structure: several interviewees complain that each federal state "goes one's own way" with the result that there are neither common standards nor consistent strategies for developing data literacy. This fragmentation leads to duplicate data structures, media disruptions and inefficient use of resources, such as platforms, administrative software or training opportunities. Closely linked to this is the criticism of the digital infrastructure and platform policy. Many interviewees reported parallel systems, a lack of interfaces and confusing access points. Technical implementation lags the political aspirations. Instead, a certain proliferation of digital solutions has emerged, which must be managed inefficiently and often maintained redundantly. Some voices address a fundamental lack of political determination and strategic vision. Digitalization is often treated inconsistently or hesitantly. After the coronavirus pandemic, it became clear that many education policy stakeholders were clinging to outdated ideas: "When the pandemic was over, many wanted to go straight back to the chalkboard." The lack of competence in political decision-making bodies is also problematized several times, for example with regard to the difference between media education and information literacy. A more nuanced perspective is provided by one interviewee who defends the role of the Standing Conference of the Ministers of Education and Cultural Affairs (KMK). In the KMK's policy papers, the goals for digital education and data literacy are already well formulated; the problem clearly lies in the lack of implementation and quality assurance at state and school level: "The guidelines are clear. The problem is: how can we achieve a minimum level of quality assurance?"

Finally, several interviewees emphasized the importance of data literacy for the future, not only for the education system, but also for democratic and economic participation. Today, data-driven decision making is a basic prerequisite for the ability to act, not only in politics, but also in schools and lessons. "In a world that is changing ever faster, education systems need to adapt much more quickly." For this to succeed, data literacy must not be seen as a marginal issue, but as a central educational task and must be structurally ensured.

12. Critically, how do you assess your national school curriculum in terms of integrating data literacy? What would you suggest improving it?

The question of how data literacy is anchored in the national curriculum was predominantly answered critically by the respondents. Key statements concern a lack of transparency, fragmentation, a lack of systematic embedding and a lack of implementation capacity. Nevertheless, there are also constructive suggestions for improvement.

Several interviewees emphasized that data literacy rarely or not at all explicitly appears in existing curricula, especially not in subjects outside of computer science. The curriculum is often outdated or has remained unchanged for decades: "I don't know of any subject where the triad of data - information - knowledge is addressed.". Individual initiatives (e.g. via working groups or projects) do exist but are based on individual commitment not on curricular obligation. Some criticize that data literacy is wrongly reduced to the subject of computer science. This subject is often too technology-centered (e.g. "unscrewing a PC" or algorithms), while data protection,



social or application-related aspects are neglected: “The dominance has shifted. Today data, AI, copyright are more relevant than if/else loops.” It is suggested that the subject be renamed (e.g. “Computer Science and Media Education”) or that data literacy be embedded in several subjects across disciplines. Some interviewees point out that there are theoretically a variety of implementation options, for example through cross-cutting topics, interdisciplinary modules or competence-oriented approaches. However, there is a lack of clear guidelines, commitment and time resources: “It is not resource-friendly if everyone has to think about how to link the topic themselves.” The need to mediate between pilot projects and systemic integration is emphasized combined with the demand for continuous further development instead of selective reform.

At the same time, it is emphasized that the teaching of this competence begins with the teachers. Only those who themselves have sufficient knowledge, awareness and the ability to reflect on how to deal with data can pass this on to pupils in a credible and effective way: “Teachers must live this authentically for it to be received at all.”

6.4.6 Summary

The interviews offer a multifaceted insight into perceptions, challenges and development opportunities regarding the promotion of data literacy in schools. The answers are strongly influenced by the respective perspectives but can nevertheless be brought together.

1. data literacy as a relevant but underestimated future skill: A key finding of the interviews is the perspective of data literacy as an increasingly relevant skill for all those involved in education. Many interviewees emphasized the social relevance of confident and reflective handling of data. The relevance of (initial) sensitization to related aspects was pointed out several times.

2. lack of curricular and structural anchoring: At the same time, there is widespread agreement that the education system in Germany does not currently enable or provide for the systematic and comprehensive promotion of data literacy. The anchoring in curricula is fragmentary or non-existent. In many cases, there are no concrete starting points, while information science as a central core subject is often considered too technology oriented.

3. tension between ideal and reality: The interviews clearly show the tension between pedagogical aspirations and structural reality. Teachers and school leaders are already confronted with a multitude of challenges. Under these conditions, many find it almost impossible to adequately integrate another challenging topic such as data literacy. At the same time, however, some also recognize the freedom that the system offers and are calling for its targeted use through school development.

4. criticism of education policy implementation and federal fragmentation: There is also strong dissatisfaction with education policy management at state and federal level. The federal structure is perceived by the majority as a barrier. Instead, clear standards, centralized interfaces and uniform implementation are called for, not least to make more efficient use of existing resources.

5. (in-service) teacher training as key: (In-service) training formats should be as practical, subject-related and modular as possible. General and purely theoretical training courses meet with little acceptance among the participants. Instead, the focus should be on concrete application examples from subject lessons, ideally embedded in a spiral curriculum structure.

6. Perspectives for implementation: Despite many points of criticism, pragmatic optimism prevails among many interviewees. Data literacy is perceived as compatible with existing competence frameworks (e.g. media education, digital literacy, children's rights) and could be usefully integrated via these tracks.

Conclusion



The promotion of data literacy in the school context is seen by the experts interviewed as urgent but insufficiently anchored in the system. In addition to structural challenges, there are also didactic and political gaps that stand in the way of coherent implementation. At the same time, existing degrees of freedom, commitment and the broad consensus on the importance of the topic open opportunities for sustainable integration. However, this would require an adaptation of the political framework, curricula, resources and teacher training.

6.5 Country Summary

6.5.1 Conceptualization of the term ‘Data Literacy’

Definition of data literacy

Data literacy is a multidimensional skill that enables individuals to systematically collect, critically analyse, and ethically evaluate data, allowing them to make informed decisions (Buschauer & Wadehul, 2020). It encompasses technical skills for data processing as well as reflective judgement and awareness of the social and cultural contexts of data (Schüller, 2019; Macgilchrist et al., 2023). Unlike technology-centric digital literacy or application-centric media literacy, data literacy includes understanding data as socially constructed and interpreted variables, and handling them responsibly (Schüller et al., 2019; Stifterverband, 2021; Pollak et al., 2018). Although the interviewees did not make any direct references to theories and authors, the results of the focus group tie in with these theoretical findings and reflect the same diversity.

Theoretical perspectives on data literacy

Theoretically, data literacy has often been viewed as part of a broader digital competence in the context of digitalisation, encompassing both data and digital literacy. However, it is gaining increasing independence in media education research. In this context, Hase, Kuhl and Greiner (2024) introduce the term 'digital data literacy', describing the ability to use digital learning data from platforms in an analytical, critical and data-protection-conscious manner, enabling individualised, evidence-based teaching. Another related concept is statistical literacy, which encompasses the skills required to understand and interpret statistical information, particularly when interpreting test results (Bez et al., 2021).

Data literacy is an interdisciplinary field of knowledge that plays a central role in data-driven scientific and innovative processes. It is also a fundamental skill that enables individuals to engage critically and reflectively in data-based public discourse and make informed decisions that benefit society (Macgilchrist et al., 2023; Schüller et al., 2019). In both contexts, it is crucial to approach data competently and make informed decisions.

Practical and educational policy implementation

The practical implementation of data literacy in the German school system is mixed. Hase and Kuhl (2024) examine how primary school teachers use digital learning data in the process of data-based decision-making (DBDM). Although access to data is improving, the depth and quality of its use varies considerably.

Additionally, the term 'data literacy' remains ambiguous within the context of educational institutions. Its utilisation within the domain of compulsory education, as well as in the discourse on educational policy, remains inconsistent and sporadic. Despite the growing recognition of the significance of data-related competencies, the term itself remains conceptually ambiguous. It is rarely, if ever, explicitly included in binding curricula or teacher training standards. Conversely, data literacy is more often incorporated in a more indirect manner through broader areas of competence, such as digital, media, or IT skills. However, the precise aspects of data literacy that are encompassed remain unclear.



Overall, the discussion on data literacy in Germany currently focuses primarily on academic institutions, while its integration into school education and teacher training remains fragmented and unsystematic. This key competence has not yet been systematically embedded in curricula, training programs or education policy strategies.

6.5.2 Challenges and Gaps

An analysis of education policy documents at federal and state level reveals clear challenges and structural gaps regarding teaching data literacy at all levels of the German education system. This lack of clarity and lack of structural integration was also strongly emphasized as a gap in the interviews, which not only confirm the results of the document analysis but also highlight their relevance from the perspective of school practice. Furthermore, data literacy has not yet been systematically integrated into teacher training, and it is only mentioned implicitly in official strategy papers, for which a definition is lacking. It is unclear whether data literacy refers to technical skills, statistical understanding, or the reflective use of educational data. Without a definition, there can be no basis for teaching content or further training measures.

In the area of teacher training, this is reflected in the fact that there is no comprehensive integration of data literacy into the training and further education of teachers. While projects such as 'DigCompEdu Bavaria' address digital skills in general, the topic is only touched upon in the context of school development in Brandenburg. Even programs such as the BMBF's Quality Initiative for Teacher Training or the 'Startchancen'-programme only address elements of data literacy at the institutional level. There is a lack of concrete implementation strategies and practice-oriented concepts for the initial, continuing and further training of teachers in the field of data literacy, as well as a lack of clear recognition of data literacy as a separate competence.

Another deficit is the lack of curricular integration. While data literacy appears sporadically in computer science curricula, it is rarely explicitly considered in other subjects. As computer science is not compulsory in many federal states and is often only offered as an optional subject from Year 7 or 9 onwards, not all students are guaranteed to acquire basic data literacy skills. There are also no binding regulations for introducing data-related content in primary schools. This results in fragmented or highly limited data literacy teaching, which depends heavily on the commitment of individual teachers and school leaders as well.

Finally, there is no nationwide, mandatory competence framework that systematically structures the teaching of data literacy in the classroom or in teacher training, nor does it clarify which skills and competences constitute data literacy. While the KMK competence framework defines basic digital skills, it is unclear how these will be implemented in the subject curricula of the federal states. Consequently, the development of data literacy skills among teachers and students within the education system is inconsistent and lacks context.

6.5.2 Best practices and recommendations

Best Practices

The evaluation of the interviews, survey and literature review clearly shows that data literacy is increasingly recognized as an important future skill in education. While it has not yet been comprehensively integrated into curricula or structures, individual initiatives provide concrete starting points for further development.

One example for primary schools is the course Data Literacy for Primary Schools (KI-Campus), which is aimed at (prospective) primary school teachers and shows how basic data-related skills can be taught in primary education. The software's modular structure and use of narrative approaches facilitate integration into training and everyday teaching, even without prior technical knowledge.

In primary education, there are already initiatives to promote data literacy through the course Data Literacy for Primary Schools (KI-Campus), which offers prospective teachers' practical approaches without any prior technical knowledge. Projects such as Digital Sparks enhance students' data and digital skills through interdisciplinary, project-based learning. In contrast, DATAFIED and Unblack the Box assist educational professionals in critically evaluating data-driven control in their everyday school life.

University projects such as Cu2RVE, CODIP and DiAL:OGe demonstrate how data literacy can be systematically promoted in teacher training through adaptive learning opportunities, practical teaching formats and curricular integration.

Recommendations

Several recommendations can be derived from the results for more systematic promotion of data literacy in compulsory education:

- **Centralisation and coordinated management:** Centralisation and coordinated management: The federal structure is often seen as an obstacle to coherent implementation. Implementing uniform standards, central platforms and coordinated governance between the federal government, states and education stakeholders could help to better pool existing resources and improve the efficiency of measures.
- **Curricular integration in all phases of teacher training:** Currently, there is no binding competence framework that systematically addresses data literacy in teacher training and continuing education. Clearly defined content, learning objectives and didactic concepts encompassing both technical and ethical-reflective dimensions are needed.
- **Practical and flexible training formats:** Training programmes are largely accepted and effective if they are relevant to everyday school life. Rather than abstract theory seminars, there is a need for subject-specific, application-oriented formats that can be designed modularly and ideally structured as a spiral curriculum.
- **Interdisciplinary integration of data literacy into competence frameworks and curricula:** Data literacy should be systematically and explicitly incorporated into existing competence frameworks, particularly within media and digital education. This approach promotes connectivity within the education system and enables gradual implementation without the need to establish new structures. Furthermore, cross-curricular integration throughout all curricula is essential to ensure data literacy is accessible to all students, not just those studying computer science.

Conclusion

The relevance of data literacy in the school context is largely undisputed in literature and among the respondents. This is also evident from existing projects that attempt to integrate data literacy into school education. At the same time, there is a lack of responsibilities, binding framework requirements and practical implementation strategies at the national level. Sustainable integration therefore requires political guidance and curricular integration, as well as stronger support at the level of school practice. The projects presented provide important ideas that should be further developed and systematically implemented across the board.

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7. National Report [Greece]

The Greek National Report was authored by Apostolos Kostas, Vasilios Paraschou, Filippou Tzortzoglou, Georgios Kritikos, Stavros Pitsikalis and Ilona-Eleftherija Lasica.

This national report provides an overview of the current landscape of data literacy in compulsory education in Greece, contributing to Deliverable D2.1 of the DATA-READY project. It examines national policies, curriculum structures, educational practices, and stakeholder perspectives to assess how data literacy is conceptualized and implemented in Greek schools.

The findings reveal that, although digital skills and ICT have gained visibility in recent years, data literacy remains largely underdeveloped and undefined in formal education policy. The existing curriculum includes elements of digital competence and computational thinking, but lacks a clear, structured approach to data-related skills such as data analysis, ethical data use, and critical interpretation. This gap is compounded by the absence of a unified national framework or strategy specifically addressing data literacy.

Interviews and desk research indicate that Greek educators generally feel underprepared to teach data literacy. Training opportunities are limited, and available resources are fragmented or not well-integrated into mainstream teaching practice. While there are few coordinated initiatives, some promising examples exist at the local level, often driven by individual schools, teachers, or EU-funded projects. These initiatives demonstrate potential for broader adoption but currently lack systemic support.

The report underscores the need for a national approach that aligns with European efforts to promote data literacy as a core 21st-century skill. It emphasizes the importance of investing in teacher training, developing comprehensive educational resources, and embedding data literacy in curricula and assessments. These insights from the Greek context aim to support the development of a European Framework for Data Literacy in Compulsory Education and contribute to evidence-based policy recommendations.

7.1 Literature review

7.1.1 National curricula

7.1.1.1 Compulsory education description

In Greece the provision of free of charge education for all citizens and at all levels of the public education system is a constitutional principle of the Greek State.

The Greek educational system is centralized while national laws, presidential decrees and acts of the ministries lay out the overall strategy and key objectives.

The central administrative body for the education system across all fields, agencies and levels is the Ministry of Education, Religious Affairs and Sports.

The Ministry of Education, Religious Affairs and Sports is the competent body for making the key decisions related to long-term objectives and also regulating different education related issues, such as curricula content, staff recruitment and funding.

Compulsory education includes Primary Education and Lower Secondary Education levels

Primary education is constituted by pre-school education including kindergarten/nursery schools (Nipiagogeio) and primary schools (Dimotiko scholeio).



Students enroll in kindergarten/nursery schools at the age of 4 years old, and attend for two years, from the age of 4 to the age of 5. Attendance in kindergartens is compulsory.

Primary education is provided in primary schools, which lasts for 6 years. It concerns children in the age range of 6-12 years. The studies program extends to 6 grades, (1st grade to 6th grade). Primary schools are unified types of schools.

Depending on the number of pupils, in remote islands and locations, different levels of students (students of different grades) can operate in the same classroom under one teacher.

For all pre-schools and primary schools there is provision for an optional all-day program with extra-curricular activities. Other types of primary education schools are: Experimental primary schools, Intercultural Education primary schools and Special Education primary schools.

Secondary education includes two cycles of study: Lower secondary education (Gymnasio) and Upper secondary education (Lykeio). Lower secondary education is attended by students aged from 12 to 15 years old while Upper secondary education is attended by students aged from 16 to 18 years old. Attendance to Lower secondary education is compulsory and it concludes the cycle of compulsory education in Greece.

Other types of lower secondary schools are Music, Art and Special education schools, as well as Experimental schools under the supervision of universities.

7.1.1.2 Data literacy in national curricula

The Cross-Thematic Unified Curriculum Framework (ΔΕΠΠΣ) integrates data literacy not as an isolated discipline but as a transversal competence embedded across various subject areas. While the term "data literacy" may not always be used explicitly, the framework contains numerous references to core data-related practices, such as data collection, analysis, analysis, interpretation, processing, presentation, and visualization, which are systematically promoted through general objectives, subject-specific goals, and interdisciplinary projects.

Across the curriculum, students are expected to engage in data handling activities from early education stages. These include observing, measuring, comparing, recording, classifying, and interpreting information derived from empirical inquiry or social phenomena. In many cases, learners are encouraged to organize their findings into tables, graphs, charts, diagrams, or written summaries, and to present conclusions based on observed patterns or collected evidence.

Cross-Disciplinary Embedding of Data Literacy

ΔΕΠΠΣ emphasizes interdisciplinary learning, and this approach is central to how data literacy is treated. Multiple subjects—such as mathematics, environmental studies, social sciences, history, and technology—contain objectives that involve students working with data meaningfully. For example:

- Students are guided to formulate research questions, conduct small-scale investigations (e.g., via interviews or surveys), and collect real-world data relevant to their school or community environment.
- They then process the data using simple statistical methods, such as frequency distributions, averages, and visual summaries.
- They are expected to present their findings using various representational tools (e.g., bar graphs, pictograms, timelines, concept maps), often using digital tools to enhance clarity and communicative effectiveness.

- Finally, they are required to draw conclusions, reflect critically, and in some cases, propose solutions based on the data they have interpreted.

Emphasis on Research and Evidence-Based Thinking

One of the central aims of the ΔΕΠΠΣ is the development of students' research capacities and critical reasoning. This includes fostering skills related to systematic observation, hypothesis testing, and synthesis of information, all of which are closely linked to data literacy. The framework encourages the use of computers and digital environments to support data handling (e.g., data entry, spreadsheet use, chart generation), highlighting the role of technology in information processing and visualization.

Students are also expected to engage in meta-cognitive reflection—to think about how and why data is collected, whether it is reliable, and what it reveals about a phenomenon or problem. This reflective dimension positions data not just as a technical skill, but as a vehicle for inquiry, participation, and deeper understanding across all knowledge domains.

Below we present the findings from the Greek curriculum analysis:

Level	Discipline / Course	Description
Pre-school/ Primary/ Highschool	Active Citizen projects	Active Citizen Projects are cross-curricular, project-based activities designed to foster active citizenship in Greek primary and secondary schools. Although the term “data literacy” is not explicitly mentioned, these projects actively promote core data literacy skills: collecting, analyzing, interpreting, and presenting information from observations, surveys, and digital sources. Students work on community-based topics, gathering data about social and environmental issues (e.g., waste management, water use, health, inclusivity). They use tools like questionnaires, interviews, and digital apps to record and organize data into visual representations (charts, posters, maps) and draw conclusions. These findings are then communicated in class discussions or public forums, often leading to real-world proposals for improvement.
Pre-School		The Greek pre-primary education curriculum emphasizes in activities that develop primitive data literacy skills such as collecting, analyzing, interpreting, and presenting data in engaging and age-appropriate ways. For example, children conduct surveys (e.g., classmates' favorite foods or games) and graph the results to discover the class's preferences. Inquiry projects, such as observing insects or exploring weather changes, involve systematic data collection and visual representations through illustrations, charts, or posters, encouraging them to organize and present their findings.
Primary	Mathematics	In Mathematics (Grades 1–6), the curriculum systematically develops data literacy through a progression of skills. Students begin by formulating questions and collecting categorical or quantitative data from familiar contexts. They organize data using physical tools and gradually move to constructing and interpreting pictograms, bar charts, dot plots, and stem-and-leaf plots. From Grade 3 onward, they explore frequency tables, grouped data, and comparative diagrams. They also calculate and interpret measures of central tendency (mode, median, mean) and variability (range). Activities include surveys, experiments, and real-life scenarios (e.g. weather, preferences, measurements), promoting analysis, visualization, and interpretation. By Grade 6, learners use relative frequencies and pie charts, design questionnaires, and apply statistical tools to real-world decisions (e.g. product orders). The emphasis throughout is on authentic data handling, critical thinking, and drawing conclusions.
Primary	Informatics	In the ICT curriculum for Greek primary education (ΤΠΕ Δημοτικού), data literacy is explicitly addressed starting from Grade 4. While no references to data-related skills appear in Grades 1–3, from Grade 4 onward students are introduced to core



		data practices through targeted objectives. Learners begin by collecting data from digital devices or sensors, and progressively explore how to record, store, and manage data in digital formats—including audio, images, and video. They are also encouraged to reflect on file sizes, draw conclusions from multimedia data, and generalize patterns. From Grade 5, students are introduced to data processing using spreadsheets. They perform basic calculations, use functions, and create visual representations such as graphs to explore and communicate findings. In Grade 6, these skills expand further: students design and distribute electronic questionnaires, collect and organize responses, and use relative frequency tables and visualizations to analyze results. They are taught to apply filters to datasets, interpret graphical representations, and use visualizations (e.g., bar or pie charts) to support reasoning and decision-making. A separate focus area in the curriculum involves data-driven problem-solving. Students are expected to recognize that computational tools can process large volumes of data and use this understanding to propose informed solutions to real-world issues. Although specific activities are often not detailed, the framework highlights the importance of using data for modeling, inference, and informed action. Overall, the ICT curriculum progressively develops students' ability to collect, process, interpret, and present data using digital tools, aligning closely with contemporary data literacy goals.
Primary	History	The History curriculum in Greek primary education integrates data literacy through structured engagement with visual, material, and textual sources. From Grade 3, students are encouraged to collect and interpret data from artifacts, images, maps, and digital content. They analyze archaeological findings, categorize artworks (e.g. Cycladic figurines), and draw conclusions about daily life, beliefs, and social organization in past civilizations. Activities include constructing timelines, mapping ancient settlements or military routes, and comparing cultures through structured observation of visual evidence. In later grades, learners use historical maps and timelines to visualize expansions (e.g. Greek colonization, Roman roads, Byzantine administration), and explore cause-effect relationships using visual tools. They also engage in creative data presentations, such as group projects or collages based on historical research. From Grade 5 onward, students interpret historical data using lists, diagrams, and primary sources (e.g. photographs, songs, newspapers) to explore modern history. Throughout, students practice data collection, classification, and interpretation within historical inquiry. The curriculum promotes the development of critical thinking through the organization and analysis of historical information, fostering early competencies in data literacy while deepening historical understanding.
Primary	Social & Civic education	The Social and Civic Education curriculum in upper primary grades incorporates data literacy through inquiry-based and reflective activities. In Grade 5, students act as "young researchers," using observation and interviews to collect and record data on family life and rights. They analyze family structures, compare household roles, and synthesize findings into visual formats such as posters or charts. They also track their goals and behaviors using self-assessment tools (e.g., rating scales or schedules). In the context of environmental awareness, learners collect data during field visits (e.g., on pollution or biodiversity), discuss findings, and propose solutions, developing data interpretation and decision-making skills. In Grade 6, students deepen these skills by organizing case-based information about different family types, building concept maps, and tracing historical shifts in family structure. They interpret social data within broader historical contexts and analyze how institutions evolve over time. Activities like creating a personal leisure time diary further reinforce categorization, reflection, and the use of data to support personal or social conclusions. Across both grades, students are encouraged to



		observe, record, compare, and reflect, building foundational data literacy through authentic, age-appropriate inquiry into real-life social experiences
Primary	Environmental education	The Environmental Studies curriculum cultivates early data literacy by encouraging students to observe, collect, record, and interpret information from their everyday environment. In Grades 1–2, learners begin with basic data collection and visualization, such as listing family members or documenting local customs through interviews. In Grade 3, they expand these skills by analyzing market behavior and conducting simple physics-based measurements (e.g. tracking ball movement), promoting data-driven thinking. From Grade 4, more structured practices emerge: students collect weather data over time, compare forecasts with actual observations, and explore geomorphological features through map-based analysis. They record daily weather in journals, use online sources (e.g. weather services), and identify discrepancies between predicted and observed conditions. Projects like documenting the water cycle or lunar phases involve systematic observation and presentation of natural phenomena. Activities also include gathering social data (e.g. needs of vulnerable groups) and presenting structured information using tools such as family trees, calendars, or observation logs. Across all levels, the curriculum emphasizes real-world data collection, organization, and interpretation, fostering foundational competencies in observation, measurement, categorization, and conclusion drawing—key pillars of data literacy in a multidisciplinary context.
Primary	Physics	The Physics curriculum in upper primary school promotes data literacy through systematic observation, measurement, and experimental analysis. In Grade 5, students conduct hands-on activities such as building balance scales to measure and compare mass and using volumetric containers to determine liquid volume. They engage in experimental measurements of melting and boiling points, record temperature data, and interpret their findings. Similarly, they explore thermal conductivity by experimenting with various materials and documenting results to classify them as good or poor heat conductors. Students also investigate heat transfer (conduction, convection, radiation), compare mechanisms, and summarize observations into structured conclusions. They practice core data skills—collecting, measuring, recording, analyzing, comparing, and concluding—in each unit. The concept of calibrating a thermometer also implicitly supports measurement literacy, even without a prescribed activity. In Grade 6, students extend these practices to explore force and motion. Through structured experiments, they observe effects of force on movement and deformation, systematically record experimental outcomes, and formulate general principles based on data. This iterative cycle of prediction, observation, measurement, and reasoning supports the development of scientific thinking grounded in data handling. The curriculum clearly fosters early scientific data literacy through practical, evidence-based inquiry.



Secondary	Mathematics	Data literacy is systematically developed within the Greek lower secondary school Mathematics curriculum. In Grade 7, students formulate questions based on continuous data from their environment, analyze data through frequency diagrams (histograms), and use measures of central tendency and variability (range, outliers) to describe datasets. They are encouraged to compare and interpret different graphical representations and understand the significance of data features. Grade 8 expands these skills to include time series analysis and the creation of box plots using five-number summaries (minimum, quartiles, maximum). Students learn to track trends over time and explore how outliers and variability affect conclusions. They also use digital tools for data handling and visualization. By Grade 9, students focus on sampling and inference. They differentiate between populations and samples, apply random sampling techniques, and critically evaluate data from real-world studies (like opinion polls). This includes recognizing variability across samples and discussing the reliability of generalizations.
Secondary	Biology	In the Biology curriculum of Greek lower secondary schools, data literacy is explicitly developed through practical activities and inquiry-based learning. In Grade 7, students compare natural and artificial ecosystems by analyzing real-world data to draw conclusions about ecological balance. Grade 8 focuses heavily on scientific methods, where students collect and process data from observations, experiments, and digital or print resources. They organize and visualize data using diagrams, flowcharts, and graphs. Key skills include analyzing and synthesizing quantitative and qualitative information, drawing conclusions, and using scientific terminology to present findings. Measuring vital signs (like blood pressure and heart rate) before and after exercise also involves data collection and analysis, highlighting links between empirical data and health. In Grade 9, data literacy expands to the computational analysis of biological information in genetics and biotechnology. Students learn about bioinformatics tools for storing and interpreting data from DNA sequencing. Across grades, students develop critical data literacy skills—gathering, analyzing, interpreting, and communicating biological data—equipping them to engage in evidence-based reasoning and scientific inquiry.
Secondary	Geography-Geology	The Geology-Geography curriculum in Greek lower secondary schools explicitly integrates data literacy through authentic activities. Students work with real-world data—such as comparing old and new photographs to analyze landscape changes or gathering images of erosion processes. In Grade 8, they use a variety of tools (maps, diagrams, remote sensing images, data tables) to interpret and represent geographic information. They also organize, analyze, and synthesize data from print and digital sources to create original projects. Map work is central: students collect maps from online sources, categorize them, and explore mapping conventions (e.g., “upside down” maps), fostering critical thinking about data representation. Activities include constructing climate graphs from data tables and creating population movement maps using numeric data. Students also read and interpret population pyramids and seismographs, extracting data to understand trends and phenomena. These practices build foundational data skills—collecting, organizing, interpreting, visualizing, and communicating data—even though the term “data literacy” is not explicitly mentioned. The curriculum empowers students to critically engage with environmental and social data, fostering informed, data-driven understanding of the world.



Secondary	Music	Although not explicitly labeled as data literacy, the Music curriculum in Greek lower secondary school encourages practices that involve collecting, processing, and presenting digital sound data—key components of data literacy. In Grade 7, students experiment with sound through digital audio workstations and open-source applications (e.g., Virtual DJ). They collect and mix audio samples, create loops, and apply effects. This fosters skills in selecting, organizing, and manipulating digital data to produce original musical compositions aligned with their creative goals. In Grade 9, students extend this by evaluating performances—whether their own or those they’ve attended—using criteria like stage presence and emotional impact. Although not strictly statistical, this practice emphasizes structured reflection and critical analysis of music events, integrating qualitative data into judgments. Both grades emphasize using digital tools for music creation, enabling students to explore and present audio data in a way that develops foundational data handling and digital fluency. These activities support the broader goal of understanding and working with digital information in artistic contexts.
Secondary	Technology	The Technology curriculum in Greek lower secondary schools integrates data literacy by engaging students in activities that involve data collection, analysis, and visualization, often linked to computational thinking and digital technologies. In Grade 7, students explore energy flow in natural phenomena (e.g., seismic waves), gather and present historical data electronically, and interpret climate measurements using digital tools. In Grade 8, they learn to process and synthesize data from various sources—print and digital—to create original projects. Activities include designing climate-monitoring systems, using digital platforms to analyze solar panel performance, and working with sensors and robotics. By Grade 9, students deepen data literacy through real-world applications, like collecting and analyzing data on local natural disasters, comparing electric vehicle efficiencies, and managing smart production and logistics systems. They use data to identify patterns, optimize solutions, and present findings in visual and digital formats (e.g., interactive warning systems or automated sorting models).
Secondary	Chemistry	The Chemistry curriculum integrates data literacy through hands-on experiments, measurement, and data processing. Students learn to read and compare experimental data, identify measurement errors, and make corrections. They analyze water types and distribution globally, visually represent them using diagrams, and explore solubility of various substances, comparing outcomes in different solvents. Topics like solution concentration involve calculations based on quantitative data. Students practice dilution techniques, interpreting data from product packaging to determine concentration percentages. In atom-structure topics, they collect and interpret data from simulations and images (e.g., electron microscope visuals), integrating data from different sources. They explore the pH scale, comparing digital pH meter and indicator paper results, and visualize data by mapping color changes in cabbage extract. This approach fosters data literacy through practical measurement, recording, and critical analysis of results, helping students grasp scientific data handling and understand its role in Chemistry’s real-world applications.
Secondary	Informatics	The Informatics curriculum embeds data literacy through a strong focus on algorithmic thinking, problem modeling, and data analysis. Students develop and execute algorithms for real-world problems, represent data using tables, flowcharts, and logical models, and evaluate algorithmic complexity in terms of memory and speed. They collect, store, and visualize data, exploring different types (categorical, numerical) and coding methods. Using spreadsheets and specialized software, they perform data analysis: calculating descriptive statistics, creating graphs, and interpreting distributions. In later years, students model data (e.g., with entity-relationship diagrams), investigate datasets with sensors or simulations, and produce clear data narratives through presentations, infographics, and scientific posters. They critically assess data interpretations and discuss the ethical dimensions of data usage, privacy, and AI-driven decision-making. Overall, the curriculum cultivates data-literate students who confidently gather, process, and draw conclusions from diverse data sources, preparing them for a digital and data-rich world.



Secondary	Physics	The physics curriculum for Greek Gymnasium students includes a comprehensive exploration of natural sciences, emphasizing measurement and experimentation. In the first year, students learn about physical quantities, units, and measurement methods for length, volume, mass, and density. They explore temperature, thermal equilibrium, and how molecular movement relates to heat. In the second year, they study motion, forces, energy transformations, and equilibrium, developing skills through experiments and data analysis. Topics include Hooke's Law, Newton's laws, friction, pressure, buoyancy, and gravity, supported by hands-on activities and simulations. In the third year, focus shifts to electricity, magnetism, waves, light, and nuclear physics. Students investigate electric circuits, Ohm's law, electromagnetic interactions, light reflection and refraction, and radioactivity. The program incorporates cross-disciplinary activities, simulations, and real-world applications to foster critical thinking and scientific literacy, equipping students with foundational knowledge and experimental skills.
Secondary	History	The history curriculum for Greek Gymnasium students covers a broad range of topics from prehistory to modern times. In the first year, students explore human evolution, early civilizations (Egypt, Mesopotamia, Cycladic, Minoan, Mycenaean), Greek city-states, and the Persian Wars, focusing on historical timelines and geography. The second year emphasizes Byzantine history, daily life, and the interactions with Western medieval civilization. The third year covers the Renaissance, religious reforms, American and French Revolutions, the Greek War of Independence, and industrial and political developments. Later modules examine the decline of colonialism, global conflicts such as the World Wars, and the rise of the Third World. Special focus is given to the Asia Minor Campaign, the Cyprus struggle, and the social impact of the Greek Civil War. Activities include constructing timelines, maps, presentations, and comparative analyses to build a comprehensive understanding of historical processes and cultural contexts.
Secondary	Ancient Greek & Literature	The Ancient Greek Language and Literature curriculum in Greek Gymnasium schools focuses on understanding texts and their contexts. In the first two years, students learn to identify the type and characteristics of a text using various sources, place it within its historical and geographical framework, and explore its modern relevance through multimodal representations (e.g., maps, comics, posters). Activities include researching the author and era, creating digital resources, and expressing informed evaluations. In the third year, students focus on Plutarch's biography, refining criteria to identify and analyze such texts. They locate authors and subjects in their historical contexts, draw connections with contemporary issues, and creatively adapt texts into multimedia forms like videos and diagrams. Overall, this approach cultivates analytical, research, and presentation skills, emphasizing the dynamic relationship between ancient texts and modern interpretation.

Table 13 Greek Report [DL in national curricula]

7.1.1.3 Frameworks for data literacy in education

There are not any frameworks for integrating DL into Compulsory Education in Greece.

7.1.1.4 Summary

The review of the Greek national context reveals that data literacy is not yet an established educational priority in compulsory education. Although Greece has made notable progress in promoting digital skills—particularly through its Digital Transformation Strategy 2020–2025—data literacy as a distinct and structured competence is not explicitly addressed in national policies, curricula, or teacher training frameworks.

At the curriculum level, while digital tools and computational thinking are introduced through various subjects, especially in primary and lower secondary education, there is no consistent integration of data-related learning objectives, such as interpreting, managing, analyzing, or ethically using data. Where elements of data literacy do appear, they tend to be embedded

indirectly within ICT or STEM-related courses and are not framed as cross-curricular or critical competences.

Policy documents reviewed as part of this analysis reference the importance of equipping students with digital competences for life and work in the 21st century. However, none of the strategies or frameworks make explicit mention of data literacy or offer guidance for its structured inclusion in the classroom. This policy gap contributes to the fragmentation and limited visibility of data literacy practices across the Greek education system.

Teacher training programs, both initial and in-service, also lack specific emphasis on data literacy. Educators are often left to interpret or adapt general digital skills content to address data-related concepts. Most professional development opportunities focus broadly on digital technologies and do not provide concrete pedagogical strategies or ready-to-use materials for teaching data skills. As a result, teacher preparedness and confidence remain low, even among those who recognize the importance of data literacy.

Despite these challenges, the review identified several isolated but promising practices. Some schools have implemented interdisciplinary projects involving data collection and analysis, often within the framework of EU-funded initiatives or local innovation networks. These examples demonstrate that there is space and willingness within the education system to explore data literacy, but systemic support and policy backing are currently insufficient.

In conclusion, the Greek education system is at an early stage in the integration of data literacy. While general digital skills are increasingly prioritized, data literacy is not yet conceptualized as a standalone educational goal, and its implementation is sporadic and largely dependent on individual efforts. The findings highlight the need for national-level frameworks, teacher support structures, and curricular integration strategies that would allow for a more coherent and equitable development of data literacy in schools. Greece could benefit from aligning with broader European initiatives and frameworks—such as those developed through the DATA-READY project—to move from fragmented practices to a more structured and systemic approach to data literacy in compulsory education.

7.1.2 Policy context

7.1.2.1 National educational policy bodies

Policy body/institution	Brief description	URL
Ministry of Education, Religious Affairs, and Sports	The Ministry of Education, Religious Affairs, and Sports is the government body responsible for shaping and implementing national policies in education, religious affairs, and sports. It oversees all levels of education, promotes equal access to learning, supports religious and cultural heritage, and encourages athletic development and participation across the country.	https://www.minedu.gov.gr
Institute of Educational Policy	The Institute of Educational Policy is an executive, scientific, and research body that supports the Ministry of Education, Religious Affairs and Sports and its supervised entities on matters related to primary and secondary education, teacher training, the transition from secondary to higher education, post-secondary education, the reduction of educational inequalities, student dropout, and early school leaving. Its aim is to ensure every child's right to education.	https://iep.edu.gr/en

Table 14 Greek Report [National educational policy bodies]

7.1.2.2 Educational policies for DL in CE

Policy body/institution	Resource type	URL	Author(s)	Description



Ministry of Education, Religious Affairs, and Sports	Legislation	https://sear.ch.et.gr/fekId=773114	Ministry of Education, Religious Affairs, and Sports	“Active Citizenship Actions” Curriculum for Kindergarten, Elementary, Middle and High Schools The document outlines the national curriculum for the subject Active Citizenship Actions, which applies to all levels of compulsory education in Greece, from kindergarten to high school. The program is built around the 17 United Nations Sustainable Development Goals (SDGs) and aims to cultivate critical thinking, responsibility, participation, and solidarity among students. It promotes an interdisciplinary and experiential approach to teaching that encourages students to take initiative in addressing social, environmental, and civic challenges. The curriculum includes specific learning objectives, thematic modules aligned with each SDG, and examples of age-appropriate activities. This document serves as a foundational guide for teachers to implement projects and educational actions that help form conscious, active, and socially responsible citizens.
Institute of Educational Policy	Document	https://act.digitalschool.gov.gr/wp-content/uploads/2024/12/odigos_ekpedeutikou_2024-12.pdf	Institute of Educational Policy	Teacher’s Guide – Actions to Strengthen Active Citizenship The document’s main objective is to support teachers in implementing activities that promote active citizenship across all levels of education, from preschool to high school. The guide presents the theoretical background and methodology needed to plan and carry out citizenship-related activities. It offers detailed examples of programs tailored to different age groups and covers a wide array of topics including social responsibility, environmental awareness, and democratic participation. Teachers are provided with practical tools and resources to help them integrate these activities into the school curriculum, particularly within the framework of new skill-building workshops and optional school programs. Through these initiatives, the guide promotes experiential learning and encourages student involvement in meaningful, real-world issues. It aims to develop students’ social, emotional, and civic competencies, ultimately helping to shape responsible, engaged, and well-informed citizens.



Institute of Educational Policy	Portal	https://iep.edu.gr/el/p/sifiako-apothetirio/skill-labs	Institute of Educational Policy	Skills Workshops The Skills Workshops are an innovative and dynamic educational initiative that introduces new skill-focused Thematic Units into the mandatory curriculum of Kindergarten, Primary, and Lower Secondary Education, using modern teaching approaches. Their central aim is to combine academic subjects with the development of essential student competencies, helping to shape students into responsible and independent citizens in today's Greek and global context. Structured as Open Curriculum Programs, the Workshops foster the development of soft skills, life skills, conflict resolution, accountability, as well as competencies in digital learning, technology, and science.

Table 15 Greek Report [Educational policies]

None of the above educational policies explicitly mention DL. However, there are significant references related to DL. In the “Active Citizenship Actions” Curriculum for Kindergarten, Primary, Middle, and High School, data collection is strongly emphasized, followed by data analysis, data communication, and, to a lesser extent, data interpretation. In the Teacher’s Guide – Actions to Strengthen Active Citizenship, there are two references: one to data analysis and one to conducting research using scientific data. Finally, in most of the Skills Workshops, references are mainly made to data collection, less frequently to data analysis and communication, and only minimally to data interpretation.

7.1.2.3 Strategic plans for DL in CE

There are not any strategic plans for integrating DL into Compulsory Education in Greece.

7.1.2.4 Summary

The review of Greece’s policy landscape regarding DL in Compulsory Education reveals that, although DL is not yet explicitly defined or prioritized within national education policy, several recent curricular developments have begun to integrate elements that are closely aligned with the skills and competencies required for DL.

At the forefront of this integration is the “Active Citizenship Actions” Curriculum, which has been implemented across all levels of compulsory education (Kindergarten, Primary, Middle, and High School). While the curriculum’s primary aim is to cultivate responsible, critically engaged citizens through the framework of the 17 United Nations Sustainable Development Goals (SDGs), it incidentally introduces students to fundamental aspects of data literacy. This includes data collection, basic data analysis, and communication, particularly in the context of addressing social, environmental, and civic challenges. The curriculum encourages students to engage with real-world issues, collect and interpret evidence, and present their findings, a process that mirrors the core practices of DL, though without explicit reference to it.

Similarly, the Teacher’s Guide “Actions to Strengthen Active Citizenship”, developed by the Institute of Educational Policy, supports educators in delivering the Active Citizenship Curriculum. This guide provides pedagogical strategies and practical resources for implementing project-based, inquiry-driven learning experiences. It includes references to analyzing and conducting research using data, especially scientific data, which supports the development of critical and evaluative thinking among students. These references to data-handling practices,



while limited in number, signal an emerging awareness of the importance of evidence-based reasoning in the educational process.

Another significant initiative is the Skills Workshops. These workshops form a compulsory component of the curriculum in Kindergarten, Primary, and Lower Secondary Education and are designed to develop students' transversal competences. The workshops are structured around thematic units that promote soft skills, life skills, civic engagement, digital literacy, and scientific inquiry. Although the dominant focus within these workshops is on data collection, they also encourage basic data analysis and communication of findings, particularly through group projects and real-world applications. However, data interpretation, a crucial element of full data literacy, is addressed only minimally.

Despite the presence of these positive developments, the absence of a dedicated national strategy or systematic policy framework for DL in compulsory education is a notable gap. There are no strategic plans, benchmarks, or formal teacher training modules aimed specifically at fostering data literacy. As a result, while DL-related skills are implicitly cultivated through broader educational goals, especially in relation to sustainability, citizenship, and digital skills, they are not consistently or equitably embedded across all subjects and grade levels.

The fragmented nature of DL implementation also raises concerns regarding teacher preparedness, resource allocation, and student equity. Teachers may lack clear guidance on how to approach DL in a structured and age-appropriate manner, and schools with fewer resources may struggle to integrate DL practices effectively, particularly those involving digital tools and technologies.

In conclusion, while Data Literacy is not yet a formal objective in Greek educational policy, it is becoming increasingly visible through indirect pathways, particularly within civics education, sustainability education, and skills development frameworks. There is clear potential for expansion and integration. Moving forward, it would be valuable for Greece to consider the development of a national DL strategy that includes clearly articulated learning outcomes, pedagogical guidance, professional development for teachers, and assessment tools. Such a strategy would enable the systematic embedding of DL across the curriculum and ensure that all students develop the capacity to critically engage with data in an increasingly complex, data-driven world. This would not only align with international trends in education but would also equip future generations with essential skills for democratic participation, informed decision-making, and lifelong learning in the digital age.

7.1.3 Scientific Research

Summary	Educational level, discipline
Dermentzi, E., Zotou, M., Tambouris, E., & Tarabanis, K. (2022) The study investigates how Problem-Based Learning (PBL) combined with educational technologies can enhance university students' skills in working with Open Data (OD). Recognizing the growing importance of OD and the lack of structured educational approaches for teaching it, the researchers designed, implemented, and refined an OD course for undergraduate students in Applied Informatics using a Design-Based Research (DBR) methodology. The course engaged students in solving real-life problems using OD, supported by tools like Moodle and Tableau. Data from stakeholder interviews, student focus groups, and instructor reflection informed iterative improvements. The study aims to identify effective strategies for teaching OD, understand student perceptions of PBL, and evaluate the role of technology in this context.	Undergraduate level, final-year students in Applied Informatics (Information Systems, Data Literacy)



Mavroudi, A., & Papadakis, S. (2020) This case study investigates how K-12 teachers in Greece are engaging with Big Data Analytics (BDA) and digital learning environments in their schools. While BDA has gained attention for its potential to enhance evidence-based educational practices, little is known about how teachers practically implement these tools in their day-to-day work. The study involved 30 teachers from both primary and secondary education, examining the types of student data they collect and use, how they use this data, and which educational technology platforms they rely on. Findings show that teachers use BDA primarily for two purposes: supporting the teaching-learning process (e.g., tracking student progress, providing feedback) and managing administrative tasks (e.g., monitoring attendance, issuing grade reports). Widely used platforms include “MySchool” and “Photodentro,” though use of advanced or multimedia data analytics is still limited. The results highlight a need for targeted teacher training in BDA and the development of robust privacy frameworks to support responsible data use in schools.	K-12 (primary and secondary education), Education Technology, Data Analytics
Papamitsiou, Z., Filippakis, M. E., Poulou, M., Sampson, D., Ifenthaler, D., & Giannakos, M. (2021) This study presents the development and validation of an Educational Data Literacy (EDL) Competence Profile framework specifically for Instructional Designers (IDs) and e-Tutors (eTUTs) working in online and blended learning environments. Recognizing that existing competence frameworks largely neglect data literacy skills, the authors propose a new model that addresses this gap. The framework defines EDL as the capacity to ethically and critically collect, manage, analyze, comprehend, interpret, and apply educational data to improve teaching and learning. It synthesizes insights from five existing frameworks and twelve relevant courses, resulting in six core dimensions with 21 specific competence statements. The model was evaluated through a global survey of 210 professionals, confirming both its validity and the pressing need to enhance EDL competence in current educational practice.	Higher education and professional development; Educational technology, Instructional Design, e-Learning
Rizou, O., Klonari, A., & Kavroudakos, D. (2022) This case study investigates the effectiveness of an ICT-based teaching scenario in enhancing the statistical and geospatial literacy of 9th-grade students in a Greek secondary school. Conducted during the COVID-19 pandemic, the study integrated an interdisciplinary approach combining Geography, Statistics, and Information and Communication Technologies (ICT). Using the online platform statistics4school.eu, students worked in small heterogeneous groups through guided inquiry activities over four sessions. They engaged with real population data from Greece, created visualizations, interpreted statistical concepts like mean, density, and variation, and discussed real-world phenomena such as immigration and demographic shifts. The study not only assessed students’ learning outcomes but also examined the scenario’s feasibility within actual classroom conditions and its alignment with students’ cognitive abilities. The intervention aimed to promote not just content knowledge but also critical thinking, collaborative learning, and digital literacy—essential skills for 21st-century learners.	Lower secondary education (Grade 9), Geography, Statistics, and interdisciplinary teaching with ICT integration
Varlamis, I. (2025) This article presents a longitudinal case study of a Master’s-level course in Data Mining and Business Intelligence, designed to enhance students’ data science literacy by immersing them in hands-on work with messy, real-world datasets. Over 15 years, students have engaged in semester-long projects using open-access data (e.g., from Kaggle, Airbnb, World Bank, or government portals) that are often incomplete, noisy, and inconsistent. These assignments mirror industry challenges, requiring students to perform data cleaning, transformation, integration of external sources, and exploratory data analysis. The course emphasizes experiential learning, guided by Kolb’s learning theory, and promotes critical thinking, decision-making, collaboration, and the communication of actionable insights. The course’s design bridges the gap between academic instruction and professional practice by fostering both technical (e.g., preprocessing, modeling, visualization) and soft skills (e.g., teamwork, business reasoning, presentation). Students are assessed on their ability to extract business value and communicate findings effectively. The approach prepares graduates to confidently navigate data ambiguity, adapt to real-world conditions, and contribute meaningfully in data-centric roles.	Master’s level; Data Science, Computer Science, Informatics, Business Intelligence

Table 16 Greek Report [Scientific research]

7.2 Case studies

7.2.1 Description

Case study 1: A Data Driven Decision Making plan based on DigCompOrg areas for improvement in a primary school in Greece	
URL	https://digitum.um.es/digitum/bitstream/10201/134136/1/Athanatou-%20Mar%c3%ada_TD_2023.pdf#page=19.09
Educational level/context	Research in the context of a PhD Dissertation completed in 2023 Research took place in a primary school in Rhodes Island, Greece.
Description	The main purpose of this research is to investigate digital competence of a primary school in Greece related to the DigCompOrg areas and to propose a data driven decision making plan for school improvement based to the extracted data. We have therefore studied the specific case of a center for improvement, but we have also been able to integrate two theoretical models (DigCompOrg and DDDM) into a practical proposal. Based on the above, the following are proposed as general objectives: a) Analyse the degree of development of the digital competence of a school in Greece according to the areas contemplated in the DigCompOrg model considering for the opinion of teachers and students. b) To analyse how the variables of model DigCompOrg affect each other from teacher's questionnaire, to have self-evaluation and school improvement. c) Design a decision-making plan based on a DDDM model and the results obtained by this research.
Methodology	The research has been designed with a quantitative research method to analyse the self-perception about the dimensions of DigCompOrg in teachers and students. These data have been used to design a DDDM plan for the improvement of the primary school. In the case study, the researcher followed the below steps to develop a DDDM plan for the school unit: - setting a vision - choose the appropriate data resource - collect the data - analyse and evaluate the results
Technology	The research tool was based on SELFIE and the DigCompOrg framework. No specific technologies were used.
Outcomes	A model of improvement actions based on DDDM has been proposed. This includes an iteration cycle of 4 phases: 1. creation of a common digital strategic plan based on school improvement - setting a vision 2. integration of the objectives of phase 1 in the defined internal planning of the school regarding the next academic year with the help of the Ministry of Education 3. Implementation of the questionnaire created by will be flexible and tailored to the needs of the school and evaluation of the extracted data with SPSS tool, based on the settled vision. 4. Self-reflection: The school manager as a leader with the cooperation of teachers should set a discussion and externalization of the exported data to students and their parents or the local community to implement a new improvement plan for the next academic year. Adapt learning processes to needs individual students and discussion about the use of technology would be a creative way to externalize the needs of school improvement to the directly interested.
Case study 2: Investigating the Impact and Effectiveness of an ICT-based Teaching Scenario on Secondary School Students' Geospatial and Statistical Literacy: A Case Study from Greece	



URL	https://doi.org/10.48088/ejg.o.riz.13.3.050.069
Educational level/context	Intervention in a high school in Greece, Lesvos Island under the supervision of the Department of Geography, University of the Aegean. Here the emphasis is on Statistics Literacy as the collection, organization, encoding, presentation and interpretation of data in relation to Geospatial Literacy. In Geography as an applied science, during the last years there has been an increasing demand for cartographic backgrounds and the need to provide cartographic material in various other disciplines (courses in all educational levels) in relation to ICT applications. Moreover, this relates to spatial thinking as part of students' geoliteracy in terms of understanding cartography and geovisualizations. The general assumption here is that Geography has evolved from cartography to geovisualization.
Description	The case study investigates students' statistical and geospatial literacy and their reaction to an ICT-based teaching scenario. The study involved 41 High School students in Lesvos Island, Greece. The intervention was applied in the ICT lab, in the context of a second-semester project on Geography. The means we employed to carry out students' activities included worksheets and the web-based platform statistics4school. To check the effectiveness of this intervention, the sample completed assessment sheets and an anonymous self-reporting questionnaire. According to the results, students declared that they became more confident with statistical concepts and geospatial thinking. The same perspective was also reflected in their responses regarding developing cognitive and social skills and literacy in general. The intervention's findings establish the basis according to which implementing new ICT-based teaching scenarios will support statistical, geospatial, and digital literacy.
Methodology	This case study recognizes the importance of student-centric education based on guided inquiry learning methods and cooperative teaching. The research method used is commonly called a "one-shot case study", in which a group is exposed to a treatment followed by a measure. This 'treatment', or intervention in this paradigm, was the teaching method. To conduct this case study for the purpose of evaluating the effectiveness and impact of the intervention across a number of independent parameters, researchers posed the following research questions: 1. How well was the lesson organized inside the classroom? – i.e. group separation, role assignment, adequate technological equipment, teaching method, completion time, interplay between students. 2. To what degree has this teaching method, built around an ICT-based scenario ("Investigating regional population distribution and density in Greece (and the factors that affect them) using an online digital tool"), helped students develop their statistical and geospatial literacy? 3. How well was this scenario and the activities it included structured, with the intent of meeting the learning/cognitive needs of students of this age?
Technology	Worksheets and the web-based platform statistics4school Data was collected from 3 different sources: a) the replies on the students' worksheets, along with the teacher's notes, b) the survey they were asked to complete at the end of the teaching process and c) the independent observer's data sheet.
Outcomes	Students declared that they became more confident with statistical concepts and geospatial thinking. The intervention's findings establish the basis according to which implementing new ICT-based teaching scenarios will support statistical, geospatial and digital literacy. The contribution of the online platform (statistics4school.eu) was deemed catalytic to the success of our intervention. Through the tools it offers the students were able to easily carry out the scenario's activities, aided by the clear instructions given to them in the accompanying sheets, even though the use of GIS –and related software– does not exist as a prerequisite in the Greek Curricula. After the intervention students are able to realize how statistics are part of their daily routine. Students' skill to interpret graphs and charts was honed as they became more competent to read the information contained in each method of representation as well as decide which one was more suitable in each case. Overall, a development of the students' statistical, geospatial and visual literacy was observed.
Case study 3: A case study on how Greek teachers make use of Big Data Analytics in K-12 education	



URL	https://doi.org/10.1007/978-3-030-38778-5_1
Educational level/context	K-12 Greek education, support of 'evidence-based education' with Learning analytics using platforms from the Greek Ministry of Education
Description	Big Data Analytics can help teachers to make better and informed decisions. Several recent articles in the field of technology enhanced learning concern about this potential, yet little is known about how teachers actually make use of Big Data Analytics in their school to support themselves and their students. To compensate for this gap, this paper focuses on the actual uses of Big Data Analytics by active schoolteachers. Thirty teachers who live in Greece participated in survey about their usage of (a) Big Data analytics and (b) online learning environments which capture student data. The data were analysed using mixed methods. Main findings reveal that the schoolteachers are storing and actively using student data as well as Big Data which involve the support of the teaching-learning process. Also, it became clear that teachers use Big Data Analytics for two main distinctively different purposes: to cover teaching-learning aspects and to complete administrative tasks. Finally, it emerged that a small number of teachers is archiving digital multimedia. Consequently, a need arises for appropriate analytics and relevant privacy frameworks. Other practical implications of the findings of this work touch upon the design of teachers' development programs in Big Data and their analytics.
Methodology	A questionnaire was used which was comprised of three main categories of questions: basic participants' demographics, participants' usage of BD analytics (related either to students or to the learning process), and participants' usage of online educational technology environments (which capture some users data).
Technology	"MySchool" is an online platform designed to support the school units mostly on administrative tasks, and has several implications, such as monitoring early school leaving "Photodentro", is the Greek national learning object repository for primary and secondary education. All the learning objects of "Photodentro" are offered as Open Educational Resources. The Greek School Network (GSN) is an online environment which safely connects all schools (including non-Greek educational units), services and entities supervised by the Ministry at central and regional levels. The e-learning service of GSN is based on the Moodle LMS. The Learning Design system is another platform integrated in the GSN, it promotes collaborative learning, and it is based on an open-source Learning Activity Management System (LAMS). The Electronic Classroom service is a platform that can help teachers to create online courses and fully interact with their students. It can also be used for teacher training and collaboration between teachers. And the Advanced Electronic Scenarios Operating Platform (A.E.S.O.P.)
Outcomes	Student data used: Frequency of occurrence, Grades., Personal data, Attendance, Student progress, Awards Student artifacts, Participation, Multimedia. Data was used for better organization of the school life, educational, administrative or functional needs of the school. For example, to monitor absence of students from school to issue grade certificates at the end of the semester or certificates of completion of an educational program. Other reasons mentioned are monitoring and providing feedback in the teaching-learning process, as well as archiving decisions made by the local educational policymakers.
Case study 4: Introducing 3D Visualization of Statistical Data in Education Using the i-Use Platform: Examples from Greece	
URL	http://www.rigeo.org/vol6no3/Number3Winter/
Educational level/context	Secondary education. 3D visualization of statistical data in conjunction with regional spatial data for decision-making. Moreover, visual representation of statistical data can be effectively implemented within the educational process not only as an independent and unaltered discipline but also as a supportive means to many other subjects.
Description	In the 21st century, in the age of information and technology, there is an increasing importance to statistical literacy for everyday life. In addition, education innovation and globalization in the past decade in Europe has resulted in a new perceived complexity of reality that affected the curriculum and statistics education, with a shift from content knowledge to competence. Moreover, the amount of data that can today be accessed on the Internet suggests that students can choose nearly any topic of interest to them for their work on, which can increase their motivation. Furthermore, new location - based technologies actively promote the power of digital



	spatial representation and geo - communication opportunities. So, the aim of this work is to present an application of 3D visualization of statistical data in conjunction with regional spatial data from Greece, using the www services and applications in real time. This has been accomplished by modifying the code of an open source of educational software: the online platform iUse. Nowadays, there has been a clear shift towards Free Software/Open-Source Software (FOSS) from users worldwide. FOSS has begun to play an important and decisive role in Greek education, as well. The examples which are taken from Greece are related to statistical data from various sectors of modern life. The spatial background used is the 13 Administrative regions of Greece. All functions and modifications implemented were made with FOSS
Methodology	Its main goals are to help both teachers and pupils to: - handle the plethora of information flooding them - learn how to use and work with Statistics & collaborate, exchanging views and ideas - be better prepared to use the tools available to them for the analysis and process of statistical data – tools based on new, advanced technologies and cutting-edge services provided by the WWW, and to - use the interdisciplinary approach as a pedagogical practice to combine Statistics with other learning subjects. Various scenarios were implemented with data involved many fields such as Tourism, Building Activity (private and public buildings) e.t.c. from five regions in Greece for the years 2007-2011
Technology	The web-based platform i-Use, fully created with the aid of Free Open Software, combines tools which help the statistical data analysis of and the cross-curricular Statistic approach to other subjects by using statistical data concerning Europe and the World. Data concerning individual countries is represented with the aid of two- and three-dimensional cartographic backgrounds.
Outcomes	Since the application is open-source software, one can modify it to meet one's needs and create a 'final product' which will best fit one's own didactic purposes. As a result, this project offers useful and powerful tools for teachers to teach efficiently and systematically. It can be a valuable aid in teaching concepts of Statistics, insofar as teachers themselves know how to help their students acquire and develop statistical literacy skills. Moreover, teachers and students could use it as a research tool to explore how far it can be helpful to teaching and education in general.
Case study 5: Fostering Statistical Literacy in Greece	
URL	https://doi.org/10.3233%2FSJI-210832
Educational level/context	K-12 Education Hellenic Statistical Authority (ELSTAT), the National Statistical Institute of Greece One of the objectives of Hellenic Statistical Authority's (ELSTAT) strategy in fostering Statistical Literacy is the establishment of a long-standing relationship with the members of the educational community of all levels, as well as with significant institutional stakeholders. What is the content of the strategy "Fostering Statistical Literacy in Greece"? All the above individual actions can be classified into the following groups: 1. Establishing the framework of cooperation with the Ministry of Education 2. Organizing educational visits and presentations addressed to students 3. Establishing the role of ELSTAT as key partner in the educational process 4. Communicating and promoting the strategy "Fostering Statistical Literacy in Greece" 5. Launching competitions 6. Granting educational material
Description	The Hellenic Statistical Authority (ELSTAT), the National Statistical Institute of Greece, as the guarantor of the quality of official statistics in Greece, has been pursuing, since 2016, an ambitious strategy aiming to foster Statistical Literacy, focusing on strengthening ties with citizens in their dual capacity both as providers of data and ultimately as users of statistics, and thus, operate as crucial enablers of a smoothly functioning virtuous circle of official statistics. Objectives include the development of an understanding of basic methodologies and tools used in official statistics, along with the awareness of its institutional foundations and core principles. This critically contributes



	to the value of official statistics being spread and effectively communicated, making, at the same time, a convincing case for fact-based decision making in the daily lives of the main stakeholders. This article motivates the approach followed in developing a specific strategy on statistical literacy, outlines its philosophy and main objectives and browses through the array of initiatives and actions undertaken over the last five years. In addition, it explores the responsiveness of citizens to these initiatives and the extent to which these initiatives lead to an increased engagement of key targeted stakeholders.
Methodology	ELSTAT's strategy aims at strengthening the ties with citizens in their dual capacity first as providers of primary data and ultimately as users of the final statistical product, and thus, operate as crucial enablers of a smoothly functioning, uninterrupted "virtuous circle of official statistics" (VCOS). Through this relationship the principles that rule official statistics are made visible and known, while the importance and relevance of official statistics become clear and justifiable. By educating and informing the young/future users of statistics, ELSTAT manages to build confidence and trust of the public in its ability to properly handle and technically manage individual data with a view to producing meaningful and relevant statistics out of it, while fully adhering to the best practices and core principles governing the production and dissemination of official statistics. A wide range of topics is covered by the strategy "Fostering Statistical Literacy in Greece". Typical areas of focus of actions undertaken in the framework of the strategy "Fostering Statistical Literacy in Greece" include, inter alia, applications of statistics in every-day life and the importance of flagship surveys such as the Population and Housing Census for the life of Greek citizens. Moreover, specialized topics and specifically the scientific tools used in the development, production, dissemination and communication of official statistics and the emerging expansion and streamlining in the day-to-day production of official statistics of alternative data sources, such as big data and data produced by smart devices and sensors, the perspectives they offer and the challenges they entail, are also covered. In parallel, institutional topics and topics related to the United Nations Fundamental Principles of Official Statistics, the European Statistics Code of Practice and the protection of personal data are part of the strategy.
Technology	ELSTAT online platform
Outcomes	• The project "Fostering Statistical Literacy in Greece" is included in the configuration of the concept of the so-called "Thematic Week" of Junior High Schools and of the so called "Flexible Zone" of primary schools. These sessions take place for a given time duration within the school year and are meant to include topics that lie beyond the coverage of the standard school program but still lie within the interests of students. • The elaboration of postgraduate dissertations on official statistics topics is established. These topics would be selected after the cooperation of ELSTAT with the corresponding degree granting Universities. • Webinars for students of primary and secondary educational levels are created. • ELSTAT participates in the program "Filoxenia", funded by the Hellenic Parliament Foundation. This program is granting short-term accommodation in Athens to students of remote secondary schools from all over Greece in order for them to participate in various cultural and educational activities.

Table 17 Greek Report [Case studies]

7.2.2 Summary

This summary synthesizes findings from five distinct case studies on data literacy initiatives in Greek compulsory education, highlighting varied methodologies and impacts on enhancing statistical, geospatial, and digital competencies among students and educators.

The first case study, conducted in a primary school in Rhodes, employed the DigCompOrg framework combined with a Data-Driven Decision Making (DDDM) model. Through comprehensive self-assessment questionnaires administered to teachers and students, the research identified strengths and weaknesses in digital competencies. An iterative improvement plan was developed, emphasizing the importance of collective engagement from teachers, students, and parents. The study underscored how structured discussions informed by accurate data could lead to substantial improvements in digital strategy and education quality.

In the second case study from Lesvos Island, high school students participated in an ICT-based teaching scenario to enhance their statistical and geospatial literacy. Using the web-based statistics4school platform, students demonstrated increased confidence and improved skills in



interpreting statistical and spatial data. This study utilized guided inquiry and cooperative learning, illustrating their effectiveness in promoting cognitive and social skills development, thus advocating for student-centered educational approaches to data literacy.

The third study investigated Greek K-12 educators' usage of Big Data analytics. Results revealed the active employment of analytics for instructional improvement and administrative tasks. However, a notable gap emerged regarding adequate professional training and awareness of privacy implications. Consequently, this study emphasized the necessity of targeted professional development programs designed to enhance analytical skills and privacy-awareness among educators.

In another secondary education initiative, the i-Use platform integrated 3D visualization of statistical data with regional spatial information. Teachers and students engaged in interdisciplinary, collaborative, and practical data handling exercises. This case highlighted significant benefits in educational outcomes through the adoption of open-source technologies and interactive methodologies, enhancing both student motivation and practical statistical literacy skills.

Finally, the Hellenic Statistical Authority (ELSTAT) has strategically fostered statistical literacy through sustained engagement with educational communities via institutional cooperation, structured educational visits, interactive competitions, and specialized webinars. ELSTAT's approach significantly improved public trust and understanding of official statistics, effectively demonstrating the practical importance of statistical literacy in everyday decision-making processes and emphasizing data privacy and ethics.

In-depth conclusions from these case studies collectively indicate that successful data literacy initiatives share key characteristics: *structured frameworks, technological integration, interactive methodologies, comprehensive teacher training, and community-wide involvement.*

There is clear evidence that enhancing data literacy through student-centered, inquiry-driven learning environments significantly contributes to improved cognitive, analytical, and social competencies. Moreover, ongoing professional development and the integration of privacy and ethical considerations into educational practices are essential for sustaining and advancing data literacy within Greek education.

7.3 Survey

Έρευνα για τον Εγγραμματισμό στα Δεδομένα στη Σχολική Εκπαίδευση

Η παρούσα έρευνα υλοποιείται στο πλαίσιο του έργου **"Ενδυνάμωση της Εκπαίδευσης μέσω της Ενσωμάτωσης του Εγγραμματισμού στα Δεδομένα στην Υποχρεωτική Εκπαίδευση (DATA READY)"** το οποίο διενεργείται στο πλαίσιο του προγράμματος Erasmus+ European Policy Experimentation (ERASMUS-EDU-2024-POL-EXP) για την ανάπτυξη, εφαρμογή και έλεγχο μίας νέας προσέγγισης για τη βελτίωση του Εγγραμματισμού στα Δεδομένα (Data Literacy) στη Σχολική Εκπαίδευση στην Ελλάδα, την Πορτογαλία, την Κύπρο, τη Γερμανία και την Πολωνία.

Σκοπός της έρευνας είναι να συγκεντρώσει τις απόψεις, τις πρακτικές και τις προθέσεις εκπαιδευτικών, διευθυντών σχολικών μονάδων και εμπλεκόμενων στη λήψη αποφάσεων αναφορικά με τη χρήση και την ενσωμάτωση του Εγγραμματισμού στα Δεδομένα στην Ελλάδα. Ο εκτιμώμενος χρόνος για τη συμπλήρωση του ερωτηματολογίου είναι περίπου 10' και θα θέλαμε να σας ευχαριστήσουμε εκ των προτέρων για τον χρόνο σας!

Για οποιαδήποτε απορία, μπορείτε να επικοινωνήσετε με την Ομάδα Έργου στο: dataready@aegean.gr.

GDPR: Όλα τα δεδομένα που θα συλλεχθούν στο πλαίσιο της παρούσας έρευνας θα χρησιμοποιηθούν αποκλειστικά για τους σκοπούς της έρευνας. Η κάθε είδους επεξεργασία των απαντήσεων θα διεξαχθεί με κατάλληλο τρόπο και η συμμετοχή στην έρευνα είναι ανώνυμη. Οι απαντήσεις θα αποθηκευτούν με ασφαλή τρόπο, ενώ και πρόσβαση σε αυτές δεν θα έχει κανένα τρίτο μέρος εκτός από την ερευνητική ομάδα του έργου. Η ομάδα έργου συμμορφώνεται με τα προβλεπόμενα στον Κανονισμό GDPR και την προστασία και την επεξεργασία των προσωπικών δεδομένων.

Αποποίηση ευθύνης: Με τη χρηματοδότηση της Ευρωπαϊκής Ένωσης. Οι απόψεις και οι γνώμες που διατυπώνονται εκφράζουν αποκλειστικά τις απόψεις των συντακτών και δεν αντιπροσωπεύουν κατ'ανάγκη τις απόψεις της Ευρωπαϊκής Ένωσης ή του Ευρωπαϊκού Εκτελεστικού Οργανισμού Εκπαίδευσης και Πολιτισμού (EACEA). Η Ευρωπαϊκή Ένωση και ο EACEA δεν μπορούν να θεωρηθούν υπεύθυνοι για τις εκφραζόμενες απόψεις.

* Indicates required question

Κάνοντας κλικ στο κουμπί "Συμφωνώ", δηλώνετε ότι έχετε διαβάσει όλες τις παραπάνω πληροφορίες και την πολιτική απορρήτου, συμφωνείτε να συμμετάσχετε εθελοντικά και είστε τουλάχιστον 18 ετών. Εάν δεν επιθυμείτε να συμμετάσχετε σε αυτήν την έρευνα, παρακαλούμε κάντε κλικ στο κουμπί "Δεν συμφωνώ".

☐ Συμφωνώ
 ☐ Δεν συμφωνώ

Next
Clear form

Figure 105 Greek Survey [Screenshot]

The national survey in Greece was accessible through this link: <https://forms.gle/Py5wQKD1cJhujkiq8>.

7.3.1 Demographic Data (Section A)

Most of the respondents identify as female ($n = 190$), followed by male participants ($n = 61$). Additionally, 1 respondent identified as non-binary, while 2 chose not to disclose their gender. This gender distribution reveals a significant overrepresentation of women in the sample, which may reflect the demographics of the target population, particularly if the sample draws from education or health-related professions.

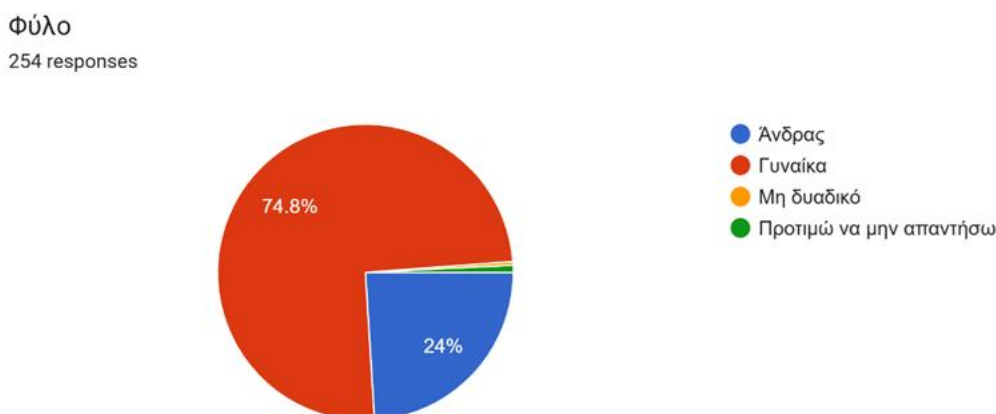


Figure 106 Greek Survey [Gender]

Participants are predominantly aged 46–55 years ($n = 103$), with additional substantial representation in the 56–60 ($n = 51$) and 41–45 ($n = 24$) age brackets. Conversely, younger age groups such as 22–29 ($n = 15$) and 30–35 ($n = 24$) are underrepresented. This suggests that the sample mainly includes experienced professionals with many years of service, while early-career professionals or younger individuals are less represented.

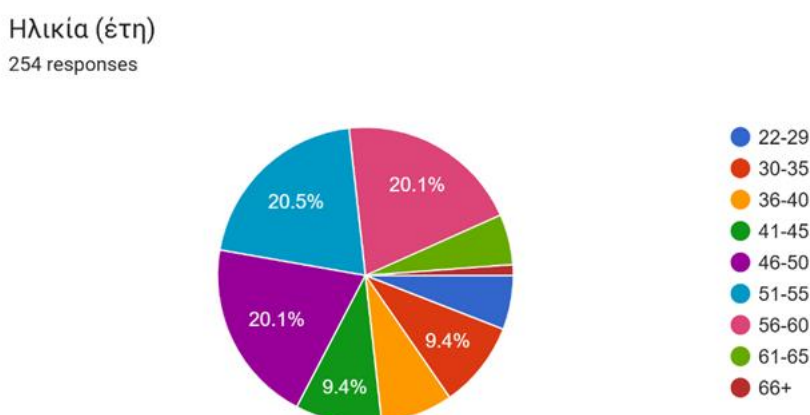


Figure 107 Greek Survey [Age]

Regarding formal educational qualifications, most respondents possess postdoctoral ($n = 101$) and doctoral degrees ($n = 89$). A considerably smaller proportion hold a Master's degree ($n = 6$) or

Bachelor's degree (n = 1). This indicates that the sample comprises a highly educated population, likely consisting of academics, researchers, or other professionals with advanced expertise.

Ποιο είναι το υψηλότερο επίπεδο τίτλου σπουδών που κατέχετε;
254 responses

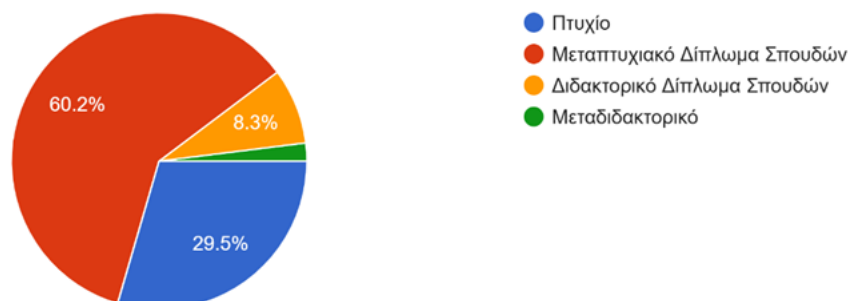


Figure 108 Greek Survey [Educational level]

Most participants report higher levels of digital proficiency: Level 3: n = 89, Level 4: n = 101, Level 5: n = 57. Lower proficiency levels are less common, with Level 1 and Level 2 accounting for 57 and 6 participants, respectively. These findings reflect a digitally literate population, with over 80% of participants demonstrating moderate to advanced levels of information technology skills.

Επίπεδο δεξιοτήτων Πληροφορικής
254 responses

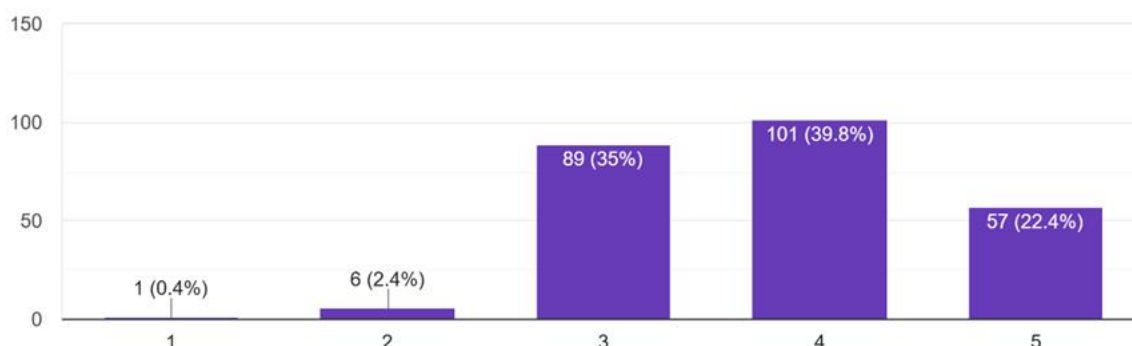


Figure 109 Greek Survey [ICT skills]

When asked whether they had received any training related to data use or data literacy:

- 106 respondents reported no training.
- 63 respondents reported informal learning, either through self-study or peer collaboration.
- 39 respondents received training through formal university programmes.
- 22 respondents were trained via Lifelong Learning Centres, and
- 24 respondents participated in in-service training provided by schools.

Despite the high level of education and digital skills, a significant portion of the sample lacks formal training in data literacy. Informal learning appears to be the primary route for many, highlighting a gap in structured, institutional approaches to developing these competences.

Έχετε λάβει εκπαίδευση σχετικά με τη χρήση δεδομένων ή τον Εγγραμματισμό στα Δεδομένα;
254 responses

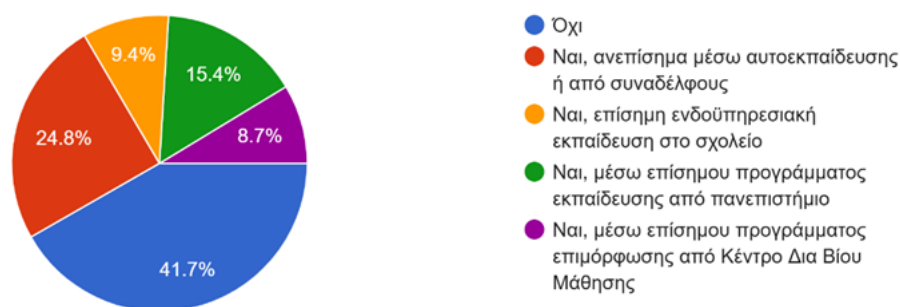


Figure 110 Greek Survey [Have you received training related to data use or Data Literacy?]

The next question had to do with the participants' current role in education, which transferred them to specific questions related to this role. The responses were distributed as follows:

- Teachers: 204 respondents
- School Principals: 36 respondents
- Representatives of Educational Authorities: 14 respondents

The data indicates that the majority of participants (approximately 80%) are active teachers, reflecting the survey's strong relevance to instructional practice. School leaders represent a smaller but notable segment (14%), while a minority of participants (6%) serve in roles related to educational governance or policymaking.

Επιλέξτε τον τρέχοντα ρόλο σας στην εκπαίδευση
254 responses

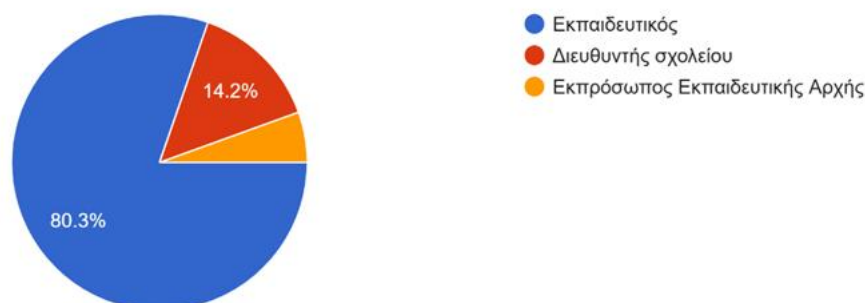


Figure 111 Greek Survey [Select your current role in education]

The following tables and figures represent details related to each role's demographics.

Section A: Demographic Data [Teacher]

Participants with the role of “teacher” (204 in total) were asked to indicate their primary teaching subject or area of expertise. Due to the open-ended nature of the responses, some entries were complex or hybrid (e.g., “Technology & Skills Lab”, “Parallel Support”). Generally, Primary Education Teachers (classified under “ΠΕ70”) make up the largest single group, representing approximately one-third of all responses. Philologists (ΠΕ02), encompassing Greek language, literature, history, and classical studies, also comprise a substantial proportion of the sample, suggesting high participation from secondary-level humanities educators. STEM disciplines (Informatics, Mathematics, Physics, Chemistry, Biology) are moderately represented, with Informatics teachers (ΠΕ86) showing particularly strong engagement, likely due to the topic's relevance to digital competences and data literacy. Teachers of foreign languages, such as English, German, and French, appear frequently, highlighting the cross-curricular nature of data skills and the integration of digital tools in language learning environments. While Special Education and Early Childhood Education are not the dominant categories, their presence in the sample is important, as they represent groups for whom differentiated digital pedagogies are especially impactful. A smaller subset includes music educators, theology teachers, and social science professionals, demonstrating interdisciplinary interest in the topic.

Most teachers (n = 98, or 48%) reported more than 20 years of teaching experience, suggesting a sample composed primarily of seasoned educators. Only 24% (n = 48) reported less than 7 years of experience. This indicates a highly experienced group, potentially reflecting greater confidence or willingness to engage in professional development and educational innovation.

Έτη διδακτικής προϋπηρεσίας
204 responses

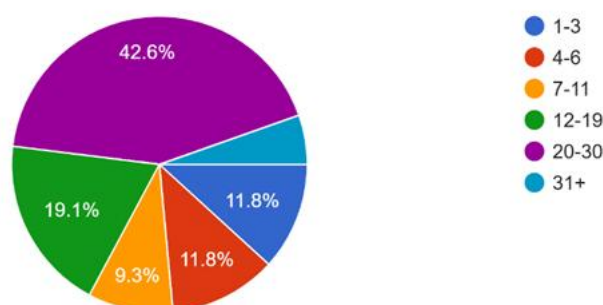


Figure 112 Greek Survey [Teachers: Teaching Experience (years)]

The sample is evenly split between primary and lower secondary education, with the majority working in lower secondary schools (50%). A smaller group (6%) represents early childhood education. This diverse distribution allows for comparisons across school levels, particularly in how digital and data-related competencies are addressed.



Τύπος Σχολείου

204 responses

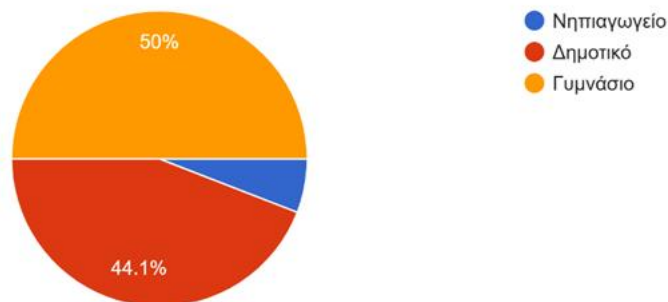


Figure 113 Greek Survey [Teachers: School type]

Most participants are based in urban or semi-urban areas, where access to infrastructure, technology, and training opportunities may be more prevalent. However, the presence of a substantial rural contingent provides insight into regional disparities and potential barriers faced by educators in more remote settings.

Περιοχή Σχολείου

204 responses

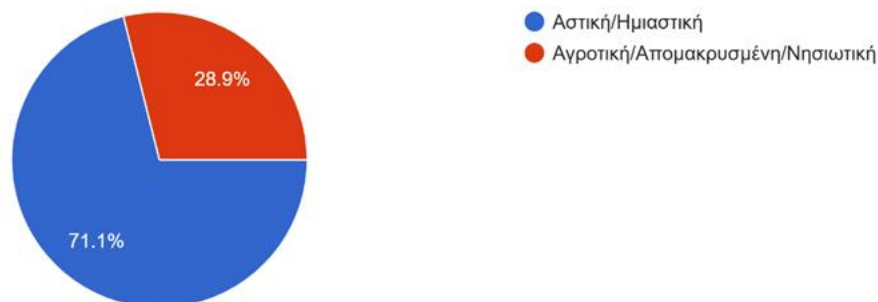


Figure 114 Greek Survey [Teachers: School region]

Nearly 39% of teachers ($n = 79$) work in very large schools, while another 26% ($n = 53$) are based in medium-sized institutions. A minority of participants ($n = 32$, or 16%) teach in small or very small schools, which may indicate limited staffing or multi-grade teaching environments. This size variation is significant, as it may influence digital infrastructure availability, staff collaboration potential, and the implementation of data-driven practices.



Μέγεθος Σχολείου

204 responses

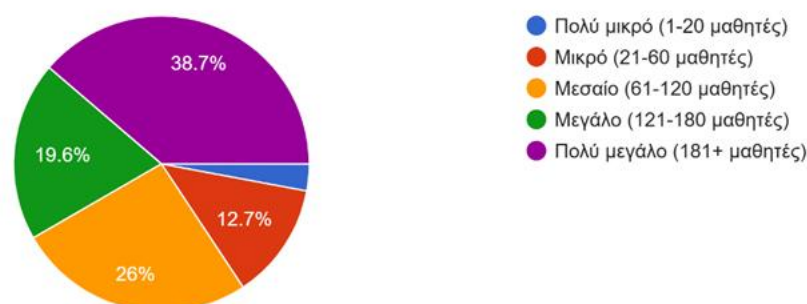


Figure 115 Greek Survey [Teachers: School size]

Finally, participants were asked to indicate the total number of teachers currently employed at their school. The responses ranged from 1 to 215 teachers, reflecting a wide variance in school size across the sample. A large portion of schools fall within the 15–35 teacher range, suggesting that medium-sized schools dominate the dataset. A smaller subset of responses (e.g., 1–5 teachers) likely corresponds to very small or rural schools, including possibly one-teacher schools or specialized units. At the opposite extreme, a few entries report very large schools with 100+ teachers, indicative of urban or centralized educational institutions, or possibly multi-campus settings. These findings highlight the diversity of educational settings represented in the sample, ranging from small rural schools to large urban institutions. Such variability in school size may influence both the organizational culture and the availability of resources, including opportunities for professional development, peer collaboration, and digital infrastructure for data-related practices.

Section A: Demographic Data [Administrator]

Most administrators (n = 17, or 47%) report more than 20 years of teaching experience, consistent with their current leadership roles. A smaller proportion (n = 8, or 22%) are relatively early in their careers (1–6 years), which may include newly appointed administrators or those transitioning into leadership from teaching roles.

Έτη εμπειρίας στην εκπαιδευτική ηγεσία

36 responses

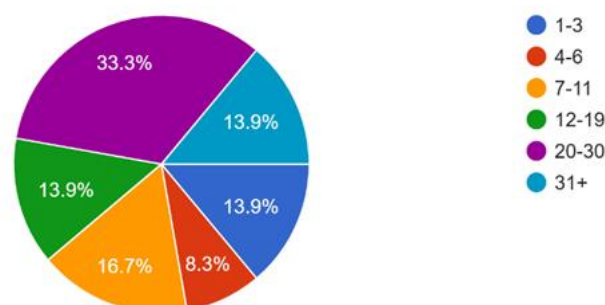


Figure 116 Greek Survey [Teachers: Teaching Experience (years)]

The largest group of administrators is found in lower secondary schools ($n = 16$), followed by those in primary schools ($n = 14$). A smaller group ($n = 6$) lead pre-school. This distribution suggests a broad representation across all stages of compulsory education.

Τύπος Σχολείου

36 responses

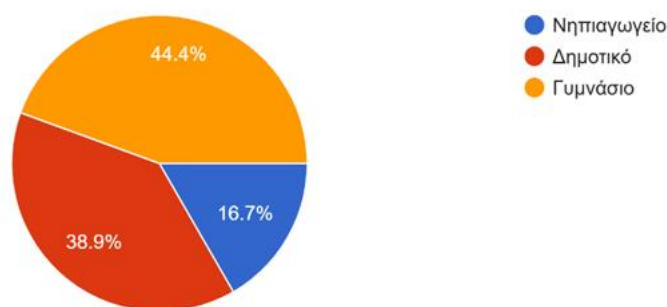


Figure 117 Greek Survey [Administrator: School type]

A substantial majority (81%) serve in urban or semi-urban settings, indicating that administrative roles may be more prevalent or centralized in larger municipalities. Nevertheless, the inclusion of administrators from rural and island schools (19%) ensures a level of geographic diversity.

Περιοχή Σχολείου

36 responses

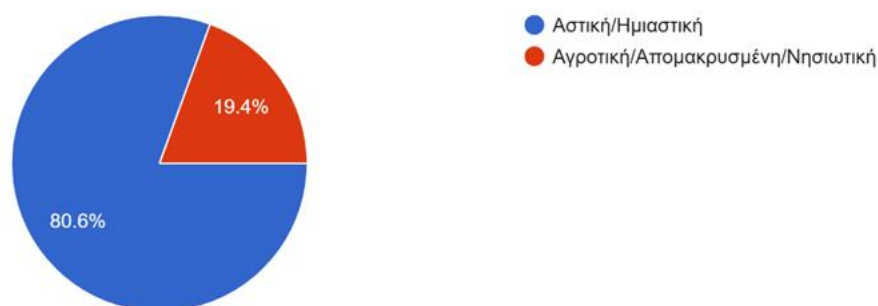


Figure 118 Greek Survey [Administrator: School region]

Over 50% of administrators ($n = 18$) are responsible for medium to very large schools, which often require more complex administrative coordination. A smaller number ($n = 8$) oversee small or very small schools, which may reflect multi-role responsibilities, particularly in rural areas.

Μέγεθος σχολείου

36 responses

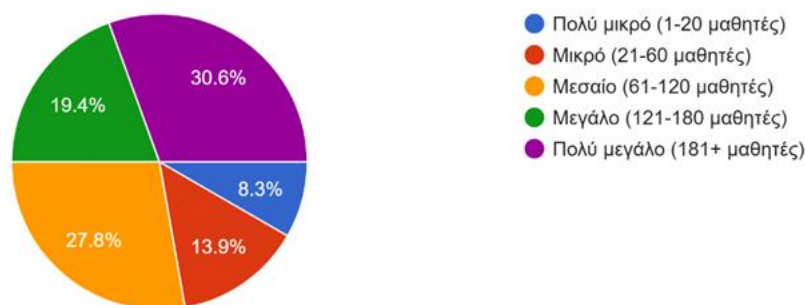


Figure 119 Greek Survey [Administrator: School size]

Finally, administrators were asked to indicate the number of teachers employed at their school. The responses reveal substantial variability in school staffing levels, ranging from 2 to 120 teachers. Small schools (fewer than 10 teachers): A small subset (e.g., schools with 2, 3, 6, 7 teachers) indicates the presence of very small institutions, possibly rural, remote, or specialized settings. Medium-sized schools (10–35 teachers): This category constitutes most responses, reflecting the typical staffing size of primary and secondary institutions. Large schools (40+ teachers): A few schools fall into the upper range, with the largest reporting 120 teachers, indicating urban school complexes or multi-unit institutions.

The data reveal a positively skewed distribution, with most schools employing between 15 and 35 teachers, but with a few high outliers significantly raising the mean. The most common school size (mode) is 25 teachers, aligning with national norms for medium-sized schools in urban and semi-urban areas.

Section A: Demographic Data [Educational Authority Representative]

The data show that most representatives (n = 17 total responses, suggesting overlap or multiple selections) have substantial teaching experience, with 12 participants (71%) reporting over 20 years in the field. This reflects a group of professionals whose authority roles are grounded in long-term practical engagement with education, suggesting credibility and lived expertise in policy-making or supervisory responsibilities.

Έτη εμπειρίας στην εκπαιδευτική ηγεσία

14 responses

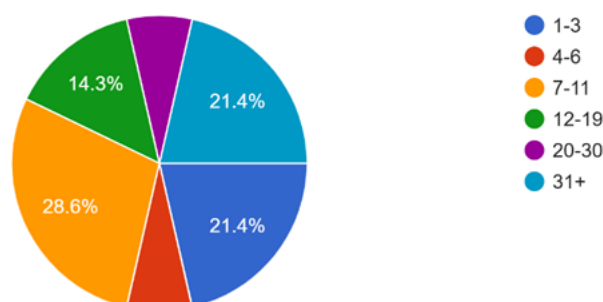


Figure 120 Greek Survey [Authority: Experience (years)]

The majority (71%) are employed at the local level of educational governance, such as school boards, municipal education departments, or local directorates. A smaller subset (29%) works at the regional level, potentially including regional education authorities or supervisory bodies. Notably, no participants identified as working at the national level, which limits direct insight into central policy perspectives within the sample.

Επίπεδο Αρχής
14 responses

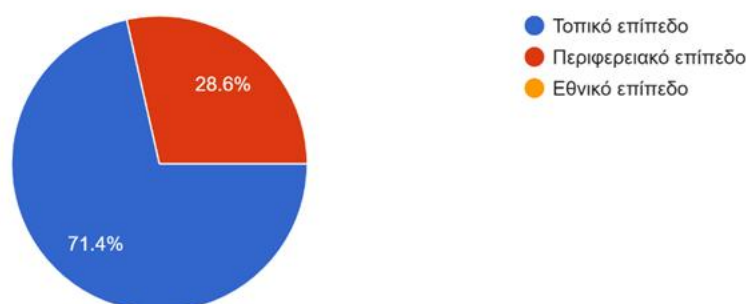


Figure 121 Greek Survey [Authority: Level]

Finally, participants serving in educational authorities reported a range of roles, reflecting both administrative and pedagogical functions. The most frequently reported role was Educational Advisor, including both general education and subject-specific advisory roles (e.g., mathematics). This title appears in various forms across at least 9 of the 14 entries, making it the predominant profile within the sample.

Other positions such as Director of Education, Deputy Director, and Coordinator appeared only once each. Two participants reported roles related to the coordination of school activities or extra-curricular programs, suggesting a pedagogical support focus.

7.3.2 Understanding and Awareness of Data Literacy (Section B)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Διαφωνώ πλήρως), 2 = Disagree (Διαφωνώ), 3 = Neither Agree Nor Disagree (Ούτε Συμφωνώ Ούτε Διαφωνώ), 4 = Agree (Συμφωνώ), 5 = Strongly Agree (Συμφωνώ πλήρως).

The first statement was: “I understand the following concepts:”

Seven specific literacies were assessed: Data Literacy, Digital Literacy, AI Literacy (Artificial Intelligence Literacy), Information Literacy, Statistical Literacy, Learning Analytics, Scientific Literacy.

1.Κατανοώ τις ακόλουθες έννοιες:

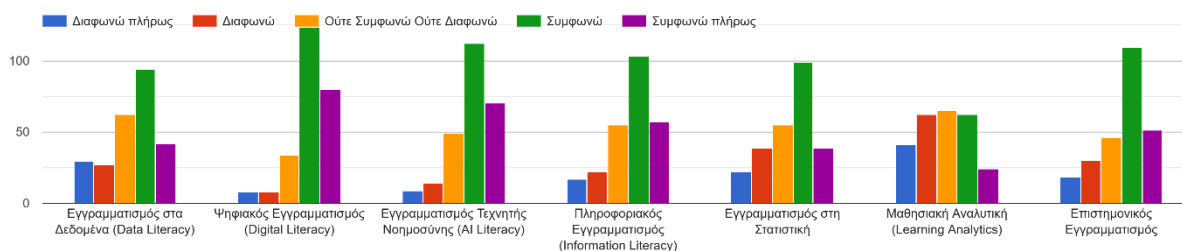


Figure 122 Greek Survey [Understanding of concepts]

A qualitative review of the responses reveals the following trends:

- Digital Literacy and AI Literacy show consistently high levels of agreement. Most participants selected either Agree or Strongly Agree, indicating a general sense of familiarity and confidence with these concepts.
- Data Literacy also received predominantly Agree and Strongly Agree responses, suggesting it is widely understood or at least recognized among participants.
- For Scientific Literacy, Learning Analytics, and Statistical Literacy, there is a noticeable spread across the full Likert range. A considerable number of participants selected Neither Agree Nor Disagree or even Disagree, indicating mixed levels of understanding or uncertainty.
- Information Literacy had the highest concentration of lower agreement levels, including several Disagree and Strongly Disagree responses, suggesting that this concept is less clearly understood or perhaps interpreted inconsistently across respondents.

The following statement was: “Data Literacy is connected to the following concepts:”

Six specific literacies were assessed: Digital Literacy, AI Literacy (Artificial Intelligence Literacy), Information Literacy, Statistical Literacy, Learning Analytics, Scientific Literacy.

2.Ο Εγγραμματοσμός στα Δεδομένα συνδέεται με τις ακόλουθες έννοιες:

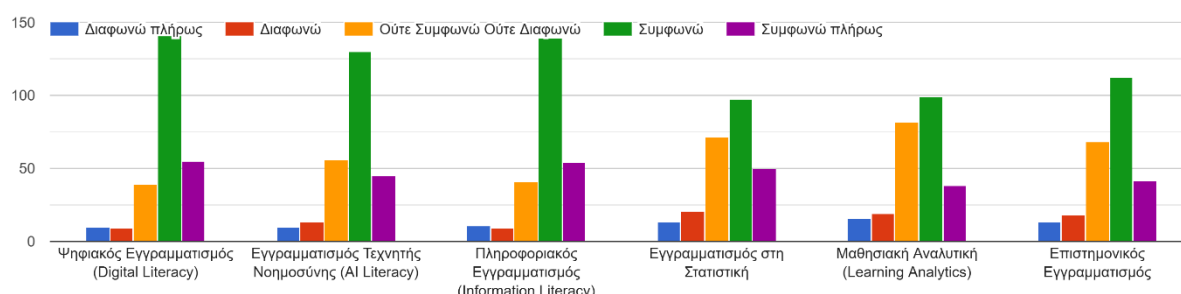


Figure 123 Greek Survey [Connection of concepts]



The responses show an overwhelmingly positive agreement that Data Literacy is strongly linked to Digital Literacy. More than 85% of participants selected “Agree” or “Strongly Agree,” indicating a broad consensus that foundational digital skills are essential for understanding and working with data. This reflects the recognition of digital environments as the primary context where data is accessed, managed, and interpreted. AI Literacy is also widely accepted as a relevant domain within Data Literacy.

While a strong majority agreed, there was a slightly higher proportion of neutral responses compared to Digital Literacy. This may suggest that while the connection is acknowledged, not all participants feel fully confident in their understanding of AI or its specific relationship to data skills—highlighting an area where awareness or professional development could be enhanced.

A similarly high level of agreement was recorded for Information Literacy. Over 80% of responses were positive, indicating that participants see clear parallels between the ability to critically evaluate information sources and the ability to understand and interpret data. This alignment reinforces the idea that data is a form of information that requires similar evaluative and ethical reasoning.

Although Statistical Literacy also received majority agreement, this concept presented a higher number of neutral and negative responses compared to the others. This suggests that some participants may see statistics as a more specialized or technical field, and not necessarily a foundational requirement for all individuals engaging with data. This could point to a perception gap between statistical methods and broader data understanding.

Opinions on Learning Analytics were more varied. While a majority still expressed agreement, there was a notable proportion of neutral and disagree responses. This dispersion may reflect lower familiarity with the concept of Learning Analytics among participants, or uncertainty about its direct relevance to general Data Literacy. This implies a potential need for better integration or explanation of how learning-related data practices fit within broader data literacy frameworks. Scientific Literacy received high levels of agreement, with many participants selecting “Agree” or “Strongly Agree.” This indicates that the principles of scientific inquiry—such as evidence-based reasoning, hypothesis testing, and data interpretation—are viewed as highly relevant to the development of data literacy skills. It suggests that participants recognize the value of applying scientific thinking when working with data in various educational and professional contexts.

The statement “I understand the potential uses and applications of data to support learning, assessment, research, and decision-making in education.” followed.

3.Κατανοώ τις πιθανές χρήσεις και εφαρμογές των δεδομένων για την υποστήριξη της μάθησης, της αξιολόγησης, της έρευνας και της λήψης αποφάσεων στην εκπαίδευση

254 responses

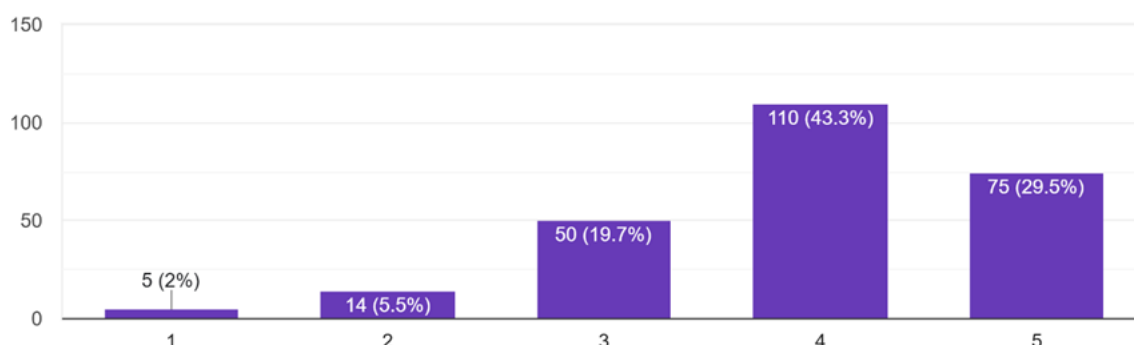


Figure 124 Greek Survey [I understand the potential uses and applications of data to support learning, assessment, research, and decision-making in education]

The data reveals a predominantly positive perception among respondents regarding their understanding of data applications in the educational context. Specifically, 73% of participants selected either "Agree" (43.3%) or "Strongly Agree" (29.5%), indicating a high level of self-reported awareness and confidence in the potential of data to inform and enhance practices related to learning, assessment, research, and decision-making.

A noteworthy proportion of participants (19.7%) selected "Neither Agree nor Disagree", suggesting a segment of the sample that remains ambivalent or uncertain. This may be attributed to a lack of exposure to practical applications of educational data, limited institutional support, or varying levels of digital/data literacy. As such, this group may benefit from targeted professional development to strengthen their conceptual and practical engagement with data use in education. Conversely, a relatively small percentage of respondents expressed disagreement with the statement (Disagree: 5.5%; Strongly Disagree: 2.0%). While this minority view may reflect differing pedagogical orientations or contextual barriers to implementation (e.g., lack of access to relevant tools, resources, or training), its limited size suggests that explicit resistance to the use of data in educational processes is not widespread within the sample.

The statement "I recognize Data Literacy as an essential element teachers' modern role." followed.



4. Αντιλαμβάνομαι τον Εγγραμματισμό στα Δεδομένα ως ένα ουσιαστικό στοιχείο του σύγχρονου ρόλου των εκπαιδευτικών

254 responses

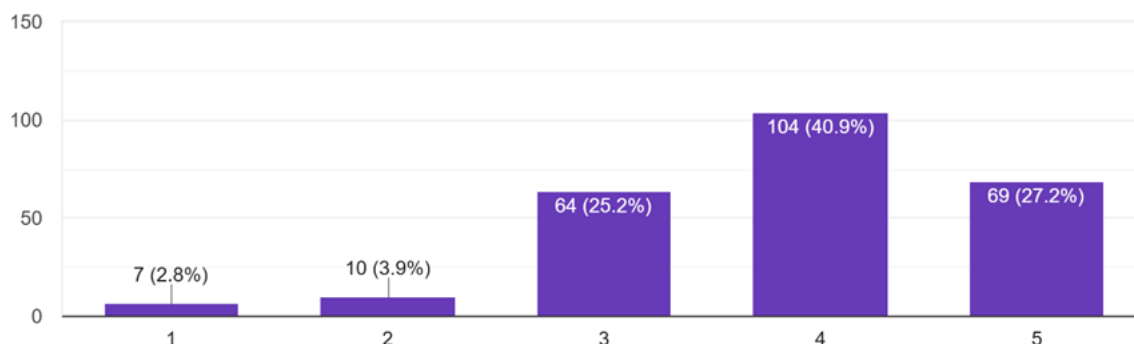


Figure 125 Greek Survey [I recognize Data Literacy as an essential element teachers' modern role]

The responses reflect a strong positive orientation toward the integration of Data Literacy into the contemporary role of educators. A total of 173 participants (68.1%) expressed agreement with the statement (“Agree” or “Strongly Agree”), underscoring a widespread recognition of the relevance of data competencies in the professional responsibilities of teachers. However, it is noteworthy that 64 participants (25.2%) chose “Neither Agree nor Disagree”.

This neutral stance, representing over a quarter of the sample, may indicate limited familiarity with the concept of Data Literacy or uncertainty regarding its practical implications for everyday teaching practice. Such neutrality suggests an opportunity for further professional development or clearer institutional guidance regarding the application of data-informed pedagogical strategies.

Only a small fraction of respondents expressed disagreement (6.7%), indicating that explicit resistance to the inclusion of Data Literacy in the teacher’s role is minimal. This suggests that most educators, even if not fully confident, are at least open to the concept and its potential.

The statement “I recognize the legal, ethical and privacy issues associated with data in education.” followed.



5. Αντιλαμβάνομαι τα νομικά, ηθικά και ζητήματα ιδιωτικότητας που σχετίζονται με τα δεδομένα στην εκπαίδευση

254 responses

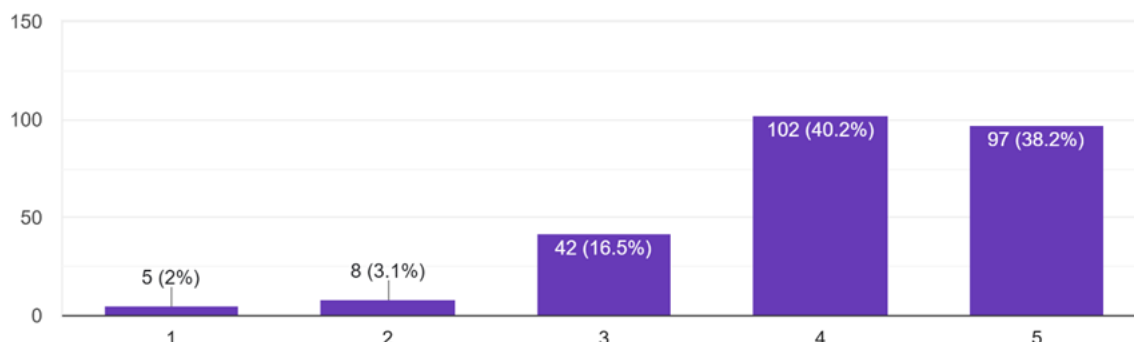


Figure 126 Greek Survey [I recognize the legal, ethical and privacy issues associated with data in education]

The data demonstrates a high level of awareness among participants regarding the legal, ethical, and privacy dimensions of educational data use. Specifically, 199 respondents (78.3%) selected either “Agree” (40.2%) or “Strongly Agree” (38.2%), indicating a strong consensus that such considerations are recognized and deemed important in the context of data practices in education.

This elevated level of agreement aligns with international discourse highlighting the need for responsible data use, particularly when sensitive student data is involved. The results suggest that a significant proportion of the sample acknowledges the broader implications of data collection, storage, sharing, and analysis—issues that are increasingly relevant given the digital transformation of educational environments.

A smaller segment of participants (42 respondents, or 16.5%) selected “Neither Agree nor Disagree”, which may reflect uncertainty or a lack of familiarity with the regulatory frameworks (e.g., GDPR), institutional data policies, or ethical frameworks surrounding data use. This signals an area where further professional development or policy communication may be warranted.

Only 13 respondents (5.1%) expressed disagreement with the statement. While minimal, this group may represent educators who have not yet engaged deeply with the normative or legal aspects of data handling, or who operate in contexts where such issues are not explicitly addressed or prioritized.

7.3.3 Knowledge and Skills (Readiness) in Data Literacy (Section C)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Διαφωνώ πλήρως), 2 = Disagree (Διαφωνώ), 3 = Neither Agree Nor Disagree (Ούτε Συμφωνώ Ούτε Διαφωνώ), 4 = Agree (Συμφωνώ), 5 = Strongly Agree (Συμφωνώ πλήρως).

The first statement was: “I know of data analysis methods, techniques and tools”.



6. Γνωρίζω μεθόδους, τεχνικές και εργαλεία ανάλυσης δεδομένων

254 responses

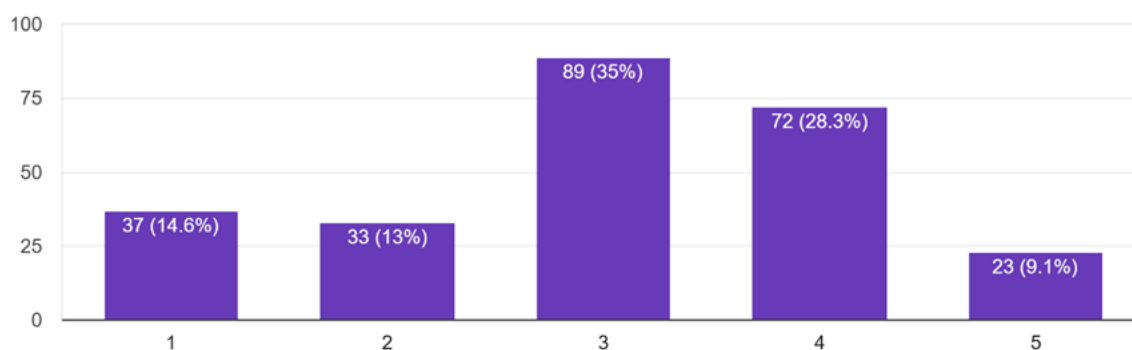


Figure 127 Greek Survey [I know of data analysis methods, techniques and tools]

The responses to this statement reveal a more divided landscape in terms of participants' self-reported familiarity with data analysis methods, techniques, and tools. While 95 respondents (37.4%) indicated agreement ("Agree" or "Strongly Agree"), a slightly larger proportion—70 respondents (27.6%)—expressed disagreement ("Disagree" or "Strongly Disagree"), and 89 respondents (35.0%) selected the neutral option.

This distribution suggests that while a segment of the participants possesses some level of knowledge in data analysis, a substantial portion either lacks this knowledge or is uncertain about their own proficiency. The high number of neutral responses may reflect limited exposure to formal training or practical experience with data analysis tools commonly used in educational settings (e.g., Excel, SPSS, Google Sheets, or basic statistical software).

The elevated percentage of disagreement (especially the 14.6% who selected "Strongly Disagree") highlights a clear skills gap. This contrasts with the more confident responses observed in other statements related to the perceived importance of data use and ethics, suggesting that while participants may value data-informed practices, many do not feel equipped to carry them out independently.

The statement "I know how to use digital tools to manage and organize data effectively." followed.



7. Ξέρω πώς να χρησιμοποιώ ψηφιακά εργαλεία για να διαχειρίζομαι και να οργανώνω αποτελεσματικά τα δεδομένα

254 responses

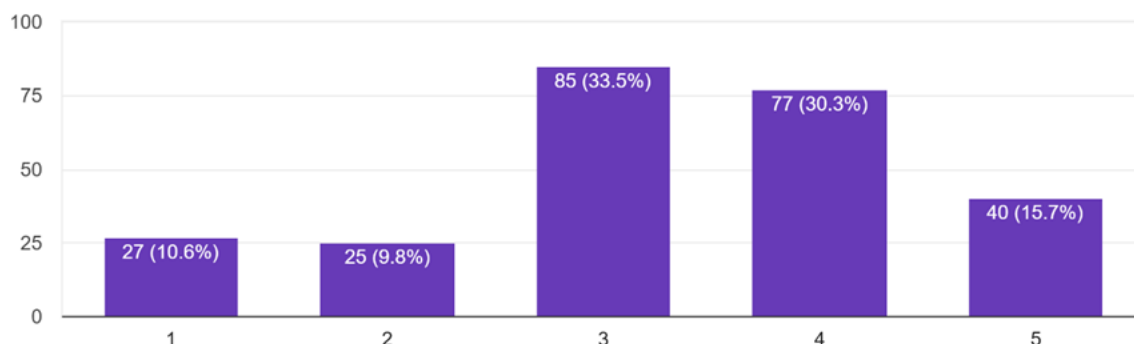


Figure 128 Greek Survey [I know how to use digital tools to manage and organize data effectively]

Positive agreement (“Agree” or “Strongly Agree”) was expressed by 117 participants (46.1%)—with 77 selecting “Agree” (30.3%) and 40 selecting “Strongly Agree” (15.8%). This indicates that less than half of the respondents feel confident in their data management skills with digital tools.

A significant portion—85 participants (33.5%)—selected “Neither Agree nor Disagree”, suggesting uncertainty or limited familiarity with the specific tools or practices involved. At the same time, 52 respondents (20.5%) expressed disagreement (“Disagree” or “Strongly Disagree”), which points to a meaningful subset of educators who currently lack confidence or competence in this area.

The statement “I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information.” followed.

8. Ξέρω πώς να διαβάζω, να κατανοώ και να ερμηνεύω διαγράμματα, πίνακες και γραφήματα και να τα συσχετίζω με άλλες πληροφορίες

254 responses

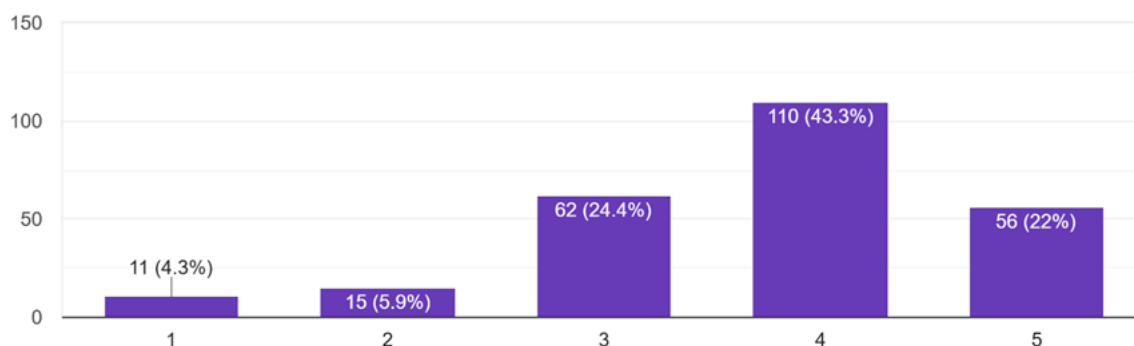


Figure 129 Greek Survey [I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information]



A significant majority of respondents (65.3%) selected either “Agree” (43.3%) or “Strongly Agree” (22.0%), indicating a broad level of confidence in their ability to read and interpret data visualizations and connect them to broader informational contexts. This suggests that basic data comprehension is a well-established skill among the participants.

Meanwhile, 62 respondents (24.4%) selected “Neither Agree nor Disagree”, which may reflect some level of uncertainty or limited experience with interpreting data in more complex or applied educational scenarios—for example, relating assessment data to teaching strategies or policy decisions.

Only 10.2% of respondents expressed disagreement (“Disagree” or “Strongly Disagree”), a relatively small percentage that nonetheless indicates a subset of educators who may require support in building confidence or technical fluency with interpreting visual data formats.

The statement “I know how to create charts, tables, and graphs to organize and visually present data.” followed.

9. Ξέρω πώς να δημιουργώ διαγράμματα, πίνακες και γραφήματα για να οργανώνω και να παρουσιάζω οπτικά τα δεδομένα
254 responses

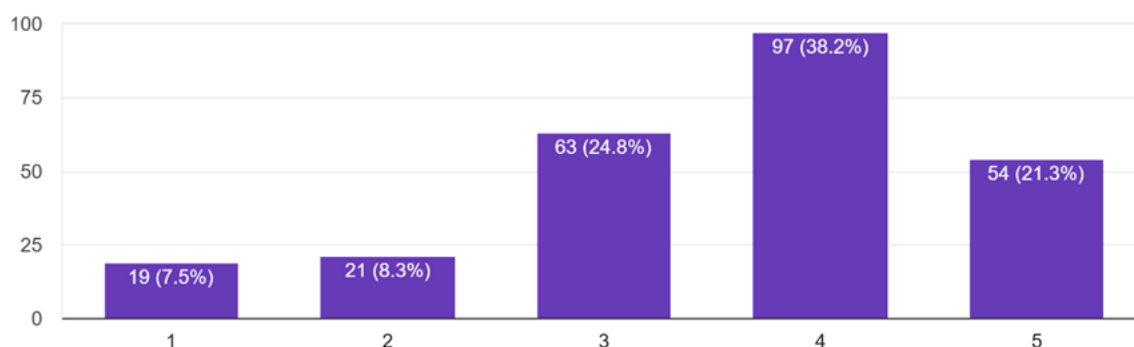


Figure 130 Greek Survey [I know how to create charts, tables, and graphs to organize and visually present data]

A combined 59.5% of respondents (151 out of 254) selected “Agree” (38.2%) or “Strongly Agree” (21.3%), suggesting that more than half of the participants feel confident in their capacity to organize and communicate information visually. This indicates a solid functional understanding of basic data presentation techniques, which are essential for both instructional and administrative purposes.

However, 63 participants (24.8%) selected “Neither Agree nor Disagree”, pointing to a substantial group whose familiarity or confidence with creating visualizations remains limited or uncertain. This neutrality may reflect a lack of practice with digital tools, unfamiliarity with visual design conventions, or minimal exposure to settings where such skills are required.

Meanwhile, 40 respondents (15.7%) expressed disagreement (“Disagree” or “Strongly Disagree”), suggesting that a notable minority may currently lack the technical or conceptual skills needed to effectively translate data into visual formats. This group represents an important target for foundational digital upskilling.

The statement “I know how to make use of data to solve problems and make decisions related to my work.” followed.

10. Ξέρω πώς να χρησιμοποιώ τα δεδομένα για να λύσω προβλήματα και να πάρω αποφάσεις σχετικές με τη δουλειά μου

254 responses

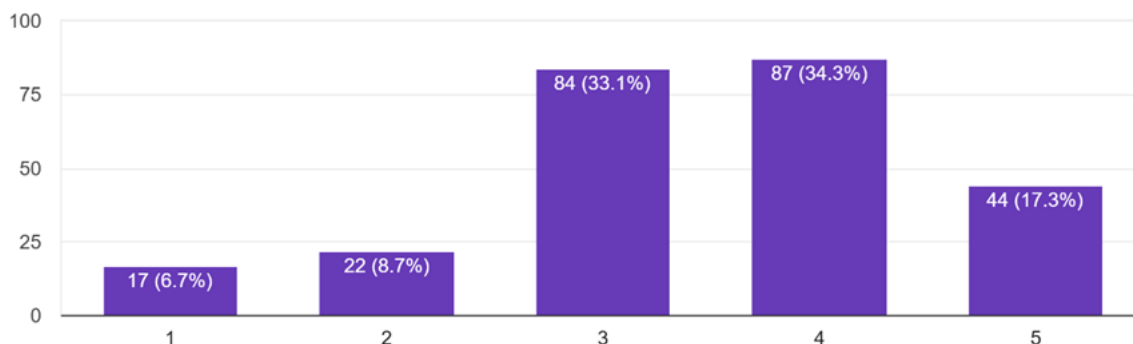


Figure 131 Greek Survey [I know how to make use of data to solve problems and make decisions related to my work]

A combined 131 participants (51.6%) selected “Agree” or “Strongly Agree”, indicating that slightly over half of the respondents believe they are capable of applying data to address work-related challenges or to inform instructional and administrative decisions. This reflects a developing competence in applied data use, which is a key element of effective data literacy.

At the same time, 84 respondents (33.1%) chose the neutral option, suggesting a significant level of uncertainty or limited experience. This may imply that many educators recognize the theoretical value of data in decision-making but do not yet feel equipped or empowered to use it practically, whether due to a lack of time, access to tools, or institutional support.

Additionally, 39 respondents (15.3%) expressed disagreement (“Disagree” or “Strongly Disagree”), which indicates that a noteworthy subset of participants may not perceive data use as part of their professional role or may not yet possess the necessary skills or mindset to integrate data into their decision-making processes.

7.3.4 Current Practices and Implementation (Section D)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Διαφωνώ πλήρως), 2 = Disagree (Διαφωνώ), 3 = Neither Agree Nor Disagree (Ούτε Συμφωνώ Ούτε Διαφωνώ), 4 = Agree (Συμφωνώ), 5 = Strongly Agree (Συμφωνώ πλήρως). The first statement was: “I know of data analysis methods, techniques and tools”.

The first statement was: “I explore and collect data for my work (i.e. surveys, assessment results, participation statistics, etc.)”.

11. Εξερευνώ και συλλέγω δεδομένα για τη δουλειά μου (π.χ. έρευνες, αποτελέσματα αξιολογήσεων, στατιστικά συμμετοχής κ.ά.)

254 responses

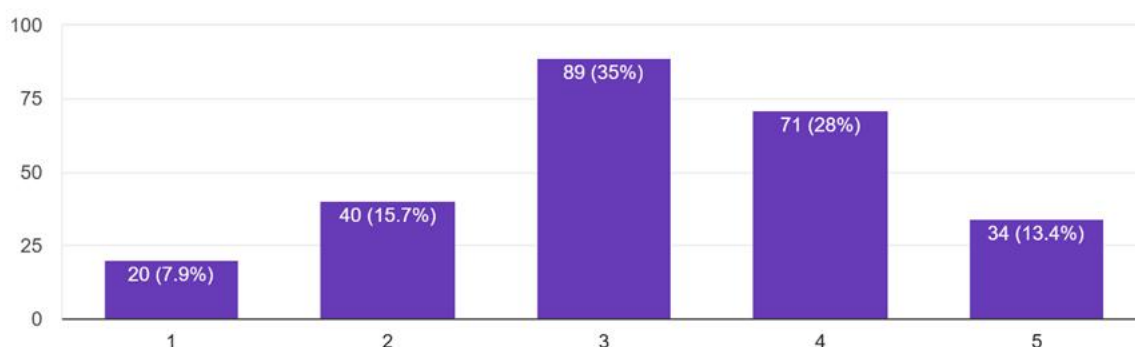


Figure 132 Greek Survey [I explore and collect data for my work (i.e. surveys, assessment results, participation statistics, etc.)]

A combined 105 respondents (41.4%) selected “Agree” (28.0%) or “Strongly Agree” (13.4%), indicating that fewer than half of the participants actively explore or collect data as part of their professional responsibilities. While this demonstrates that a portion of educators are beginning to incorporate data collection into their work, the overall figure points to a modest level of integration.

A substantial proportion—89 respondents (35.0%)—selected “Neither Agree nor Disagree”. This high level of neutrality may signal that many educators do not currently engage in data collection, or do not recognize their existing practices as such (e.g., using informal assessments or observations without formal documentation).

It may also reflect a lack of clarity regarding what constitutes “data” in everyday teaching contexts. Importantly, 60 respondents (23.6%) expressed disagreement (“Disagree” or “Strongly Disagree”), a considerable percentage that suggests a clear skills and practice gap in initiating or conducting data collection activities—such as designing surveys, interpreting participation trends, or systematically analyzing assessment results.

The statement “I assess and use data in my work” followed.

12. Αξιολογώ και χρησιμοποιώ δεδομένα στη δουλειά μου

254 responses

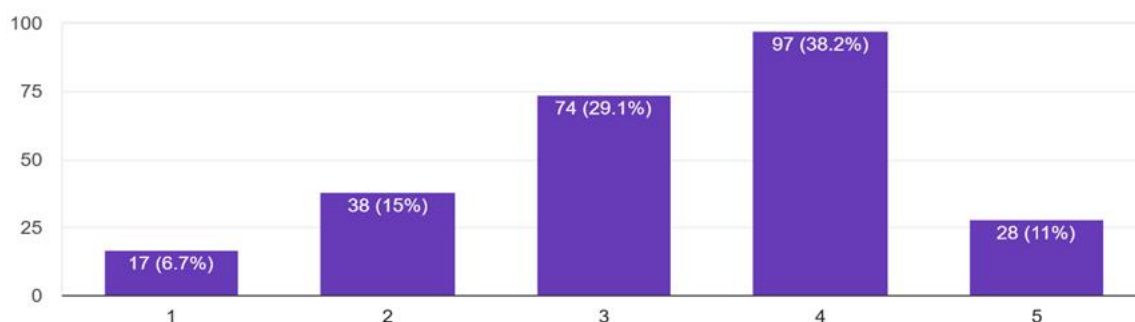


Figure 133 Greek Survey [I assess and use data in my work]

A combined 125 participants (49.2%) selected “Agree” (38.2%) or “Strongly Agree” (11.0%), indicating that approximately half of the respondents report actively assessing and applying data in their work. This reflects a basic but not yet widespread integration of data-informed practices into daily educational routines. At the same time, 74 participants (29.1%) chose “Neither Agree nor Disagree”.

This substantial neutral segment may represent individuals who have partial or irregular interaction with data, lack clarity on how to apply it meaningfully, or are uncertain about their competence in interpreting and using data outputs (e.g., performance indicators, student feedback, classroom analytics). 55 respondents (21.7%) expressed disagreement (“Disagree” or “Strongly Disagree”), suggesting that for a considerable portion of the sample, data is not yet an embedded or accessible element of their practice.

This may reflect systemic limitations such as insufficient access to data, lack of time, digital literacy gaps, or a school culture that does not yet support evidence-informed teaching.

The statement “I analyze and synthesize data for addressing a problem or question” followed.

13.Αναλύω και συνθέτω δεδομένα για την επίλυση ενός προβλήματος ή ερώτησης
254 responses

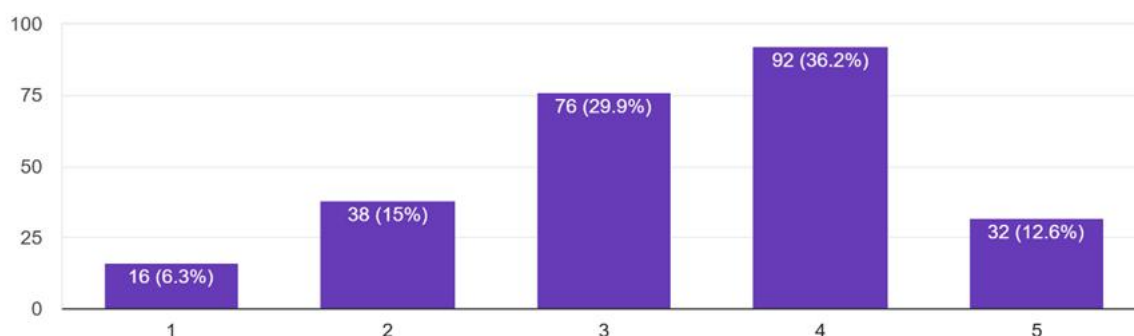


Figure 134 Greek Survey [I analyze and synthesize data for addressing a problem or question]

A combined 124 respondents (48.8%) selected “Agree” (36.2%) or “Strongly Agree” (12.6%), indicating that nearly half of the participants perceive themselves as capable of using data not merely descriptively, but analytically and synthetically—skills associated with higher-order data literacy. However, a considerable proportion—76 participants (29.9%)—remained neutral.

This suggests that a significant number of respondents may not feel fully confident in their ability to engage with data at a deeper level, or may lack opportunities to practice problem-driven data inquiry in their current professional context. Notably, 54 respondents (21.3%) expressed disagreement (“Disagree” or “Strongly Disagree”), underscoring the presence of a non-trivial skills gap.

These individuals may face barriers related to statistical literacy, familiarity with analytical tools, or support in applying data for inquiry and problem-solving purposes.

The statement “I use data visualizations in my work” followed.

14.Χρησιμοποιώ οπτικοποιήσεις δεδομένων στη δουλειά μου

254 responses

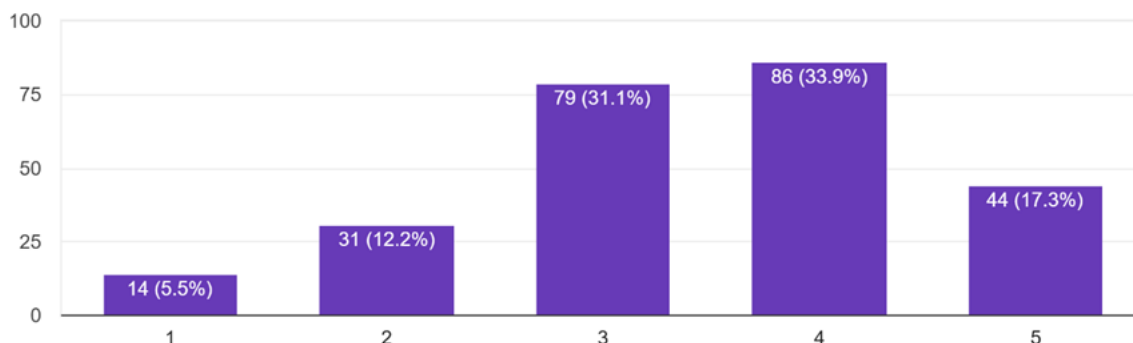


Figure 135 Greek Survey [I use data visualizations in my work]

A total of 130 participants (51.2%) selected “Agree” (33.9%) or “Strongly Agree” (17.3%), indicating that just over half of the respondents use visual representations of data (e.g., charts, graphs, dashboards) in their professional activities. This suggests a growing but not yet widespread integration of data visualization into everyday educational work.

A substantial number—79 respondents (31.1%)—selected “Neither Agree nor Disagree”, highlighting a large neutral segment. This may point to variability in practice: educators might either not have regular opportunities to use visualizations or may rely on visual data passively (e.g., interpreting dashboards rather than creating their own visuals). 45 respondents (17.7%) expressed disagreement, implying that for a notable minority, data visualization is not yet part of their workflow.

This could be due to limited technical skills, lack of access to appropriate tools, or absence of institutional emphasis on visual communication of data.

The statement “I collaborate with colleagues on interpreting educational data” followed.

15.Συνεργάζομαι με συναδέλφους για την ερμηνεία εκπαιδευτικών δεδομένων

254 responses

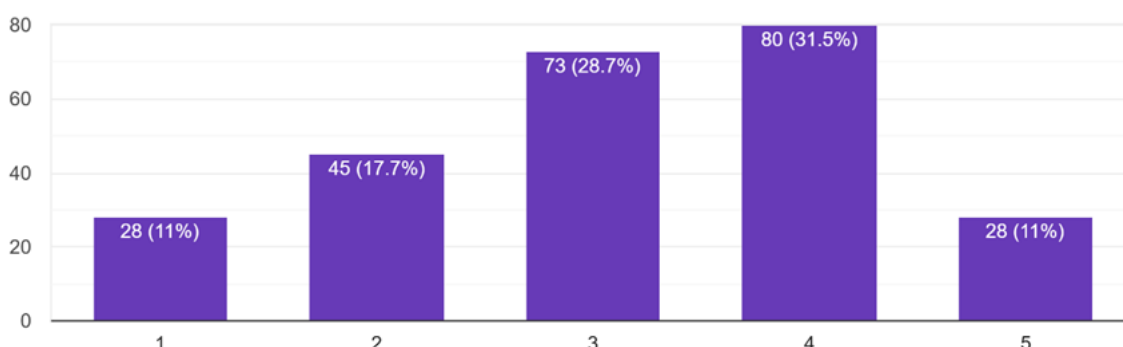


Figure 136 Greek Survey [I collaborate with colleagues on interpreting educational data]

108 participants (42.5%) reported positively (“Agree” or “Strongly Agree”), indicating that fewer than half of the respondents actively engage in collaborative interpretation of educational data. This reflects a moderate level of engagement with team-based data reflection, which is often considered a hallmark of data-informed school cultures. A sizeable number—73 respondents



(28.7%)—selected “Neither Agree nor Disagree”, indicating uncertainty or variability in collaborative practices.

This may reflect contextual limitations, such as the absence of structured opportunities for joint data reflection, time constraints, or unclear expectations regarding collaborative use of data. Importantly, 73 participants (28.7%) also expressed disagreement (“Disagree” or “Strongly Disagree”), which highlights a significant proportion of educators working in isolation when it comes to interpreting data.

This points to potential gaps in school culture, professional learning communities, or leadership-driven data strategies.

The statement “I share data with students, parents, teachers, administration and others” followed.

16.Μοιράζομαι δεδομένα με μαθητές, γονείς, εκπαιδευτικούς, διοίκηση και άλλους
254 responses

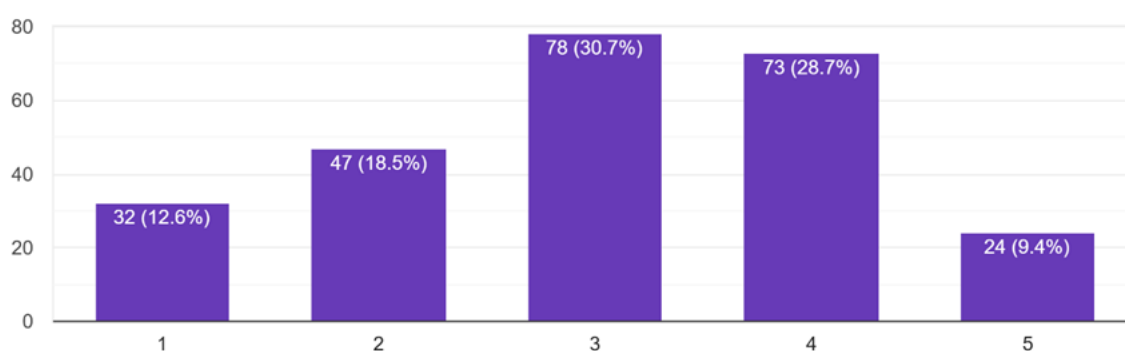


Figure 137 Greek Survey [I share data with students, parents, teachers, administration and others]

Only 97 participants (38.2%) selected “Agree” (28.7%) or “Strongly Agree” (9.4%), indicating that fewer than four in ten respondents report actively sharing data with key stakeholders. This suggests that data sharing—whether with students, parents, or colleagues—is not yet a regular or systematic part of professional practice for most respondents. A large proportion of the sample—78 participants (30.7%)—selected “Neither Agree nor Disagree”.

This level of neutrality may indicate uncertainty regarding appropriate practices, institutional expectations, or ethical/privacy concerns associated with data dissemination. It may also suggest that while data may be used internally, it is not routinely communicated to external audiences. Notably, 79 respondents (31.1%) expressed disagreement (“Disagree” or “Strongly Disagree”), a relatively high figure that points to barriers to transparency and data-informed dialogue within and beyond the school community.

Such barriers may stem from a lack of digital tools for secure sharing, limited training in effective communication of data, or concerns about data sensitivity.

7.3.5 Attitudes and Dispositions Towards Data Literacy (Section E)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Διαφωνώ πλήρως), 2 = Disagree (Διαφωνώ), 3 = Neither Agree Nor Disagree (Ούτε Συμφωνώ Ούτε Διαφωνώ), 4 = Agree (Συμφωνώ), 5 = Strongly Agree (Συμφωνώ πλήρως).

The first statement was: “In my opinion, data enhance: Learning, Teaching, Assessment”.

17. Κατά τη γνώμη μου, τα δεδομένα βελτιώνουν:

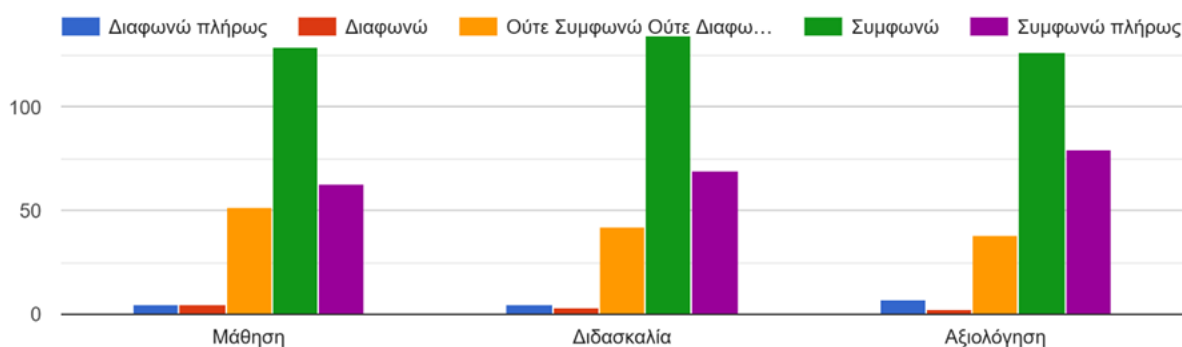


Figure 138 Greek Survey [In my opinion, data enhance: Learning, Teaching, Assessment]

Across all three categories, the data reveals a strong consensus in favor of the enhancing role of data in education:

- For Learning, a total of 192 participants (75.6%) either agreed or strongly agreed, indicating that a clear majority view data as a means to improve student learning outcomes. Only 10 participants (3.9%) disagreed, while 52 (20.5%) remained neutral.
- For Teaching, the responses are slightly more favorable, with 204 participants (80.3%) expressing agreement or strong agreement. This suggests that teachers particularly recognize the instructional benefits of using data to inform lesson planning, adapt strategies, and personalize learning.
- For Assessment, positive responses are highest, with 207 participants (81.5%) agreeing or strongly agreeing. This reflects a growing understanding of data's essential role in formative and summative assessment, including tracking progress, identifying learning gaps, and supporting feedback practices.

Neutral responses ranged from 15% to 20%, suggesting a modest portion of participants who may be less familiar with the practical applications of data or who have limited opportunities to engage with data in a meaningful way. The percentage of disagreement remains low (below 4% for all three aspects), indicating minimal resistance or skepticism.

The statement “I believe that data enhance personalization and differentiated teaching” followed.

18. Πιστεύω ότι τα δεδομένα βελτιώνουν την εξατομίκευση και τη διαφοροποιημένη διδασκαλία
254 απαντήσεις

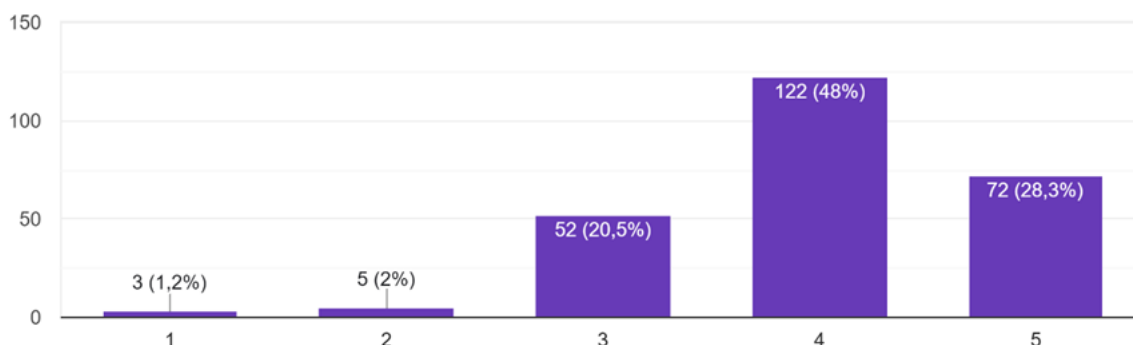


Figure 139 Greek Survey [I believe that data enhance personalization and differentiated teaching]

The data reveal a strong consensus among respondents regarding the benefits of data in supporting personalized and differentiated instruction. A combined 76.3% of participants either agreed (48.0%) or strongly agreed (28.3%) that data enhances the ability to tailor teaching to students' individual needs, preferences, and abilities.

Neutral responses account for 20.5%, suggesting that while many educators acknowledge the potential of data to inform personalized teaching, some may lack either the tools, training, or confidence to fully integrate such practices into their daily instruction.

Only a small minority (3.2%) expressed disagreement, indicating very limited resistance to the concept, and reinforcing the broad appeal of personalization as a pedagogical goal.

The statement “I believe that data-driven methods improve educational equity” followed.

19. Πιστεύω ότι οι μεθοδολογίες που βασίζονται σε δεδομένα βελτιώνουν την εκπαιδευτική ισότητα
254 απαντήσεις

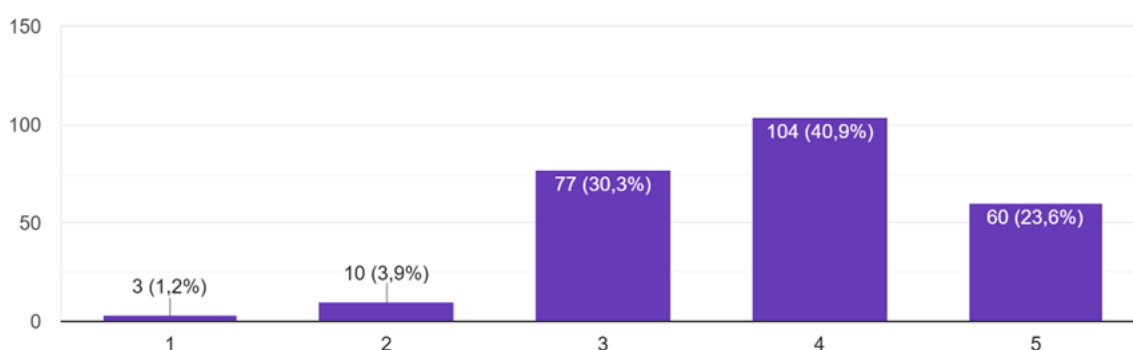


Figure 140 Greek Survey [I believe that data-driven methods improve educational equity]

The results show that a substantial majority of respondents (64.5%) agree or strongly agree that data-driven approaches can contribute to enhancing educational equity. This indicates a growing awareness of the role of data in identifying disparities, allocating resources, and tailoring support to underserved learners.



At the same time, 30.3% of participants selected “Neither Agree Nor Disagree”, suggesting a significant level of uncertainty or cautiousness about the connection between data and equity outcomes. This may reflect practical concerns about how data is currently collected or used—e.g., fears of bias in datasets, limited transparency, or lack of actionable insights that truly reach marginalized student groups.

Only 5.1% of respondents disagreed or strongly disagreed, pointing to minimal opposition to the concept, though it is worth noting that these views might stem from skepticism regarding current implementations of data-driven policies, rather than the concept itself.

The statement “I believe that data-driven methods increase teachers' workload” followed.

20. Πιστεύω ότι οι μεθοδολογίες που βασίζονται σε δεδομένα αυξάνουν το φόρτο εργασίας των εκπαιδευτικών
254 απαντήσεις

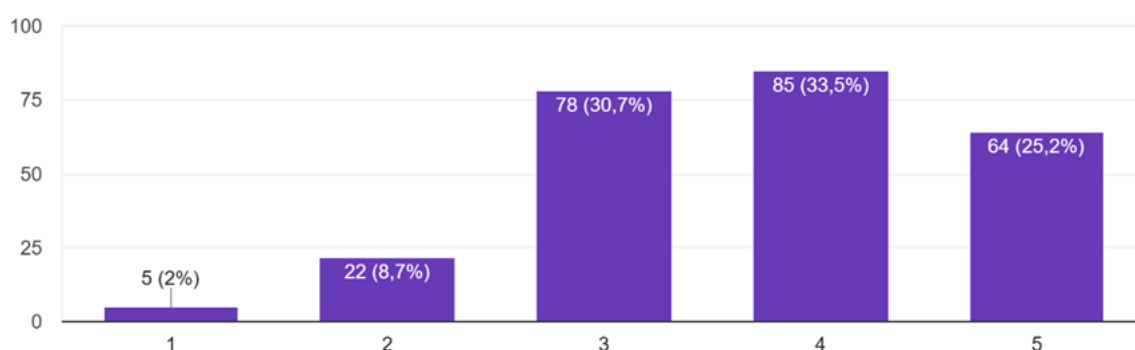


Figure 141 Greek Survey [I believe that data-driven methods increase teachers' workload]

The responses indicate that a significant proportion of participants (58.7%) perceive data-driven methods as contributing to an increased workload for teachers, either agreeing or strongly agreeing with the statement. This suggests that while data practices are recognized for their benefits in pedagogy and equity, they are also associated with practical and time-related challenges.

A notable 30.7% of respondents chose a neutral stance, indicating uncertainty or context-dependent views—possibly reflecting differences in how data processes are implemented across schools and systems (e.g., integration into workflow vs. added administrative burden).

Only 10.7% of participants disagreed or strongly disagreed, pointing to a minority who view data practices as manageable or beneficial in terms of efficiency.

7.3.6 Policy and Curriculum Perspectives (Section F)

Participants were asked to indicate their level of agreement with a number of statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Διαφωνώ πλήρως), 2 = Disagree (Διαφωνώ), 3 = Neither Agree Nor Disagree (Ούτε Συμφωνώ Ούτε Διαφωνώ), 4 = Agree (Συμφωνώ), 5 = Strongly Agree (Συμφωνώ πλήρως).

The first statement was: “Educational system sufficiently promotes Data Literacy in schools”.

21. Το εκπαιδευτικό σύστημα προωθεί επαρκώς τον Εγγραμματισμό στα Δεδομένα στα σχολεία
254 απαντήσεις

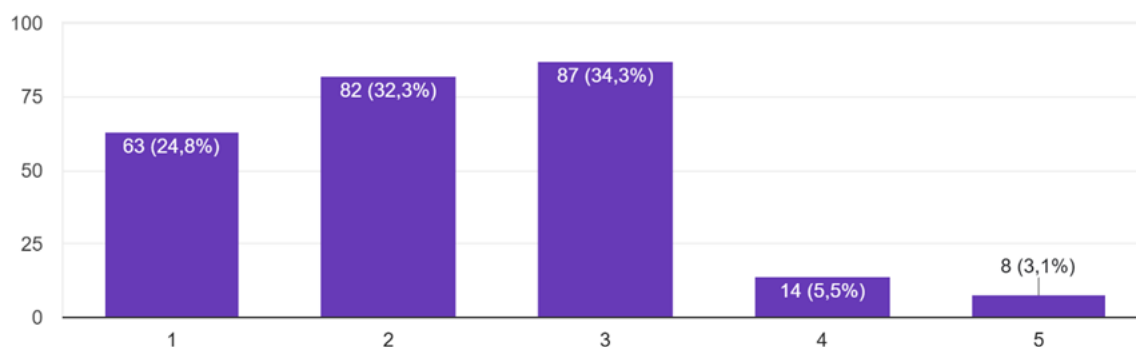


Figure 142 Greek Survey [Educational system sufficiently promotes Data Literacy in schools]

The data clearly indicates a strongly critical perception among respondents regarding the current efforts of the educational system to promote Data Literacy in schools. A combined 57.1% of participants either disagreed or strongly disagreed with the statement, highlighting widespread dissatisfaction or disillusionment with systemic support for this emerging competence.

A significant proportion (34.3%) selected “Neither Agree Nor Disagree”, which may reflect ambivalence, limited awareness of ongoing initiatives, or variability across different educational contexts and regions.

Only 8.6% of participants expressed agreement, suggesting that very few educators perceive current policies or programs as adequate in building data-related skills and competencies within the school environment.

The statement “School curricula effectively integrate Data Literacy concepts and methods” followed.

22. Τα σχολικά αναλυτικά προγράμματα ενσωματώνουν αποτελεσματικά τις έννοιες και μεθόδους του Εγγραμματισμού στα Δεδομένα
254 απαντήσεις

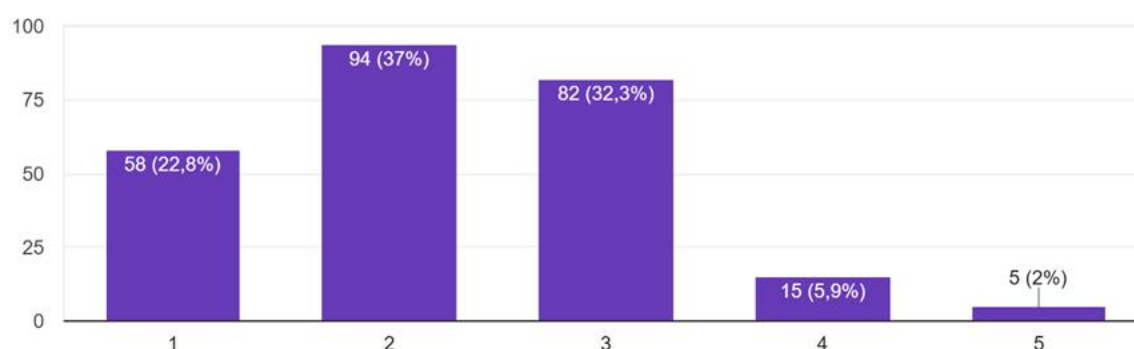


Figure 143 Greek Survey [School curricula effectively integrate Data Literacy concepts and methods]

The data reveal a clear perception of inadequacy regarding the integration of Data Literacy within school curricula. A combined 59.8% of respondents expressed disagreement or strong disagreement, reflecting a widespread concern that curricular frameworks do not sufficiently



embed data-related concepts, skills, or learning opportunities. An additional 32.3% of participants remained neutral, potentially indicating uncertainty, inconsistent experiences across subjects or schools, or a lack of clarity regarding what constitutes Data Literacy in curriculum design. Only 7.9% of respondents agreed or strongly agreed with the statement, confirming that very few educators perceive existing school curricula as effectively supporting data literacy development.

The statement “School administrators play a critical role in successful Data Literacy integration” followed.

23. Οι Διευθυντές των σχολείων διαδραματίζουν κρίσιμο ρόλο στην επιτυχή ενσωμάτωση του Εγγραμματισμού στα Δεδομένα

254 απαντήσεις

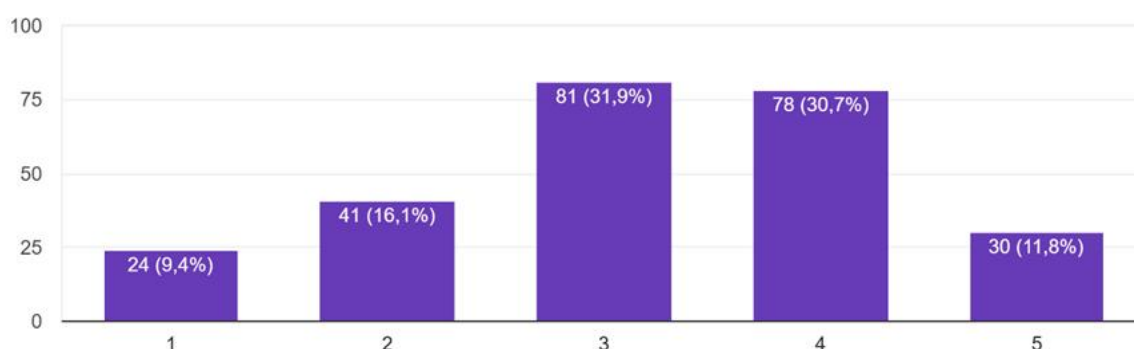


Figure 144 Greek Survey [School administrators play a critical role in successful Data Literacy integration]

The data present a somewhat divided perspective on the role of school administrators in supporting Data Literacy. While 42.5% of respondents agreed or strongly agreed with the statement—acknowledging the importance of leadership in integrating Data Literacy—this agreement is less pronounced compared to other items in the dataset.

A significant 31.9% of participants selected “Neither Agree Nor Disagree”, suggesting ambivalence or lack of visibility regarding administrators' actions in this area. This may indicate that, for many educators, the extent of administrative involvement in Data Literacy efforts remains unclear or inconsistent across schools.

Meanwhile, a notable 25.5% of respondents expressed disagreement, which may reflect perceptions of insufficient leadership, strategic planning, or support from school heads in fostering a data-informed culture.

The statement “Teachers have adequate knowledge to address ethical considerations related to educational data (privacy/security/responsible use)” followed.



24. Οι εκπαιδευτικοί διαθέτουν επαρκείς γνώσεις για να διαχειριστούν ζητήματα ηθικής που σχετίζονται με εκπαιδευτικά δεδομένα (ιδιωτικότητα/ασφάλεια/υπεύθυνη χρήση)
254 απαντήσεις

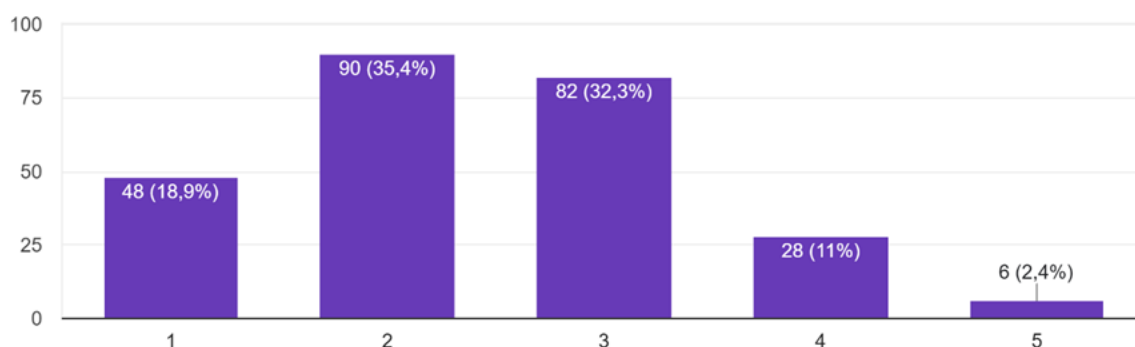


Figure 145 Greek Survey [Teachers have adequate knowledge to address ethical considerations related to educational data (privacy/security/responsible use)]

The responses to this statement reveal a notable concern regarding teachers' preparedness to handle ethical dimensions of data use in education. A combined 54.3% of participants expressed disagreement or strong disagreement, suggesting that more than half of the respondents do not believe that teachers possess sufficient knowledge about issues such as data privacy, security, and responsible use. Another 32.3% selected "Neither Agree Nor Disagree", reflecting uncertainty—possibly due to limited access to training, inconsistent institutional guidance, or varying interpretations of what constitutes "adequate knowledge." Only 13.4% of respondents indicated agreement or strong agreement with the statement, highlighting a clear gap in ethical data literacy awareness and confidence within the teaching profession.

The statement "Teachers have adequate autonomy to implement data-driven methods" followed.

25. Οι εκπαιδευτικοί διαθέτουν επαρκή αυτονομία για να εφαρμόσουν μεθόδους που βασίζονται σε δεδομένα
254 απαντήσεις

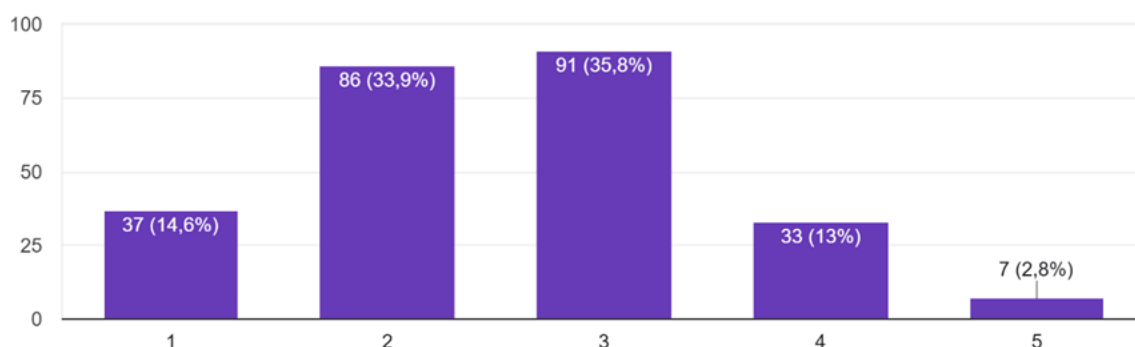


Figure 146 Greek Survey [Teachers have adequate autonomy to implement data-driven methods]

The next statement was: "School curricula sufficiently cover:".

Five aspects were available: Data collection skills, Data analysis skills, Data interpretation skills, Data visualization skills, Data communication skills.

26. Τα σχολικά αναλυτικά προγράμματα καλύπτουν επαρκώς

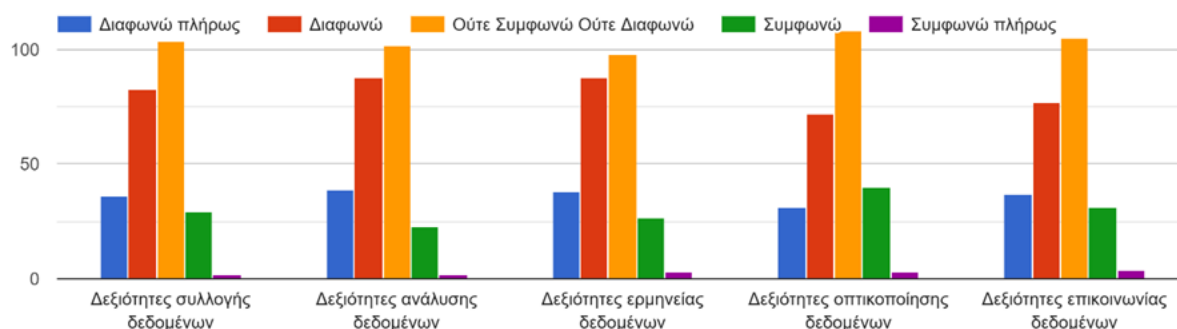


Figure 147 Greek Survey [School curricula sufficiently cover Data collection skills, Data analysis skills, Data interpretation skills, Data visualization skills, Data communication skills]

The findings across all five components reflect a consistent perception of insufficiency regarding the integration of Data Literacy skills in current school curricula. Most respondents disagreed or strongly disagreed with the adequacy of curriculum coverage for each skill, with the strongest disagreement noted in data analysis and data interpretation (combined disagreement at ~50% each). Neutral responses were also prominent, particularly for data visualization and data communication, possibly indicating uncertainty or inconsistent implementation across educational levels or disciplines. Only a very small proportion of respondents selected “Agree” or “Strongly Agree”—ranging from 11% to 17% across all categories—indicating limited perceived curricular emphasis on data literacy skill-building.

The next statement was: “School curricula approach the use of Data Literacy:”

Two options were available: With STEM/ STEAM/ STEAME activities and With project-based learning across disciplines.

27. Τα σχολικά αναλυτικά προγράμματα προσεγγίζουν τον Εγγραμματοισμό στα Δεδομένα

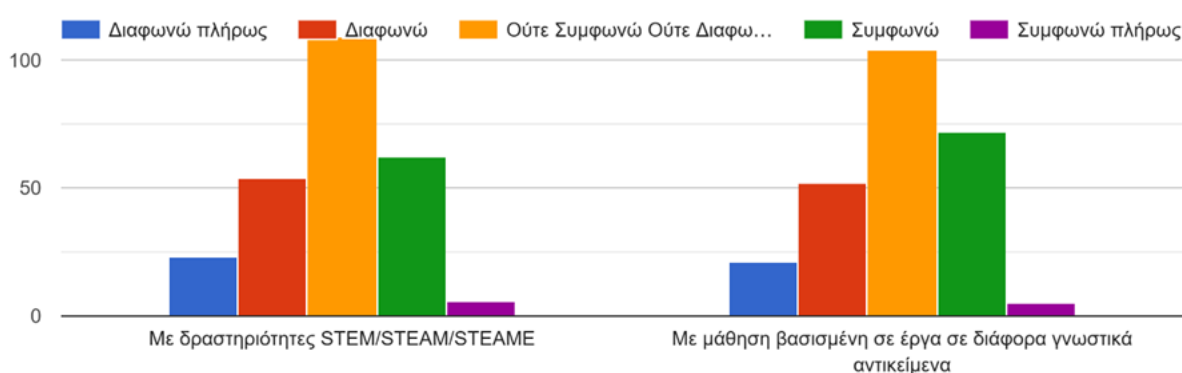


Figure 148 Greek Survey [School curricula approach the use of Data Literacy with STEM/STEAM/STEAME activities and with project-based learning across disciplines]

The data suggests that only a minority of respondents perceive a systematic curricular integration of Data Literacy through either STEM/STEAM/STEAME activities or cross-disciplinary project-based learning (PBL). For both options, over 30% of respondents selected Disagree or Strongly Disagree, reflecting a substantial perception of underutilization of these pedagogical approaches

for promoting Data Literacy. A significant portion of respondents (~43% for STEM, ~41% for PBL) selected Neither Agree Nor Disagree, possibly indicating:

- A lack of clarity or visibility regarding how curricula apply these frameworks.
- Limited exposure or inconsistent implementation across schools or educational levels.

Only ~27% (STEM) and ~30% (PBL) agreed or strongly agreed that these strategies are currently used to support Data Literacy, indicating a moderate but insufficient alignment with innovative instructional methods. Finally, participants were asked to indicate other approaches. The open-ended feedback confirms and deepens the quantitative findings: while there are pockets of promising practice, the overall approach to Data Literacy in the Greek educational system remains fragmented, underdeveloped, and largely dependent on individual teacher initiative. Participants collectively call for: System-wide reforms, Teacher empowerment through targeted training, Curriculum revisions that align with 21st-century competences.

The qualitative insights reflect both a readiness to embrace innovation and a clear articulation of current limitations, offering valuable direction for future strategic planning and policy recommendations.

7.3.7 Training and Professional Development Needs (Section G)

Participants were asked to indicate their level of agreement with a number of statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Διαφωνώ πλήρως), 2 = Disagree (Διαφωνώ), 3 = Neither Agree Nor Disagree (Ούτε Συμφωνώ Ούτε Διαφωνώ), 4 = Agree (Συμφωνώ), 5 = Strongly Agree (Συμφωνώ πλήρως).

The first statement was: “I believe that developing Data Literacy will significantly contribute to my professional development”.

28. Πιστεύω ότι η ανάπτυξη του Εγγραμματισμού μου στα Δεδομένα θα συμβάλλει σημαντικά στην επαγγελματική μου ανάπτυξη
254 απαντήσεις

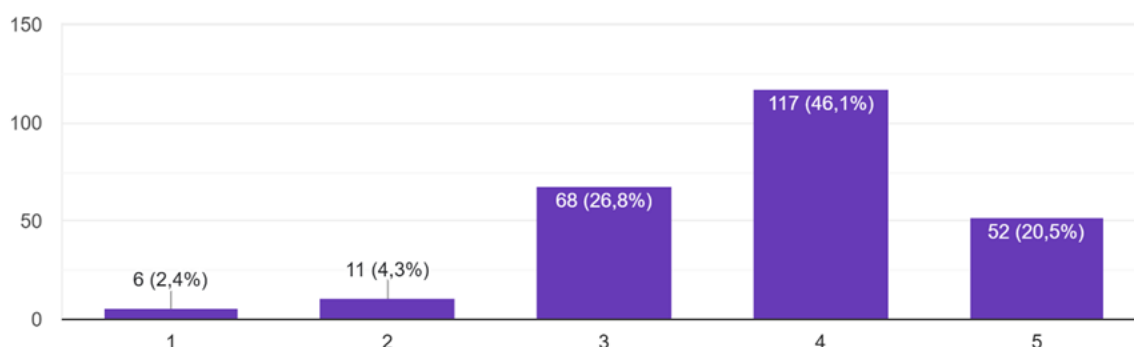


Figure 149 Greek Survey [I believe that developing Data Literacy will significantly contribute to my professional development (Likert scale)]

The responses to this statement highlight a generally positive orientation among participants regarding the role of Data Literacy in their professional advancement. Specifically, 117 participants (46.1%) selected “Agree” and 52 participants (20.5%) selected “Strongly Agree,”



indicating that approximately two-thirds of the sample (66.6%) perceive Data Literacy as a critical factor for their professional development.

A notable proportion of respondents (68 participants; 26.8%) chose the neutral option (“Neither Agree nor Disagree”), suggesting that while the majority recognize the importance of Data Literacy, there remains a subset of participants whose views may reflect uncertainty, limited experience, or a need for further information and contextualization. Only a small minority disagreed with the statement, with 11 participants (4.3%) selecting “Disagree” and 6 participants (2.4%) selecting “Strongly Disagree.”

These findings confirm that the perceived value of Data Literacy as a professional competence is widely acknowledged, though there may be opportunities to further strengthen this perception through targeted training, awareness-raising, and integration of data-informed practices in educators’ professional contexts.

The statement “I am interested in professional development related to Data Literacy” followed.

29. Με ενδιαφέρει η επαγγελματική ανάπτυξη σχετικά με τον Εγγραμματισμό στα Δεδομένα
254 απαντήσεις

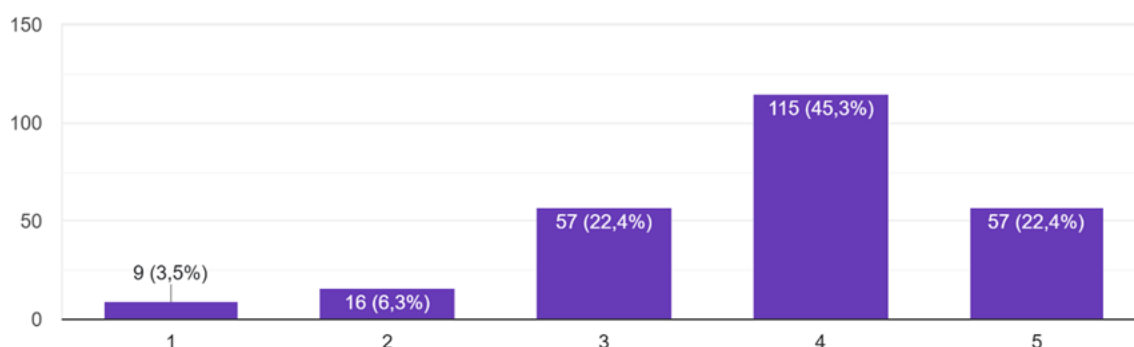


Figure 150 Greek Survey [I am interested in professional development related to Data Literacy]

The responses to this statement indicate a strong interest in professional development opportunities related to Data Literacy among participants. Specifically, 115 respondents (45.3%) selected “Agree” and 57 respondents (22.4%) selected “Strongly Agree,” showing that over two-thirds of the participants (67.7%) express a clear interest in enhancing their competencies in this area. At the same time, 57 respondents (22.4%) chose the neutral response (“Neither Agree nor Disagree”), which may reflect ambivalence, limited prior exposure to such training, or uncertainty about what such professional development entails. Only a small minority expressed disagreement, with 16 participants (6.3%) selecting “Disagree” and 9 participants (3.5%) selecting “Strongly Disagree.” This suggests that resistance to professional development in Data Literacy is minimal.

The statement “The available professional development programs address my needs regarding data use” followed.

30. Τα διαθέσιμα προγράμματα επαγγελματικής ανάπτυξης καλύπτουν τις ανάγκες μου όσον αφορά τη χρήση δεδομένων
254 απαντήσεις

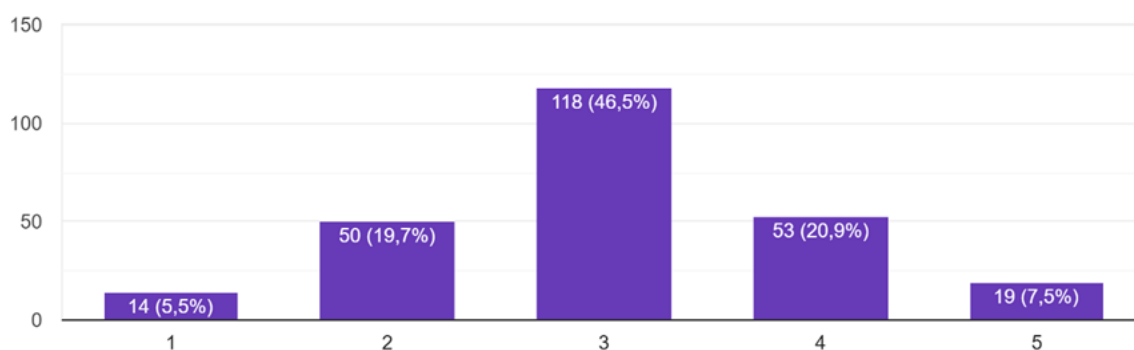


Figure 151 Greek Survey [The available professional development programs address my needs regarding data use]

The responses to this statement suggest a mixed perception among participants regarding the adequacy of existing professional development opportunities in relation to data use. While 53 participants (20.9%) agreed and 19 (7.5%) strongly agreed, indicating a degree of satisfaction with current offerings, these positive responses represent less than one-third of the total sample (28.4%). A large proportion of respondents (118 participants or 46.5%) selected the neutral option (“Neither Agree nor Disagree”), which may imply uncertainty, limited awareness, or a lack of direct experience with such programs. This neutral stance could also reflect a mismatch between the content of available training and the specific needs or expectations of educators. Notably, 50 respondents (19.7%) disagreed and 14 (5.5%) strongly disagreed, amounting to 25.2% of the sample expressing clear dissatisfaction. This highlights a significant gap between available training and educators’ actual professional development needs in the context of data use.

The next statement was: “What type of support do you need to effectively implement Data Literacy methods in your curriculum?”.

Four aspects were available: Workshops and seminars, Mentoring, Peer collaboration, Online resources. The results reflect a strong interest in structured, accessible, and collaborative forms of professional support for integrating Data Literacy.

31. Τι είδους υποστήριξη χρειάζεστε προκειμένου να εφαρμόσετε αποτελεσματικά τις μεθόδους του Εγγραμματοσμού στα Δεδομένα στο πρόγραμμα σπουδών που διδάσκετε;

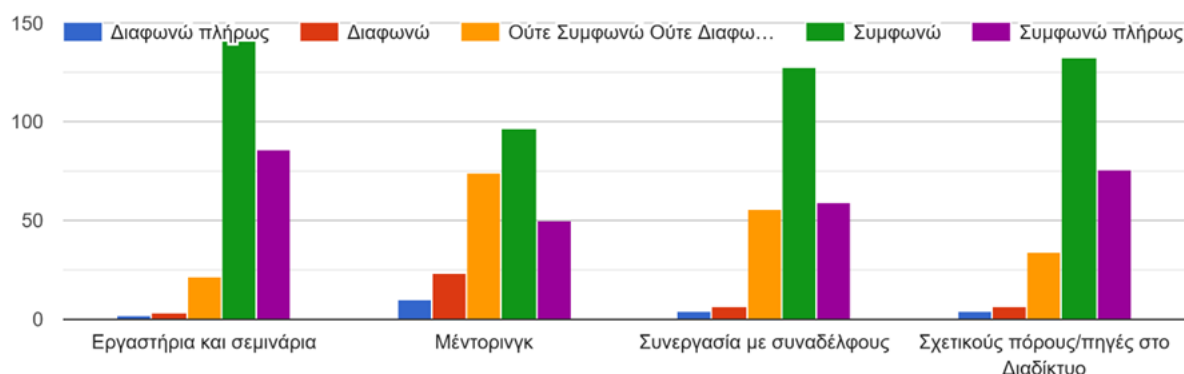


Figure 152 Greek Survey [What type of support do you need to effectively implement Data Literacy methods in your curriculum?]

Workshops and Seminars received the highest level of endorsement: 141 participants (55.6%) agreed and 86 (33.9%) strongly agreed, totaling 89.5% positive responses. Only 5 participants (2.0%) expressed disagreement. This underscores a widespread demand for formal training formats that offer hands-on guidance and targeted knowledge-building.

Online Resources were also rated very positively, with 133 participants (52.4%) agreeing and 76 (29.9%) strongly agreeing, accounting for over 82% of the total. This reflects educators' appreciation for flexible, on-demand tools that can be integrated into their own schedules and teaching practices.

Peer Collaboration emerged as another highly valued form of support, with 128 respondents (50.4%) agreeing and 59 (23.2%) strongly agreeing, summing to 73.6% positive responses. This indicates a desire for collaborative learning environments, where educators can exchange experiences and co-develop strategies.

Mentoring, while still positively received, showed a relatively more moderate endorsement. 97 participants (38.2%) agreed and 50 (19.7%) strongly agreed, while a substantial 74 respondents (29.1%) selected the neutral option. This may suggest that while mentoring is appreciated, it may not be as widely available or clearly defined in participants' current contexts.

In the open-ended responses, participants highlighted a broad range of needs to effectively implement Data Literacy in their teaching practice. Many emphasized the importance of time availability, practical training opportunities, and subject-specific professional development. Requests also included face-to-face workshops, mentoring, and access to open-source tools and digital infrastructure. Several respondents stressed the need for curriculum alignment, institutional support, and flexibility in scheduling, while others called for recognition of efforts and reduction of workload. A notable number indicated that the existing options (e.g. workshops, mentoring, peer collaboration) were sufficient, suggesting a diversity in readiness and existing support structures among educators.

Overall, the responses reflect a desire for targeted, practical, and sustainable support embedded within the broader educational framework.

The next statement was: “What are your current training needs?”.

Six aspects were available: Understand basic Data Literacy concepts, Acquire skills in interpreting complex data visualizations, Organize classroom interventions with my students, Get familiar with data-driven decision making in school, Understand the ethical use of educational data, Know how to integrate data literacy with other literacies.

32. Ποιες είναι οι τρέχουσες επιμορφωτικές σας ανάγκες;

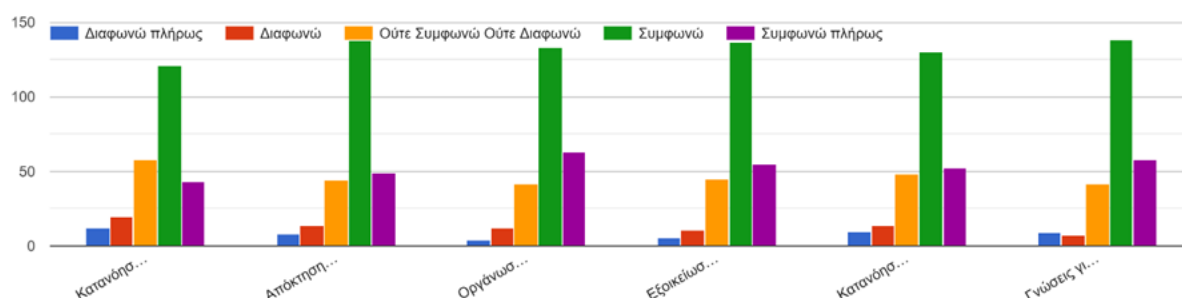


Figure 153 Greek Survey [What are your current training needs?]

Regarding the question on current training needs, participants expressed high levels of agreement across all six proposed areas. The majority indicated that they would benefit from professional development to understand basic Data Literacy concepts, with 139 responses indicating "Agree" and 49 selecting "Strongly Agree".

Similar levels of demand were observed for the ability to interpret complex data visualizations (133 Agree, 63 Strongly Agree), and to organize classroom interventions involving students (137 Agree, 55 Strongly Agree).

Equally important were the needs to familiarize themselves with data-informed decision-making in school contexts (130 Agree, 52 Strongly Agree), to understand the ethical use of educational data (138 Agree, 58 Strongly Agree), and to integrate Data Literacy with other literacies. Neutral responses ranged between 42 and 48 across items, while levels of disagreement remained low. These findings confirm a widespread and multifaceted interest in capacity building for teachers, pointing to the importance of providing training that is both conceptually grounded and practically oriented, aligned with real classroom and school management challenges.

Responses to the open-ended question asking for additional training needs beyond those listed reflected a wide range of perspectives. While many participants indicated that the predefined options were sufficient, others emphasized the importance of practical training, time availability, and integration with existing curricula. Frequently mentioned themes included practice-oriented workshops, familiarization with AI tools, support for lesson planning, and case-based learning. Several respondents also highlighted digital security, data ethics, and cross-disciplinary collaboration as emerging priorities. Additionally, some educators pointed to systemic barriers, such as bureaucratic workload and lack of resources, underlining the need for targeted, accessible, and realistic professional development opportunities that align with their daily teaching realities.

7.3.8 Challenges and Obstacles (Section H)

Participants were asked to indicate their level of agreement with a number of statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Διαφωνώ πλήρως), 2 = Disagree (Διαφωνώ), 3 = Neither Agree Nor Disagree (Ούτε Συμφωνώ Ούτε Διαφωνώ), 4 = Agree (Συμφωνώ), 5 = Strongly Agree (Συμφωνώ πλήρως).

Focusing on the challenges and obstacles, the relevant statement was: “Which of the following do you think constitute challenges and obstacles for Data Literacy in education?”

Seven were mentioned: Insufficient resources (i.e. labs, equipment, software, etc.) for data-driven activities, insufficient time for data-driven activities, Insufficient training programs in Data Literacy, Resistance among educators towards adopting Data Literacy methods, Lack of support or encouragement from school administrators, Unclear national policies regarding Data Literacy implementation, Ethical concerns and privacy issues in educational data handling.

33. Ποια από τα παρακάτω θεωρείτε ότι αποτελούν προκλήσεις και εμπόδια για τον Εγγραμματισμό στα Δεδομένα στην εκπαίδευση;

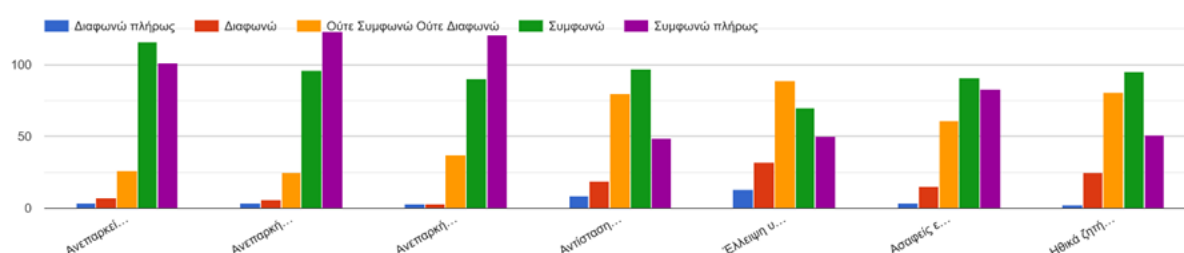


Figure 154 Greek Survey [Which of the following do you think constitute challenges and obstacles for Data Literacy in education?]

Most notably, insufficient training programs in Data Literacy were viewed as a significant challenge, with a combined 212 participants (90 Agree, 121 Strongly Agree) acknowledging it.

Similarly, insufficient time for data-driven activities and insufficient resources (labs, equipment, software, etc.) were also seen as major issues, with high levels of agreement (192 and 217 respectively selecting Agree or Strongly Agree). Unclear national policies and ethical concerns regarding data privacy also raised concerns, with 174 and 146 respondents respectively agreeing or strongly agreeing.

Although resistance among educators and lack of support from school administrators were comparatively less emphasized, they still received moderate agreement (146 and 120 combined responses for Agree/Strongly Agree), suggesting that cultural and institutional factors also play a role in hindering Data Literacy integration.

Overall, the findings highlight a clear call for better infrastructure, dedicated time, and targeted professional development, alongside policy clarity and ethical frameworks to support the successful adoption of Data Literacy in schools.

7.3.9 Future Intentions (Section I)

Participants were asked to indicate their level of agreement with a number of statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Διαφωνώ πλήρως), 2 = Disagree (Διαφωνώ), 3 = Neither Agree Nor Disagree (Ούτε Συμφωνώ Ούτε Διαφωνώ), 4 = Agree (Συμφωνώ), 5 = Strongly Agree (Συμφωνώ πλήρως).

The relevant statement was: “In the future, I intend to use data more frequently in my work for”.

Six options were mentioned: Administrative tasks, Instructional design, Communication and collaboration, Assessment and feedback, Counseling and parent engagement, Broader management responsibilities.

34. Στο μέλλον, σκοπεύω να χρησιμοποιώ δεδομένα πιο συχνά στη δουλειά μου για:



Figure 155 Greek Survey [In the future, I intend to use data more frequently in my work for:]

The strongest intention was observed in the category of assessment and feedback, where 189 respondents selected Agree or Strongly Agree, indicating a clear recognition of data’s value in informing evaluation practices.

Similarly high levels of intention were reported for instructional design (171 responses) and communication and collaboration (171 responses), suggesting that educators see data as a useful tool for shaping teaching strategies and enhancing interactions within the school ecosystem.

Administrative tasks and broader management responsibilities showed slightly more ambivalence, with higher neutrality (80 and 79 respondents, respectively choosing “Neither Agree Nor Disagree”), yet they still attracted substantial agreement (143 and 153 participants respectively).

The category with the lowest, albeit still considerable, intention to increase data use was counseling and parent engagement, where 148 participants agreed or strongly agreed—potentially reflecting more sensitivity or uncertainty around applying data in relational or supportive roles.

Overall, the data reflects a generally strong willingness to integrate data-driven approaches, especially in domains directly tied to instruction, assessment, and school-wide collaboration.

The open-ended responses to the question on additional intended uses of data revealed a range of perspectives, although the majority of participants either explicitly stated that they had nothing further to add or reiterated that the previous options had covered their needs. Among the more substantive contributions, several respondents emphasized data use for improving working conditions, understanding student behavior and learning difficulties, and enhancing classroom management through tools such as school mediation or behavior tracking.



Some educators highlighted their interest in individualized learning, student assessment, and the development of tailored educational materials based on student preferences and documented needs.

Others referred to collaborative planning, lesson design, and feedback processes, pointing to the role of data in fostering reflective teaching practices. Notably, a few participants also mentioned broader goals such as school administration, project planning, and European collaborations, as well as the ethical dimension of objectively evaluating educational stakeholders.

In summary, while many respondents felt that the closed-ended options were sufficient, those who elaborated emphasized practical applications of data to support pedagogical effectiveness, personalized instruction, classroom management, and evidence-based decision-making.

7.3.10 Open-ended Questions (Section J)

The open-ended question that followed the closed-item list provided valuable insights into additional perceived uses of data in the educational context. While a significant number of respondents indicated that the listed options were sufficient—using expressions such as “με καλύψατε,” “δεν έχω να προσθέσω κάτι άλλο,” and “όλα τα παραπάνω”—a noteworthy subset offered more nuanced suggestions reflecting both practical needs and personal aspirations.

Several participants emphasized the potential of data to improve working conditions for teachers, noting the need to “βελτιωθούν οι εργασιακές συνθήκες των εκπαιδευτικών” and to address “την εξουθένωση του εκπαιδευτικού” resulting from increasing bureaucratic demands. Others pointed to the value of data in student behavior management, proposing its use in “προβλήματα συμπεριφοράς μαθητών και σχολική διαμεσολάβηση” as well as in tackling bullying and promoting more supportive classroom relationships.

In the pedagogical domain, many highlighted the importance of individualized learning and targeted instruction, expressing interest in using data for “εξατομικευμένη μάθηση”, “καλύτερη απόδοση”, and “στοχευμένη διδακτική μέθοδο”. Some teachers mentioned their desire to use data for designing evidence-based educational materials, referring to “παραγωγή υλικού διδασκαλίας” and “ανάπτυξη εκπαιδευτικού υλικού που να βασίζεται σε τεκμηριωμένες ανάγκες”. Additionally, several respondents emphasized the role of data in lesson planning, project-based learning, and classroom activity design, using terms such as “σχεδιασμός δραστηριοτήτων”, “μαθησιακή διαδικασία”, and “σχεδιασμό εποπτικού υλικού.”

Beyond the classroom, data was also seen as instrumental in administrative and management tasks, including “διοίκηση και οργάνωση εκδηλώσεων”, “καταχώριση απουσιών”, and “συνεργασίες σε ευρωπαϊκό επίπεδο”. A few participants envisioned using data for their own professional development, stating purposes such as “προσωπική εξέλιξη γνώσεων” and “ανάπτυξη της επιστημονικής μου έρευνας”.

Several educators voiced the importance of critical thinking, student progress monitoring, and feedback mechanisms, referring to data use in “αναστοχασμό της διδακτικής μου πρακτικής”, “παρακολούθηση της προόδου των μαθητών”, and “ανατροφοδότηση”. A small number of comments also highlighted the potential of data in equity-focused decision-making, “ισότητα όλων στην εκπαιδευτική διαδικασία”, and even in AI-supported teaching, “χρήση της AI τεχνολογίας στη διδασκαλία.”

Notably, some comments reflected skepticism or frustration, often related to the lack of time or practical application of training: “υπάρχει και ο ελεύθερος χρόνος...”, “μόνο με τη δουλειά μας



ασχολούμαστε”, or a desire to avoid ineffective training experiences: “όχι άλλες ανεπιτυχείς επιμορφώσεις με πρόχειρο σχεδιασμό.”

Overall, these open responses enriched the quantitative findings by illustrating educators’ broader reflections on how data can—and should—be used to support instructional quality, professional growth, classroom management, and educational equity. The diversity of answers reinforces the need for flexible, context-sensitive strategies when designing data literacy initiatives in education.

7.3.11 Summary

The national survey on data literacy in Greece, involving 254 participants, reveals a professional community characterized by high educational attainment, extensive teaching experience, and strong digital skills.

Most respondents are female, middle-aged, and active educators, with a significant portion working in urban or semi-urban schools and holding postgraduate degrees.

Despite this strong educational background, only a minority have received formal training in data literacy; most report gaining relevant skills through informal channels such as self-study or peer learning.

Overall, participants demonstrate strong familiarity with digital and AI literacy concepts, and they widely acknowledge the importance of data literacy as part of the modern educator’s role.

Most educators view data as essential for supporting learning, assessment, research, and evidence-based decision-making. There is also broad consensus regarding the significance of legal, ethical, and privacy considerations in educational data use.

However, there are notable gaps in understanding and confidence when it comes to more specialized areas, such as statistical literacy, learning analytics, and information literacy, with many respondents expressing ambivalence or uncertainty in these domains.

The survey results indicate that while teachers and administrators appreciate the theoretical value of data-driven approaches, their practical application remains limited.

Although a majority feel confident in reading and interpreting data visualizations, fewer than half report being familiar with data analysis methods or digital tools for managing data. Similarly, less than half of the respondents are actively involved in collecting, analyzing, or sharing data as part of their professional practice, and only a minority regularly collaborate with colleagues or communicate data to students, parents, or administration.

This suggests a significant skills gap between general digital competence and the specialized practices needed for effective data literacy in educational settings.

Despite these limitations, the attitudes of Greek educators towards data use are overwhelmingly positive. Most believe that data can enhance teaching, learning, assessment, and personalization, and a majority recognize the role of data-driven methods in promoting educational equity.



Nevertheless, concerns about increased workload and time constraints associated with data practices are widespread, indicating that practical barriers may impede the broader adoption of data-informed methods.

A critical finding of the survey is the strong dissatisfaction with the current policy and curriculum landscape. Nearly sixty percent of respondents believe that the Greek educational system and school curricula do not sufficiently promote or integrate data literacy.

Few see teachers as adequately prepared to address the ethical dimensions of data use, and most view curriculum coverage of core data skills—such as collection, analysis, visualization, and communication—as insufficient.

While some educators perceive school leaders as important in advancing data literacy, others express ambivalence or dissatisfaction, pointing to inconsistencies in administrative support and strategy.

The need for high-quality professional development emerges as a major theme.

Most participants express keen interest in workshops, seminars, online resources, and opportunities for peer collaboration to develop their data literacy skills.

However, there is widespread dissatisfaction with the relevance and availability of current training offerings, and key obstacles such as insufficient resources, limited time, unclear policy direction, and ethical concerns are frequently cited.

Looking ahead, educators express strong intentions to make greater use of data in their work, especially for assessment, instructional design, and communication with stakeholders.

Open-ended feedback underscores a desire to apply data literacy to personalized learning, student support, classroom management, and professional development, as well as to administrative and research-related tasks. Nonetheless, challenges around workload, training quality, and the practical integration of data literacy into everyday teaching persist.

In summary, the survey presents a qualified and motivated educational workforce that values data literacy but faces significant systemic and practical barriers to its full integration.

The findings point to an urgent need for comprehensive policy reform, curriculum development, and investment in professional learning opportunities tailored to real classroom contexts.

Effective strategies will require not only enhancing individual skills but also building supportive school cultures, clarifying ethical and legal standards, and ensuring equitable access to digital infrastructure and resources.

For policymakers, these results highlight the importance of embedding data literacy systematically within curricula and supporting educators through sustained, context-specific professional development.

For school leaders and practitioners, the findings underscore the need to cultivate collaborative, data-informed cultures and provide concrete opportunities for teachers to experiment with and apply data literacy practices.



For researchers, the identified gaps and barriers suggest fruitful avenues for future study, including intervention research on effective capacity-building and the impact of data literacy on educational equity and student outcomes.

Ultimately, while enthusiasm and recognition of data literacy are high among Greek educators, realizing its potential will require coordinated action at every level of the education system.

7.4 Focus group

7.4.1 Understanding (Section A)

1. How would you define data literacy? What key skills and competencies do you associate with it?

Participants agreed that data literacy is a multifaceted competency that extends beyond the traditional understanding of reading or interpreting information. It involves the capacity to collect, process, evaluate, visualize, and ethically use both quantitative and qualitative data in educational and social contexts.

One participant noted: “Before talking about data literacy, we need to define what counts as data in education—ranging from grades to emotional cues gathered by sensors.” Another emphasized that “data literacy is the ability to understand, evaluate, manage, and communicate data using technological tools, but also critical thinking.”

The importance of ethical and responsible data use was also raised: “We need to understand where data come from, how reliable they are, and how they are used to make decisions.” Technology was seen as essential: “You can’t imagine data literacy without digital tools—visualization platforms, AI-powered systems, and more.”

2. Do you believe data literacy should be an essential competence for teachers and students today? Why or why not?

There was a broad consensus that data literacy is a fundamental 21st-century skill. Participants emphasized its integration from early education and across all subjects. One teacher said: “We live in an ocean of information. Being able to understand and evaluate data is essential for making sound decisions.”

Another stressed that “students must be exposed to data across subjects—it’s a transversal skill, like critical thinking.” It was also noted that educators need to be equipped not only to use data but to interpret and generate it: “Teachers must learn to read data, evaluate it, and use it to improve teaching and learning—not for controlling students.”

7.4.2 Views (Section B)

3. How would you view the generation and use of data in compulsory education overall?

The discussion revealed a fragmented and inconsistent use of data in schools. While some participants described formative assessments, surveys, and performance monitoring, others pointed out the lack of structured tools. As one participant noted: “We have grades and student results, but no way to systematically interpret them for decision-making.”

There was a strong call for improved tools: “Platforms like MySchool are mostly administrative; they don’t help us pedagogically analyze or visualize the data.”

4. In your opinion, what types of data do teachers use in schools?



Data used by educators include:

- Quantitative: test scores, grades, performance averages
- Qualitative: surveys, classroom observations, student feedback
- Informal: handwritten notes, behavior tracking, formative responses

5. In your opinion, how do teachers use that data?

As one participant reflected: “Good teachers always used data—even before we called it that.” In many cases, the use of data is intuitive rather than systematic. Others shared more structured examples: “From first to sixth grade, our students engage in age-appropriate data projects—from measuring weather to conducting surveys and analyzing results.”

6. In your opinion, what are the ethical implications of using student data? How do you evaluate the credibility and accuracy of data used in compulsory education?

Ethical concerns emerged as a central issue. Participants emphasized the need to safeguard student privacy and ensure transparency in data collection and interpretation. As stated, “It’s not just about collecting data, but who interprets it and for what purpose.”

Several expressed concern over the use of AI tools: “We don’t have platforms we can trust with student data. There’s always a fear of misuse or lack of consent.” Another added: “We must ensure student data doesn’t lead to bias or stereotyping that follows them through school.”

7. In your opinion, what are the main barriers and challenges of data literacy in compulsory education?

Key challenges identified include:

- Lack of professional development opportunities focused on data use.
- Limited access to or usability of digital tools for data analysis and visualization.
- Absence of institutional frameworks or strategic policy integrating data literacy across subjects.

One participant stated: “We can’t talk about data literacy if many teachers are still in the analogue age, relying on outdated materials.” Rapid technological change was also cited: “Tools evolve faster than we can adapt. Teachers don’t have time to catch up.”

7.4.3 Professional Development (Section C)

8. What type of support and training do you believe that teachers need to effectively implement data-driven educational practices?

Participants emphasized the need for long-term, practice-oriented professional development that combines technological skills with pedagogical and ethical awareness. One participant said: “Training should help us learn to read, produce, and use data effectively linked directly to our teaching practice.”

Another added: “It’s not just about learning how a tool works—it’s about building critical literacy to interpret data responsibly within our school setting.” Participants also advocated for the development of collaborative learning communities, sharing: “Knowledge grows collectively—we need professional learning networks for peer support.”

9. Would you prefer training sessions focused specifically on data literacy or integrated within broader pedagogical topics such as digital literacy or problem-based learning? Why?



Most participants favored integrating data literacy into broader educational areas. As one stated: “Data literacy isn’t a stand-alone subject—it’s a transversal skill that supports digital learning, assessment, and decision-making.”

There was also mention of curriculum alignment: “If we embed data literacy into projects, cross-subject tasks, and critical thinking exercises, it becomes meaningful and sustainable.” However, some participants suggested a hybrid approach: “We first need targeted training to build a shared understanding of what data literacy means, then embed it into broader themes.”

7.4.5 National Policy and Curriculum Integration (Section D)

10. In your opinion, is the educational system able to support and promote data literacy for teachers and students?

Responses were cautious, with many participants arguing that the education system currently lacks the infrastructure, culture, and strategic coordination to meaningfully support data literacy. One participant stated: “There’s no comprehensive strategy for data literacy—neither in curricula nor in teacher training.”

Another added: “We need a culture of data, not just tools. Right now, we operate based on intuition, not data-informed decision-making.”

11. What is your opinion on the current national education policy regarding data literacy? Are there any gaps or inconsistencies you have identified that you would like to comment on?

Participants identified major gaps and inconsistencies in the national approach. While policy initiatives emphasize digital transformation, data literacy remains vaguely defined. As noted, “There are curriculum references to statistics or data analysis, but without follow-through in teacher training or assessment criteria.”

There was a clear call for coherence: “Data literacy appears in some programs, but it’s fragmented. We need a clear, unified vision.”

12. Critically, how do you assess your national school curriculum in terms of integrating data literacy? What would you suggest improving it?

It was widely agreed that data-related concepts exist in some curriculum areas, but there is no comprehensive, interdisciplinary integration. One participant shared: “Statistics is in the math curriculum, but it’s rarely taught in ways that connect to real-world data usage.”

Suggested improvements included:

- Embedding data literacy in interdisciplinary, project-based activities.
- Linking learning objectives and assessment criteria to data-informed tasks.
- Ensuring vertical and horizontal curriculum alignment across subjects.

7.4.6 Summary

The focus group discussions provided deep insights into the evolving role and critical importance of data literacy in contemporary compulsory education. Data literacy was broadly conceptualized not simply as a technical ability, but as a composite competence that encompasses the capacity to collect, analyze, interpret, evaluate, and communicate data in meaningful, ethical, and pedagogically sound ways. Participants consistently emphasized that this competence is no longer optional—it is essential for students and educators alike in a rapidly digitizing and data-driven society.



There was strong consensus that data literacy should be treated as a **transversal skill**, to be embedded systematically across all subject areas rather than confined to specific disciplines such as mathematics or computer science. Participants advocated for the integration of data literacy into everyday teaching and learning, aligning it with inquiry-based, problem-based, and interdisciplinary pedagogical approaches. They also highlighted that data literacy plays a vital role in fostering **critical thinking, civic responsibility, and digital citizenship**.

Despite broad agreement on its importance, significant barriers to the effective implementation of data literacy were identified. These include:

- **Lack of structured and targeted professional development** for educators on how to integrate data literacy in the classroom.
- **Limited access to user-friendly and ethically secure digital tools** for data collection, visualization, and analysis.
- **Fragmented or absent national policy frameworks**, which fail to articulate a coherent vision for data literacy in education.
- **Inequities in infrastructure and digital capacity**, especially between urban and rural schools or between public and private institutions.

Ethical concerns featured prominently in the discussion. Participants expressed serious reservations about the **security, privacy, and governance** of student data—especially considering emerging technologies such as generative artificial intelligence and predictive analytics. The fear of misuse, bias, or the creation of stigmatizing student profiles was frequently raised. As one participant aptly noted, "We must ensure that data is used to empower learners, not to classify or limit them." The need for transparent, human-centered, and rights-based data governance policies was underscored repeatedly.

To overcome these challenges and build a more data-literate educational ecosystem, participants proposed a set of interconnected actions:

1. **Embed data literacy systematically in national curricula** through interdisciplinary projects, real-world problem-solving, and age-appropriate progression from primary through secondary education.
2. **Develop comprehensive teacher training models** that go beyond tool usage to include pedagogical design, ethical reasoning, data-informed decision-making, and interdisciplinary collaboration.
3. **Invest in safe and robust digital infrastructure**, enabling the secure collection and use of educational data at school level.
4. **Promote a culture of data-informed reflection**, where educators, students, and school leaders use data not for surveillance, but for dialogue, improvement, and innovation.

Ultimately, the focus group revealed that data literacy is **not a niche technical skill**, but a cornerstone of **modern educational transformation**. It intersects with key policy priorities, including digital competence, sustainability, equity, and inclusion. Preparing students to navigate, question, and contribute to the datafied world in which they live requires educators to be equally empowered.

Therefore, building capacity for data literacy is not only a professional necessity, it is an ethical imperative for 21st-century education systems committed to learner agency, evidence-informed pedagogy, and social justice.



7.5 Country Summary

The national research in Greece, based on literature, a teacher survey, and a focus group, shows that data literacy is not yet fully recognized or systematically supported in the country's compulsory education system. Although some parts of the national curriculum include elements of data use—such as collecting and analyzing information in science, mathematics, and social studies—there is no formal or structured framework for teaching data literacy in Greek schools. While digital skills and computational thinking are present in educational policies, data literacy is only indirectly addressed. There is no specific national policy or strategy for data literacy in education, which makes its application across schools uneven and inconsistent.

The national teacher survey revealed that most educators understand the value of data in supporting teaching, learning, and decision-making. However, many do not feel confident or prepared to use data in their daily practice. Teachers reported that they often lack training, time, resources, and clear guidance on how to use data effectively. Only a small number of teachers regularly use data collection or analysis in their work.

The focus group confirmed these challenges. Teachers agreed that data literacy should be a core skill in education and that it involves more than just technical ability—it also includes critical thinking, ethical understanding, and the ability to explain and communicate information clearly. Participants highlighted the need for better training, simpler tools, and more support from school leadership and education authorities.

At the same time, the research found several promising practices. Some schools have successfully integrated data activities into classroom projects, often in collaboration with universities or through European-funded programs. These cases show that with the right support and motivation, students can learn to work with data in meaningful and practical ways.

In conclusion, the Greek education system has the foundation and interest to promote data literacy but lacks the coordinated policies, training, and resources needed for wide and effective implementation.

7.5.1 Conceptualization of the term 'Data Literacy'

In theory, data literacy is seen as the ability to understand, analyze, and use data effectively. This includes being able to read charts and graphs, interpret data, ask questions about its accuracy or fairness, and communicate findings clearly. It also involves being aware of ethical issues, such as privacy and responsible use of data.

In the Greek context, data literacy is mostly understood as a combination of technical, cognitive, and ethical skills. Teachers and experts agree that data literacy is not just about working with numbers or using digital tools. It also means using data to explore real-life questions, solve problems, and support learning across different subjects.

In practice, data literacy is not taught as a separate subject in Greece. Instead, it appears in different parts of the curriculum—for example, in science experiments, geography projects, or when students analyze survey results. Teachers who participated in the research described it as a skill that should be used in many subjects and linked to student-centered learning.

The focus group stressed that data literacy should be developed in ways that match students' age and needs. For younger students, this could mean collecting simple data like weather patterns; for older students, it could include analyzing population statistics or interpreting digital maps. Teachers also said that data literacy should always include reflection on how data is used, who creates it, and what effects it can have.



In summary, in Greece, data literacy is recognized as a key skill that combines understanding, critical thinking, ethical awareness, and communication. However, it is not yet supported by a shared definition or official framework in the national education system.

7.5.2 Challenges and Gaps

The Greek national research highlighted several important challenges in promoting data literacy in schools.

First, there is no official national policy or curriculum that clearly defines or supports data literacy. As a result, it is introduced in different ways depending on the subject which leads to gaps and inconsistency.

Second, most teachers have not received formal training in data literacy. Although many have strong general digital skills, they often lack experience with data collection, analysis, and presentation. This means that even motivated teachers may struggle to include data literacy in their lessons.

Third, many schools lack access to modern digital tools, especially in rural areas. Without this infrastructure, it is difficult to carry out hands-on data activities or use online platforms for learning.

Fourth, teachers feel that the curriculum is already too full. They want to teach data literacy, but they do not always have the time or support to add new content. They also need more practical teaching materials and examples they can use directly in class.

Finally, there are concerns about student data privacy. Teachers are often unsure how to manage data safely, especially when collecting or analyzing information about students. These worries can prevent schools from using data more effectively.

7.5.2 Best practices and recommendations

Despite the challenges, the research identified several useful examples and ideas for improving data literacy in Greek schools.

One effective approach is using project-based learning. In some schools, students have collected and analyzed real data from their communities—such as information on recycling habits or local traffic—and presented their findings to classmates. These activities help make data literacy more engaging and meaningful.

Another good practice is using digital tools that allow students to work with real data. Platforms that offer visualizations, maps, or graphs can help students develop practical data skills in subjects like geography, math, or science. Successful projects often used open-access tools and involved cooperation between teachers and external partners such as universities or public institutions.

A strong recommendation from both teachers and experts is the need for high-quality teacher training. Training programs should not only explain how to use digital tools, but also show how to design lessons that include data collection, critical thinking, and communication. Ongoing support, such as peer learning or mentoring, is also important to help teachers apply what they learn.

Policymakers are encouraged to include data literacy clearly in national education strategies. It should appear in the curriculum as a cross-subject skill, with clear learning goals for different school levels. Schools also need guidelines on data ethics and student privacy, so that they can feel safe using data in the classroom.



Finally, building a culture of data use in schools is important. This means encouraging collaboration among teachers, sharing examples of good practice, and helping school leaders understand how data can support learning and improvement.

In summary, Greece has promising starting points for developing data literacy in education. With better policies, training, tools, and collaboration, data literacy can become a regular and valuable part of student learning.

7.6 References

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8. National Report [Poland]

The Polish National Report was authored by Paweł Solarz, Tomasz Szemberg, Justyna Szpond.

This national report presents the findings of the UKEN team on data literacy in compulsory education. The results indicate that while data literacy is increasingly relevant in education, its conceptualization and implementation in the Polish system remain underdeveloped and inconsistent.

Data literacy is not well recognized as a standalone competence in Poland. It is often conflated with broader digital skills and treated as a subset of digital literacy. National curricula, especially in mathematics, informatics, and science, include some data-related elements, such as basic statistics, graphing, and spreadsheet use, but these are not integrated into a coherent framework. There is no dedicated policy or structured pedagogical model for data literacy, and its presence in teaching depends largely on individual teacher initiative or specific projects.

The survey of educators revealed moderate familiarity with data literacy concepts and a positive attitude toward their importance. However, significant gaps exist in educators' confidence and readiness to apply data-driven methods in teaching. Most teachers have limited formal training in data literacy and cite time constraints, lack of resources, and insufficient support as key barriers. Data use tends to focus on assessment and administrative reporting, with less emphasis on student learning, personalization, or inquiry-based learning. Collaborative and communicative uses of data are particularly underdeveloped.

Case studies and focus group insights confirmed that while innovative practices exist, often involving digital tools or game-based learning, they are fragmented and not systematically scaled. Teachers and stakeholders expressed interest in professional development, ethical guidance, and clearer integration of data literacy into the curriculum. At the policy level, national strategies recognize the importance of digital and analytical skills, but data literacy remains loosely defined and unevenly implemented.

Poland's education system acknowledges the growing relevance of data-related competences but lacks a unified vision or structure for data literacy. To move forward, the system requires stronger curricular alignment, targeted teacher training, and clear policy directives that treat data literacy as a fundamental educational competence rather than a peripheral add-on to digital education.

8.1 Literature review

9.1.1 National curricula

8.1.1.1 Compulsory education description

Legal Framework and Overview

Compulsory education in Poland is governed by the Law on School Education (Prawo oświatowe) and overseen by the Ministry of National Education. Education is free and compulsory for all children and youth from the beginning of the school year in which they turn 7 until they complete at least 8 years of primary education and one additional year of post-primary education, or until they turn 18.

Structure of the School System

The structure of education in Poland includes the following stages:

- Pre-primary education (Edukacja przedszkolna): Available for children aged 3 to 6. One year of pre-primary education (zerówka) is compulsory for six-year-olds to prepare them for primary school.
- Primary education (Szkola podstawowa): Lasts 8 years, for children aged approximately 7 to 15. It is divided into two stages:
 - Grades 1–3: Early education, taught mostly by one teacher
 - Grades 4–8: Subject-specific teaching
- At the end of grade 8, students take the national “eighth-grade exam” (egzamin ósmoklasisty), which influences their secondary school options.
- Secondary education (Szkoly ponadpodstawowe): Compulsory until age 18. Students choose from:
 - General secondary school (liceum ogólnokształcące), 4 years
 - Technical secondary school (technikum), 5 years
 - Stage I sectoral vocational school (branżowa szkoła I stopnia), 3 years
 Students who complete liceum or technikum can take the matura exam (egzamin maturalny), which is required for entry into higher education.
- Post-secondary education (non-compulsory): Options include:
 - Stage II sectoral vocational school (branżowa szkoła II stopnia)
 - Post-secondary schools
 - Higher education institutions (HEIs)

Curriculum and Governance

The national core curriculum is defined by the Ministry and implemented in all public schools. Local authorities (gmina and powiat) are responsible for managing schools, including staffing and infrastructure.

Schools follow a centrally defined curriculum and timetable, with some autonomy in teaching methods.

Religion or ethics classes are offered but are optional.

Teacher Training and Professional Development

Teachers must hold a master's degree and pedagogical qualifications. In-service training is provided by teacher development centres and encouraged throughout a teacher's career.

Teachers progress through a structured promotion system: trainee, contract, appointed, and chartered teacher.

Recent Developments and Reforms

A significant reform in 2017 eliminated the lower secondary school level (gimnazjum) and extended primary education from 6 to 8 years.

Current reforms emphasize digital competencies, STEM education, vocational pathways, and civic engagement.

8.1.1.2 Data literacy in national curricula

Level	Discipline / Course	Description
Pre-school	General integrated activities	No formal data-literacy instruction. Some early activities may involve recognizing patterns, simple categorization, and basic comparisons (e.g., counting, sorting objects).
Primary (grades 4–8)	Mathematics	Focus on descriptive statistics (mean, median, mode), interpreting and creating charts, tables, and graphs. Basic problem-solving using numerical data.
Primary (grades 4–8)	Computer Science	Introduction to spreadsheets (basic formulas, sorting), simple data visualization. Didactic techniques include project-based learning (e.g., creating tables from real-world data).

Primary (grades 4–8)	Science (Biology, Geography, Physics)	Collecting simple data during experiments and observations. Creating and interpreting graphs and tables. Learning to observe trends and patterns.
High School	Mathematics	Extended descriptive and inferential statistics, data interpretation tasks. Emphasis on data-driven problem-solving and working with complex charts.
High School	Computer Science	Advanced spreadsheet usage, data filtering and sorting. Simple data visualizations. Occasionally, introduction to data from open sources.
High School	Science (Biology, Geography, Physics)	Working with measurement data, presenting results using graphs and tables. Evaluating reliability and sources of data in lab and field studies.
High School	Business and Management	Interpreting economic and financial data. Using data to make informed decisions and case studies. Some projects may include creating simple data reports or presentations.

Table 18 Poland Report [DL in national curricula]

8.1.1.3 Frameworks for data literacy in education

Currently, there is no specific, structured national framework or model dedicated exclusively to data literacy in the Polish school curriculum.

8.1.1.4 Summary

Elements of data literacy are integrated into various subjects, mainly mathematics, computer science, science disciplines, and business education. These include interpreting data, creating simple visualizations, and using spreadsheets. However, these skills are taught as part of broader competencies (e.g., mathematical reasoning, digital competence) rather than through a dedicated data literacy pathway.

The development of data-related skills depends largely on individual schools and teachers. Some schools integrate project-based learning involving data collection and analysis, and extracurricular activities may further support data literacy. National initiatives like *Laboratoria Przyszłości* (Laboratories of the Future) and selected NGO programs promote modern digital skills, occasionally including data handling and visualization. Still, there is no centralized, cohesive approach or pedagogical framework fully covering data literacy across educational levels.

8.1.2 Policy context

8.1.2.1 National educational policy bodies

Policy body/institution	Brief description	URL
Ministry of the National Education (Ministerstwo Edukacji Narodowej, MEN)	Central authority responsible for national education policy, including curriculum development and implementation. Sets the core curriculum for all school subjects.	https://www.gov.pl/web/edukacja
Educational Research Institute (Instytut Badań Edukacyjnych, IBE)	Government research institute supporting the development of educational policies. Conducts studies related to key competences, including digital skills and critical thinking, which are connected to data literacy.	https://ibe.edu.pl
National Institute for Educational Development (Krajowy Ośrodek Wsparcia Edukacji Zawodowej i Ustawicznej, KOWEŻIU)	Supports vocational and lifelong learning education. Occasionally develops resources and guidelines including digital competences that relate to data literacy.	https://www.koweziu.edu.pl
NASK – National Research Institute (NASK – Państwowy Instytut Badawczy)	Implements national programs on digital competence and cyber security. Coordinates educational programs promoting responsible data use and digital skills.	https://www.nask.pl

Office of Electronic Communications (Urząd Komunikacji Elektronicznej, UKE)	Though not an educational body, UKE runs programs supporting digital literacy for youth, which sometimes include elements related to data handling and critical data use.	https://www.uke.gov.pl

Table 19 Poland Report [National educational policy bodies]

8.1.2.2 Educational policies for DL in CE

Policy body/institution	Resource type	URL	Author(s)	Description
Ministry of National Education (MEN)	Legislation / Curriculum	https://www.gov.pl/web/edukacja/podstawa-programowa	MEN / Experts appointed by MEN	National Core Curriculum (Podstawa programowa) includes elements of DL in Informatics and Maths for grades 4–8. Covers data collection, organization, basic analysis, and visualization.
Ministry of Digital Affairs	Strategy Document	https://www.gov.pl/web/cyfryzacja/polietyka-cyfrowa-polski	Ministry of Digital Affairs	Digital Poland strategy includes education goals such as increasing data competences of youth and integrating DL into education.
Institute of Educational Research (IBE)	Research Report	https://librepo.pl/resources/handle/20.500.12153/3492	IBE Researchers	Report on students' digital competences, with a focus on data interpretation and information literacy. Highlights curriculum gaps and needs.
Supreme Audit Office (NIK)	Public Report	https://www.nik.gov.pl/aktualnosci/nik-o-nauczaniu-informatyki.html	NIK	Evaluation of IT education in schools; calls for better integration of practical digital skills including data usage.

Table 20 Poland Report [Educational policies]

8.1.2.3 Strategic plans for DL in CE

Note: In the Polish context, DL is rarely a stand-alone concept in official strategic plans, but appears under broader terms such as **digital competences**, **informatics education**, or **STEM development**.

Strategic plan	URL	Author(s)	Description
Digital Competences Development Programme 2030 (PRKC 2030)	https://www.gov.pl/web/cyfryzacja/program-rozwoju-kompetencji-cyfrowych-do-2030-roku	Ministry of Digital Affairs	A national strategy promoting digital competences, including data use, critical thinking, and computational thinking in education. Targets schools, teachers, and learners.
Integrated Skills Strategy 2030 (ZSU 2030)	https://www.gov.pl/web/edukacja-i-nauka/zintegrowana-strategia-umiejtnosci-2030	Ministry of Higher Education and Science	Strategic framework for lifelong learning; emphasizes development of analytical, digital, and data-related skills, including in general education.

Table 21 Poland Report [Strategic plans]

8.1.2.4 Summary

Strategically, Poland has developed several national-level plans that provide a supportive framework for data literacy in education. The Digital Competences Development Programme 2030 places strong emphasis on building citizens' digital capabilities, including data-related skills, starting from an early age. Similarly, the Integrated Skills Strategy 2030 highlights the importance of analytical thinking and digital competence across all levels of education, reflecting alignment with EU goals such as the Digital Education Action Plan. The Digital Poland Operational Programme has funded numerous initiatives supporting teacher training and ICT use in classrooms, indirectly promoting the infrastructure and pedagogical conditions for data literacy to take root. Moreover, the national AI development policy identifies data awareness and algorithmic thinking as necessary educational foundations in the age of artificial intelligence.

Overall, while Poland does not yet possess a fully defined or formalized framework specifically labeled as "data literacy education," the constituent elements of DL are present and expanding. They appear within subjects like Informatics and Mathematics, as well as in national strategies aimed at upskilling both students and teachers. A key finding of this review is the need for stronger policy coherence and the explicit naming and framing of data literacy within existing curricula and teacher training structures. This would help better align national policies with emerging European standards and ensure more systematic and sustainable implementation of data literacy in compulsory education.

8.1.3 Scientific Research

There is not any scientific research traced in Poland regarding DL.

8.2 Case studies

8.2.1 Description

Case study 1: Cyberlekcje 3.0 Bezpieczne zarządzanie danymi – poszanowanie praw autorskich	
URL	https://www.gov.pl/attachment/e10df2fd-71d7-4ff7-a19d-b97cd1338539
Educational level/context	Grades 7–8 of primary school; lesson on safe data management and copyright awareness, part of a cyber safety education project.
Description	A two-part lesson introducing students to copyright, plagiarism, and responsible use of online content through discussion, critical thinking, surveys, and creative tasks.
Methodology	Interactive methods: discussion, critical thinking routines, group work, practical tasks, and a student-led survey on peers' internet use and copyright awareness.
Technology	Use of a computer with internet access, digital tools like Canva, Genially, piZap, and an educational video on YouTube.
Outcomes	Students understand plagiarism and copyright, can explain Creative Commons licenses, analyze peer behavior, and create informed, original works respecting intellectual property.
Case study 2: Scenariusz lekcji: Projekt grupowy	
URL	https://zpe.gov.pl/a/projekt-grupowy/DmRS0YNm8
Educational level/context	Upper secondary school (high school / technical school), for 1st-year students in computer science. It's part of a group project lesson aimed at preparing students for Matura exam tasks.
Description	A group-based project lesson where students work in pairs or trios over ten 45-minute sessions to plan, collect information, create digital materials (folders, databases, reports), print outputs, and present their work using evaluation forms.
Methodology	Project-based learning: collaborative group work, decision-making, problem-solving, planning, and communication supported by teacher facilitation and consultations.
Technology	Use of Windows computers with Internet Explorer (or another browser), various user software (text editor, spreadsheet, database), and printing tools.
Outcomes	Students learn to plan and organize project work, gather and select information, solve problems, collaborate, use software tools, manage files (including disk transfers), produce printed reports, and evaluate peer work.
Case study 3: Scenariusz dla edukacji wczesnoszkolnej Cybercraft – bezpieczeństwo w sieci z Minecraftem Education	
URL	https://zpe.gov.pl/a/scenariusz-dla-edukacji-wczesnoszkolnej/D5GAj24Jc

Educational level/context	Primary school, grades 1–3; lesson on online safety using game-based learning.
Description	Students explore a Minecraft Education environment where they complete tasks related to safe internet use and data protection.
Methodology	Exploratory, game-based learning; individual and group work with physical worksheets.
Technology	Minecraft Education Edition, printed worksheets, classroom computer with internet access.
Outcomes	Students learn basic online safety principles, identify digital threats, and apply rules for protecting personal data.
Case study 4: Scenariusz dla klas IV-VI szkoły podstawowej Cybercraft- bezpieczeństwo w sieci z Minecraftem Education	
URL	https://zpe.gov.pl/a/scenariusz-dla-klas-iv-vi-szkoly-podstawowej/Dl6y7yxez
Educational level/context	Primary school, grades 4–6; intermediate level online safety and data awareness.
Description	An expanded version of the earlier module, this lesson deepens understanding of data privacy, digital consent, and internet responsibility using Minecraft-based tasks.
Methodology	Practical team-based learning through gaming and guided class discussion.
Technology	Minecraft Education, worksheets, videos, classroom projector or screen.
Outcomes	Students recognize digital risks, understand personal data protection, and apply safe behaviors in online environments.
Case study 5: Stwórz mapę okolicy swojej szkoły – część 1	
URL	https://edu.esri.pl/wp-content/uploads/2023/08/Nowy-Stworz-mape-swojej-szkoly-czesc-1.pdf
Educational level/context	Lower-secondary and secondary school—suitable for middle and high school geography, IT, or social studies classes.
Description	Students create a digital map of their school’s surroundings using ArcGIS Online. They import CSV files (e.g., local landmarks or facilities), style data layers, adjust basemaps, and prepare the map for sharing.
Methodology	Step-by-step workshop: practical activities guided by teacher instructions. Students work individually or in small groups to import data, apply thematic styling, explore pop-ups, and configure map layouts.
Technology	Uses ArcGIS Online (Map Viewer), CSV data import, and standard web browsers. Familiar software environment with emphasis on cartographic styling and data visualization.
Outcomes	Students develop digital mapping skills, visualize local geographic data, and apply spatial thinking to their school environment using ArcGIS Online.

Table 22 Poland Report [Case studies]

8.2.2 Summary

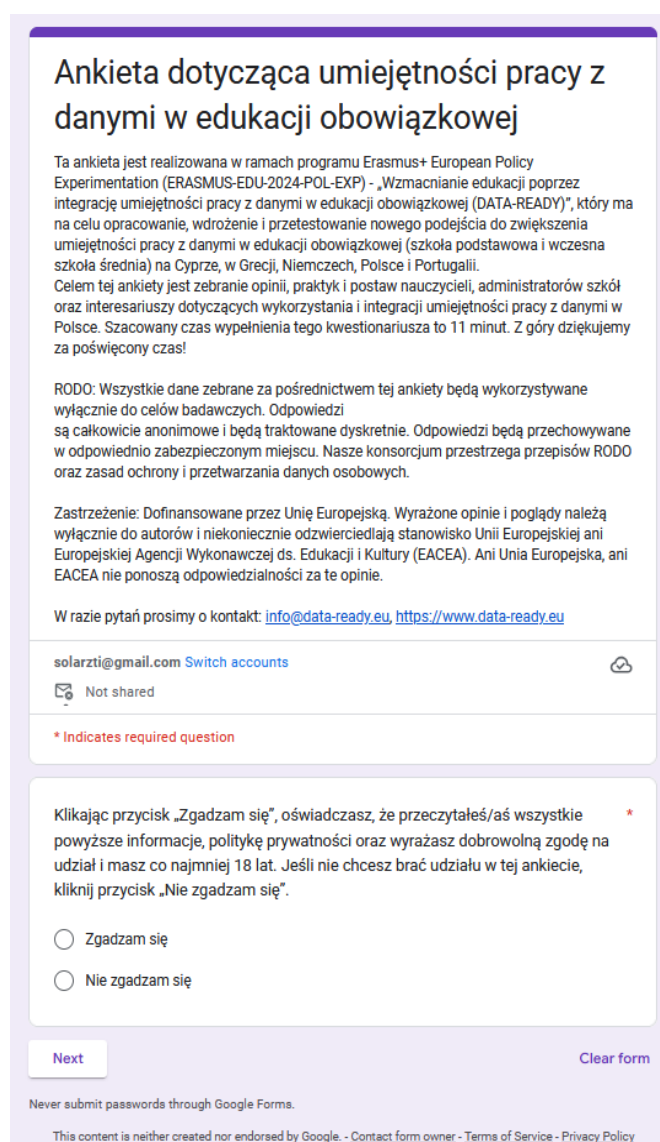
Case study of the Polish national report presents five case studies that illustrate various approaches to fostering data literacy in compulsory education. The first case, *Cyberlekcje 3.0*, involves a two-part lesson for grades 7–8 focused on copyright awareness and safe data use. Using interactive methods and tools like Canva and YouTube, students learn to recognize plagiarism, understand Creative Commons licenses, and create original works. The second case, *Projekt grupowy*, is a high school-level project-based lesson in computer science, where students collaboratively plan and execute a 10-session project involving data collection, organization, and presentation using digital tools. The third and fourth case studies use Minecraft

Education to teach online safety and data protection to students in grades 1–3 and 4–6 respectively, through game-based learning and class discussions. These lessons emphasize understanding digital threats, applying protective behaviors, and developing digital citizenship. The fifth case, *Stwórz mapę okolicy swojej szkoły*, guides lower- and upper-secondary students through the process of creating a digital map of their school’s surroundings using ArcGIS Online. Through hands-on work with CSV files and digital layers, students build spatial thinking and basic data visualization skills.

Collectively, these examples show that while data literacy is not formally embedded across the curriculum, Polish schools are implementing innovative, often technology-enhanced, practices that develop students’ competencies in data handling, analysis, and ethical use in diverse and age-appropriate contexts.

8.3 Survey

The national survey in Poland was accessible through this link: <https://forms.gle/K98X7G59wMRa8TzX8>.



Ankieta dotycząca umiejętności pracy z danymi w edukacji obowiązkowej

Ta ankieta jest realizowana w ramach programu Erasmus+ European Policy Experimentation (ERASMUS-EDU-2024-POL-EXP) - „Wzmacnianie edukacji poprzez integrację umiejętności pracy z danymi w edukacji obowiązkowej (DATA-READY)”, który ma na celu opracowanie, wdrożenie i przetestowanie nowego podejścia do zwiększenia umiejętności pracy z danymi w edukacji obowiązkowej (szkoła podstawowa i wczesna szkoła średnia) na Cyprze, w Grecji, Niemczech, Polsce i Portugalii.

Celem tej ankiety jest zebranie opinii, praktyk i postaw nauczycieli, administratorów szkół oraz interesariuszy dotyczących wykorzystania i integracji umiejętności pracy z danymi w Polsce. Szacowany czas wypełnienia tego kwestionariusza to 11 minut. Z góry dziękujemy za poświęcony czas!

RODO: Wszystkie dane zebrane za pośrednictwem tej ankiety będą wykorzystywane wyłącznie do celów badawczych. Odpowiedzi są całkowicie anonimowe i będą traktowane dyskretnie. Odpowiedzi będą przechowywane w odpowiednio zabezpieczonym miejscu. Nasze konsorcjum przestrzega przepisów RODO oraz zasad ochrony i przetwarzania danych osobowych.

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Figure 156 Poland Survey [Screenshot]

8.3.1 Demographic Data (Section A)

Most of the respondents (86 out of 102) identified as female, followed by male (14 out of 102), with 2 choosing not to disclose their gender. This gender distribution is also commonly observed among students preparing for a teaching career and likely reflects the gender composition of the teaching workforce more broadly.

Płeć

102 responses

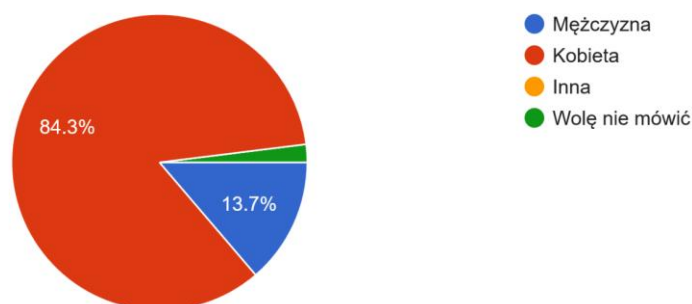


Figure 157 Poland Survey [Gender]

The age distribution of respondents shows a broad range, with the majority falling within the 41–60 age bracket. The most represented age group is 46–50 (21 respondents), followed closely by 51–55 (19) and 56–60 (17). Younger participants (under 40) are relatively few, with only 16 respondents in total. The least represented groups are those aged 22–29 (2 respondents) and 66+ (1 respondent), indicating that the sample largely consists of mid-career and late-career individuals.

Wiek (lata)

102 responses

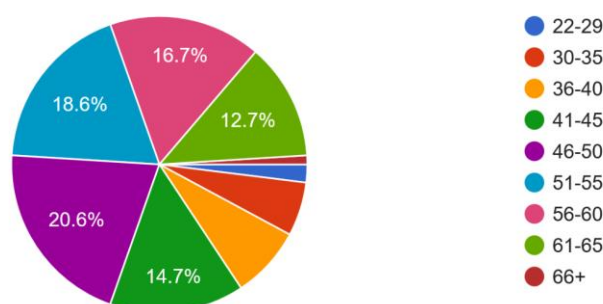


Figure 158 Poland Survey [Age]

Most respondents, who work as schoolteachers, hold a Master's degree (90 out of 102), indicating a high level of formal education within the group. Only a few reported having a Bachelor's degree (3), a Doctorate (6), or a qualification above the doctoral level (3).



Najwyższy poziom wykształcenia

102 responses

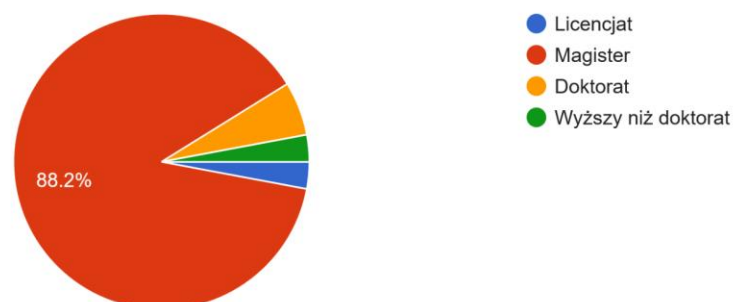


Figure 159 Poland Survey [Educational level]

Most respondents rated their ICT skills at an intermediate to high level. The majority selected level 4 (44 respondents) or level 3 (37), while fewer rated themselves at the highest level, 5 (16). Very few indicated low ICT skills, and none chose level 1, suggesting overall digital competence among the group.

Poziom umiejętności ICT (technologie informacyjno-komunikacyjne)

102 responses

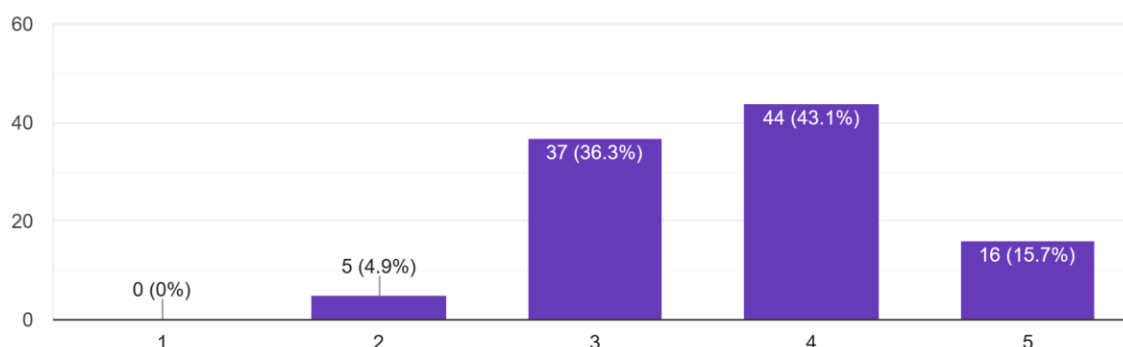


Figure 160 Poland Survey [ICT skills]

Most respondents have participated in some form of training related to data use, though most did so through informal means. While 27 reported no training at all, 36 indicated they were engaged in self-study or peer learning. Formal training was less common: 27 attended in-school programs, 9 completed university-level courses, and only 3 took part in lifelong learning programs offered by external institutions. This suggests that while interest and initiative exist, access to structured professional development in data literacy remains limited.

Czy uczestniczyłeś/aś w szkoleniach związanych z wykorzystaniem danych lub umiejętności pracy z danymi?

102 responses

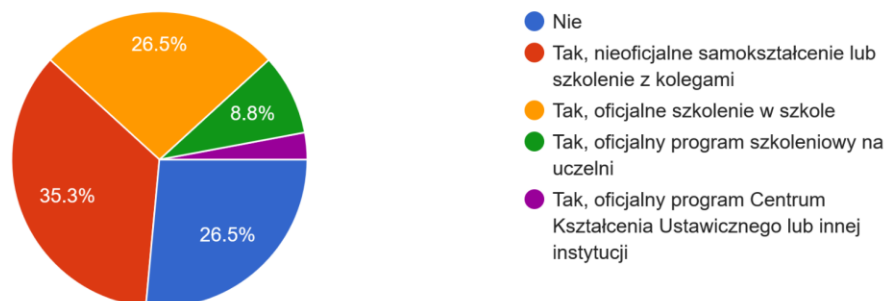


Figure 161 Poland Survey [Have you received training related to data use or Data Literacy?]

The next question focused on the participants' current roles within the education sector, directing them to follow-up questions tailored to their specific positions. The distribution of responses was as follows:

- Teachers - 85 respondents
- School Principals - 15 respondents
- Representatives of Educational Authorities - 2 respondents

These results show that most participants (around 83%) are practicing teachers, underscoring the survey's strong connection to classroom instruction. School principals accounted for 15% of the respondents, while 2% were involved in educational governance or policy-making roles.

Wybierz swoją aktualną rolę w edukacji

102 responses

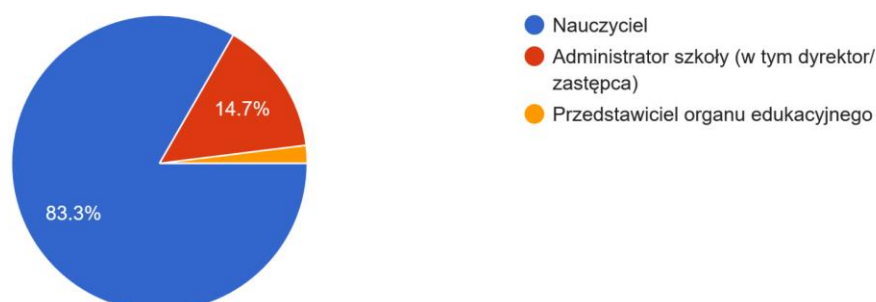


Figure 162 Poland Survey [Select your current role in education]

Section A: Demographic Data [Teacher]

A significant majority of teachers (64) reported having over 20 years of teaching experience, highlighting a predominantly experienced sample. Conversely, only a small proportion (11) indicated less than 7 years in the profession. These figures suggest that the group consists mainly of seasoned educators, which may contribute to a higher level of confidence and openness toward professional growth and pedagogical innovation.

Doświadczenie w nauczaniu (lata)

85 responses

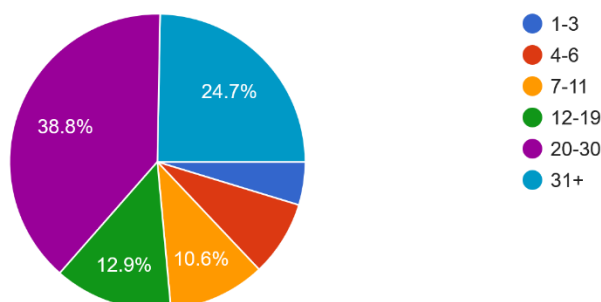


Figure 163 Poland Survey [Teacher: Teaching Experience (years)]

Most participants (42) reported working in primary schools, indicating that the sample is primarily composed of educators teaching children aged 7 to 12. Teachers from upper secondary schools made up a substantial portion as well (31), while those from lower secondary (9), and pre-schools (3) were less represented. This distribution suggests that the insights gathered reflect mainly the experiences of primary and upper secondary educators.

Typ szkoły

85 responses

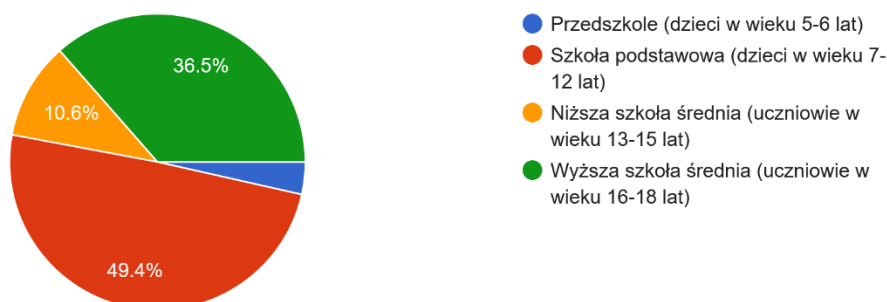


Figure 164 Poland Survey [Teacher: School type]

Most participants (60) are based in urban areas, where access to infrastructure, technology, and training opportunities may be more prevalent. However, the presence of a substantial rural contingent (25) provides insight into regional disparities and potential barriers faced by educators in more remote settings.



Region szkoły

85 responses

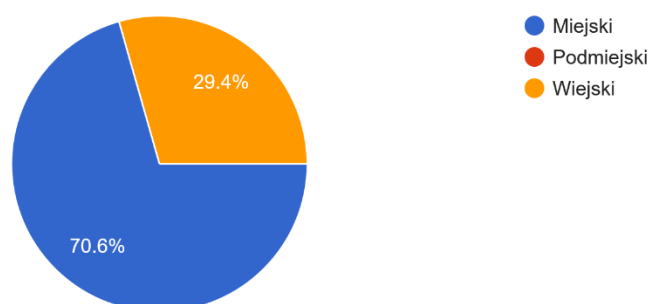


Figure 165 Poland Survey [Teacher: School region]

Approximately 67% of teachers (57) work in very large schools (181+ students), while around 17% (14) are employed in large institutions (121–180 students). A smaller portion (11%, or 9 teachers) work in medium-sized schools (61–120 students), and about 5% (4) teach in small schools with 21–60 students. Only one participant (1%) represents a very small school (1–20 students). This distribution shows that most teachers work in large or very large schools, which may offer greater access to digital infrastructure, more opportunities for staff collaboration, and stronger foundations for implementing data-informed practices.

Wielkość szkoły

85 responses

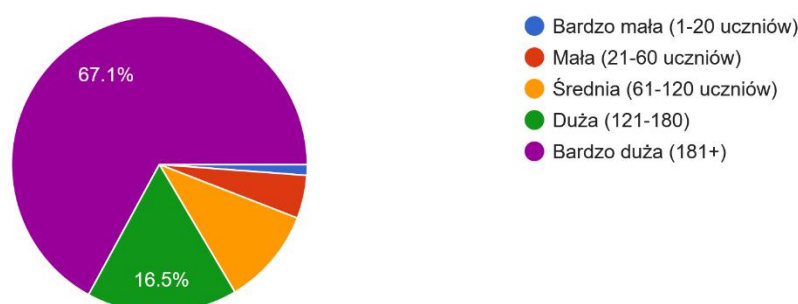


Figure 166 Poland Survey [Teacher: School size]

Participants were asked to report the number of teachers employed at their school, with responses ranging from 3 to 350. Most schools reported staffing levels between 20 and 70 teachers, suggesting that medium-sized institutions dominate the sample.

A few schools with fewer than 15 teachers likely represent small or rural settings, possibly with multigrade teaching. Conversely, some responses indicated 100 or more teachers, pointing to large urban or multi-campus schools.

This variation highlights the diversity of educational environments in the sample, which may influence resource availability, staff collaboration, and the implementation of data-informed practices.

Section A: Demographic Data [Administrator]

Participants reported varied experience in educational management, ranging from 1 to over 31 years. The largest group (5) had 1–3 years of experience, indicating a presence of newer administrators. More experienced respondents were spread across the 12–30 year range, with fewer in mid-level (4–11 years) or very long-term (31+ years) roles. This diversity suggests a mix of fresh and seasoned perspectives in the sample.

Lata doświadczenia w zarządzaniu oświatą
15 responses

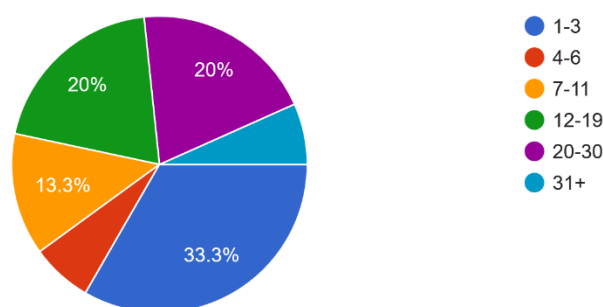


Figure 167 Poland Survey [Administrator: Experience (years)]

Most respondents (14 out of 15) serve as principals of primary schools (ages 7–12), with only one leading a lower secondary school (ages 13–15). The majority of these schools (10) are located in rural areas, while 5 are in urban settings.

This suggests that the sample is primarily composed of primary school leaders working in rural regions. Such a context may influence school size, resource availability, and access to digital tools or professional networks.

Typ szkoły
15 responses

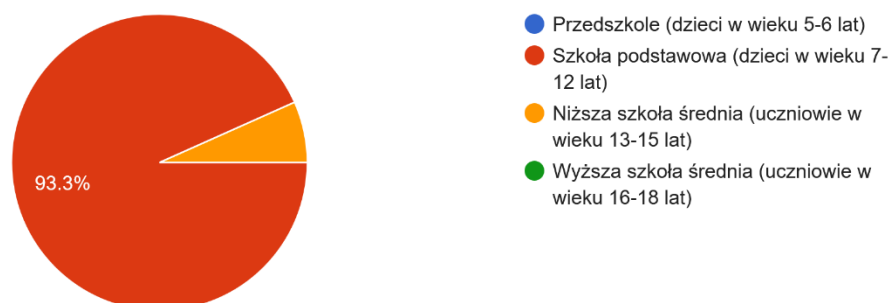


Figure 168 Poland Survey [Administrator: School type]



Region szkoły

15 responses

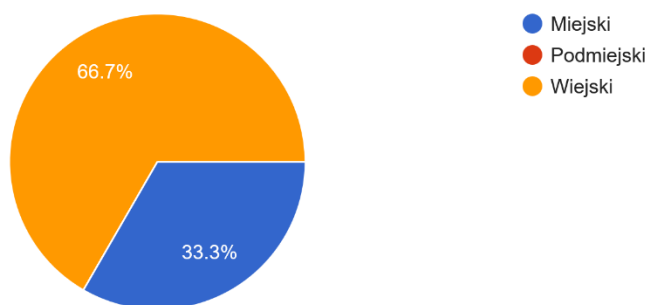


Figure 169 Poland Survey [Administrator: School region]

Most school leaders in the sample manage large or very large institutions. Specifically, over half (8 out of 15) work in very large schools (181+ students), while 2 lead large schools (121–180 students) and 4 are based in medium-sized schools (61–120 students). Only one respondent oversees a small school (21–60 students).

Wielkość szkoły

15 responses

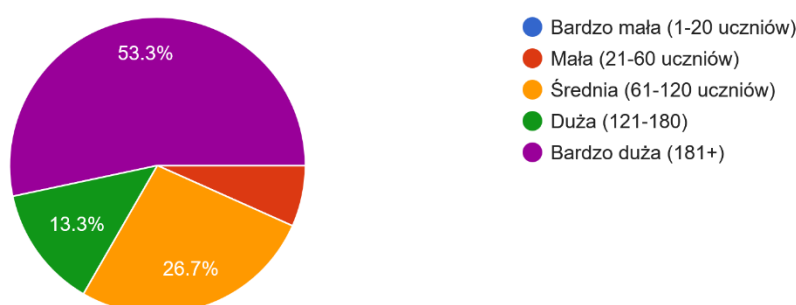


Figure 170 Poland Survey [Administrator: School size]

These size classifications align with the reported number of teachers: most schools employ between 20 and 60 teachers, with several exceeding this range. One school reports having 130 teachers, and another as many as 350, clearly corresponding to the "very large" category. In contrast, schools with around 20–30 teachers likely reflect the medium or small-sized categories.

This correlation suggests that principals in the sample predominantly operate within sizable school environments, which may provide greater staffing capacity, broader internal collaboration opportunities, and more structured administrative frameworks. Conversely, the lone small school may face different challenges related to resource constraints and staff flexibility.

Section A: Demographic Data [Educational Authority Representative]

The data show that only two representatives completed the survey ($n = 2$), severely limiting the generalizability of any conclusions. Nonetheless, both participants reported holding director-level positions, suggesting they occupy senior roles within their respective institutions. In terms



of experience, one respondent indicated over 31 years in educational leadership, while the other reported 7–11 years. This contrast illustrates a range of seniority, from long-term expertise to mid-career leadership engagement.

Lata doświadczenia w kierowaniu edukacją
2 responses

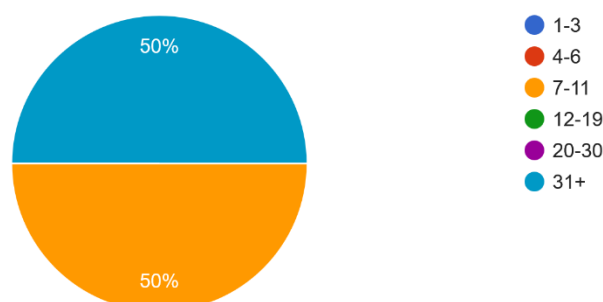


Figure 171 Poland Survey [Authority: Experience (years)]

Regarding level of authority, one participant works at the national level, while the other operates at the local level. This offers a limited but notable cross-section of educational governance, although the absence of regional-level responses prevents triangulation across all tiers of authority.

Poziom władzy
2 responses

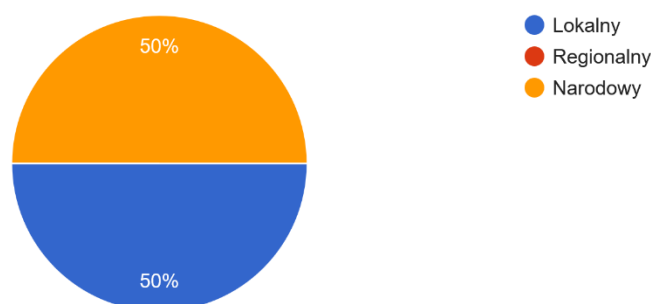


Figure 172 Poland Survey [Authority: Level]

8.3.2 Understanding and Awareness of Data Literacy (Section B)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Zdecydowanie się nie zgadzam), 2 = Disagree (Nie zgadzam się), 3 = Neither Agree Nor Disagree (Neutralny/neutralna), 4 = Agree (Zgadzam się), 5 = Strongly Agree (Zdecydowanie się zgadzam).

The first statement was: “I understand the following concepts:”.

Six specific literacies were assessed: Data Literacy (umiejętność pracy z danymi), Digital Literacy (umiejętność pracy z technologiami cyfrowymi), Artificial Intelligence Literacy (umiejętność

pracy ze sztuczną inteligencją), Information Literacy (umiejętność korzystania z informacji), Statistical Literacy (umiejętność statystyczna), Learning Analytics (analitika edukacyjna).

1. Rozumiem następujące pojęcia:

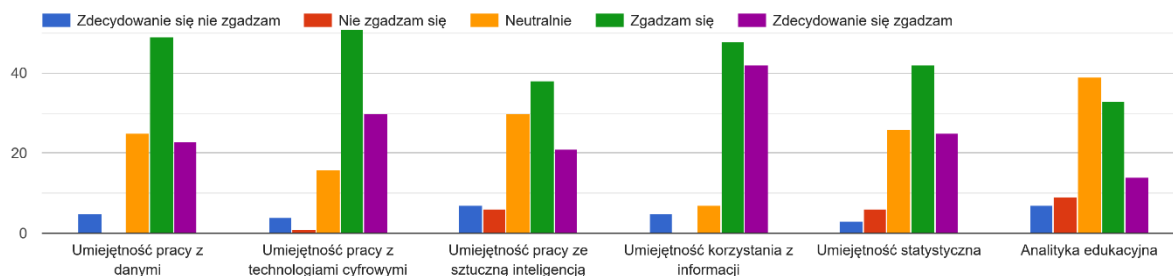


Figure 173 Poland Survey [Understanding of concepts]

A qualitative review of the responses reveals the following trends:

Digital Literacy and Information Literacy show consistently high levels of agreement. The vast majority of participants selected either Agree or Strongly Agree, indicating a strong sense of familiarity and confidence with these concepts.

Data Literacy and Statistical Literacy also received predominantly positive responses. While Agree and Strongly Agree were the most common answers, a notable portion of respondents selected Neutral or even Disagree, suggesting a more varied level of comfort or understanding.

AI Literacy and Learning Analytics display the widest spread across the Likert scale. A significant number of participants selected Neutral, Disagree, or Strongly Disagree, indicating uncertainty, lower familiarity, or a lack of exposure to these topics.

The following statement was: “Data Literacy is connected to the following concepts:”.

Five specific literacies were assessed: Digital Literacy (umiejętność pracy z technologiami cyfrowymi), Artificial Intelligence Literacy (umiejętność pracy ze sztuczną inteligencją), Information Literacy (umiejętność korzystania z informacji), Statistical Literacy (umiejętność statystyczna), Learning Analytics (analitika edukacyjna).

2. Umiejętność pracy z danymi jest związana z następującymi pojęciami:

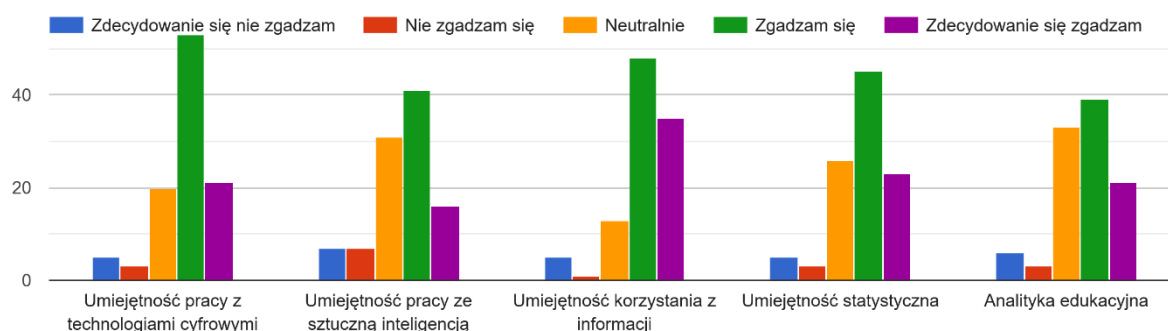


Figure 174 Poland Survey [Connection of concepts]



There is a strong and widespread agreement that Digital Literacy is closely connected to Data Literacy. Over 85% of respondents selected Agree or Strongly Agree, indicating a shared understanding that digital tools and environments are fundamental for engaging with data. This reinforces the view that digital competence forms the basis for accessing, managing, and interpreting data effectively.

Information Literacy also shows a high degree of alignment with Data Literacy. More than 80% of participants provided positive responses, suggesting that the ability to locate, evaluate, and ethically use information is seen as highly relevant for data-related tasks. This reflects a growing awareness of data as a type of information that requires critical thinking and ethical judgment.

AI Literacy is widely recognized as related to Data Literacy, though the level of agreement is somewhat lower than for Digital and Information Literacies. A higher proportion of Neutral and Disagree responses (compared to other domains) suggests that while many participants acknowledge the relevance of AI, some may feel less confident in understanding its role or its connection to data work - highlighting a potential area for further professional development. Statistical Literacy also received a strong majority of Agree and Strongly Agree responses. However, the presence of a notable number of Neutral and Disagree responses implies that some respondents may view statistics as a more specialized or technical skill rather than a core component of Data Literacy. This could indicate a perceived distinction between general data use and formal statistical analysis.

Responses related to Learning Analytics were the most diverse. While a majority still agreed with its relevance to Data Literacy, the number of Neutral and Disagree answers was comparatively higher. This variation may reflect limited exposure to the concept or uncertainty about how learning data fits into broader data literacy frameworks. It suggests a need for clearer integration of educational data practices within the general understanding of data skills.

The statement “I understand the potential uses and applications of data to support learning, assessment, research, and decision-making in education.” followed.

3. Rozumiem potencjalne zastosowania danych wspierające naukę, ocenianie, badania i podejmowanie decyzji w edukacji

102 responses

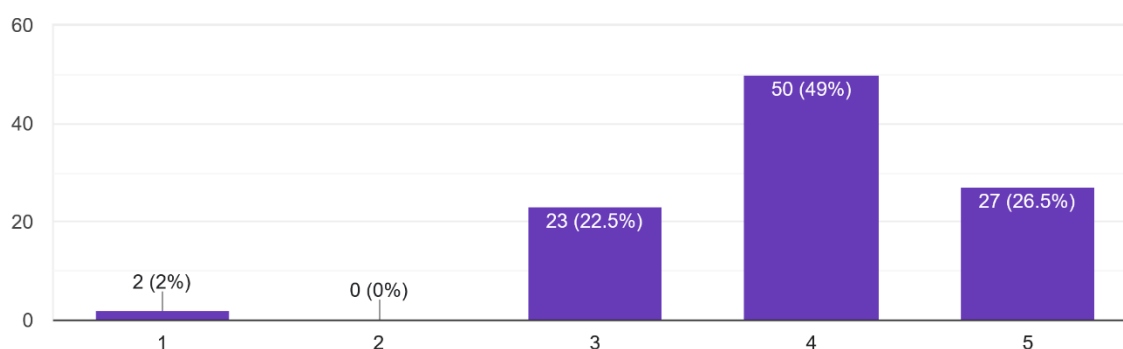


Figure 175 Poland Survey [I understand the potential uses and applications of data to support learning, assessment, research, and decision-making in education]

The data indicates a generally positive perception among respondents regarding their understanding of how data can support learning, assessment, research, and decision-making in



education. A combined 76.5% of participants selected either 4 (Agree) (50 responses, 50%) or 5 (Strongly Agree) (27 responses, 26.5%), suggesting a high level of self-reported awareness and confidence in the educational applications of data.

Approximately 22.5% of responses reflected more neutral or critical views.

This pattern implies that while the overall attitude is very positive, nearly one-fourth of respondents remain ambivalent - possibly due to limited exposure, varying institutional readiness, or differing levels of digital and data literacy. This group may benefit from targeted professional development or practical examples illustrating the value and feasibility of data-informed educational practices.

The minimal number of negative responses suggests that explicit resistance to the use of data in education is rare in this group. However, to support more widespread and effective data integration, institutions might consider strengthening infrastructure, training, and support mechanisms tailored to educators' varying needs and levels of familiarity.

The statement “I recognize Data Literacy as an essential element teachers’ modern role.” followed.

4. Uznaję umiejętność czytania danych za istotny element nowoczesnej roli nauczycieli

102 responses

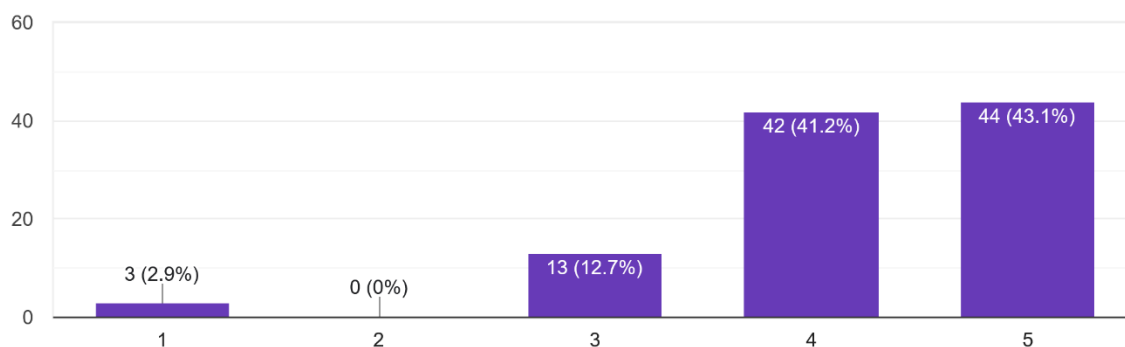


Figure 176 Poland Survey [I recognize Data Literacy as an essential element teachers’ modern role]

The responses reflect a strong positive orientation toward recognizing Data Literacy as an essential component of the modern teacher’s role. A total of 86 participants (84.3%) selected either 5 (Strongly Agree) or 4 (Agree), highlighting a broad consensus on the importance of data-related competencies within contemporary educational practice. This widespread agreement suggests that many educators view the ability to interpret and use data as integral to effective teaching, student support, and professional decision-making.

A smaller segment (13 respondents) chose 3 (Neutral). This neutral stance may point to some level of uncertainty, possibly stemming from limited exposure to the practical integration of data literacy into daily classroom work or a lack of clarity around institutional expectations. For these respondents, further clarification, training, or contextual examples may help solidify the perceived relevance of data skills in teaching.

Only 3 respondents selected 1 (Strongly Disagree), and no participants selected 2 (Disagree). This minimal disagreement suggests that outright resistance to incorporating Data Literacy into the



teaching role is virtually absent in this sample. Even among those not fully confident, there appears to be a general openness to the idea, indicating fertile ground for the continued promotion and support of data-informed educational practices.

The statement “I recognize the legal, ethical and privacy issues associated with data in education.” followed.

5. Uznaję kwestie prawne, etyczne i prywatności związane z danymi w edukacji

102 responses

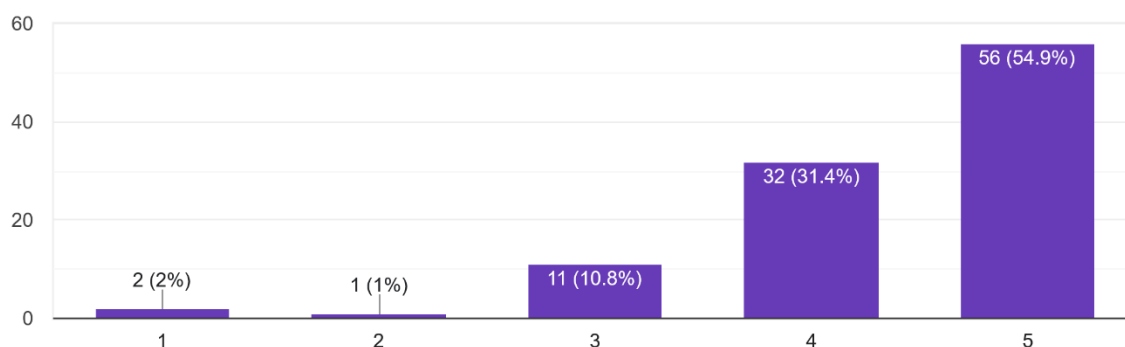


Figure 22. I recognize the legal, ethical and privacy issues associated with data in education (Likert scale)

Figure 177 Poland Survey [I recognize the legal, ethical and privacy issues associated with data in education]

The responses indicate a strong recognition of the legal, ethical, and privacy-related aspects of data use in education. A total of 88 participants (86.3%) selected either 5 (Strongly Agree) or 4 (Agree). This clear majority reflects a widespread understanding that responsible data practices are a critical component of educational work, particularly when it comes to safeguarding student rights, ensuring ethical use, and complying with legal standards.

A smaller group of 11 respondents (10.8%) chose 3 (Neutral), which may suggest some uncertainty or a lack of concrete experience in applying legal and ethical frameworks to data use. These participants might benefit from targeted training or institutional guidance to build their confidence and competence in navigating these sensitive areas.

Only 3 respondents (2.9%) expressed disagreement with the statement. The very low rate of disagreement suggests that explicit resistance to recognizing the importance of legal, ethical, and privacy-related concerns in educational data use is virtually nonexistent within the sample.

Overall, the results point to a well-established awareness of the need for ethical and legally sound data practices in education, with a small portion of participants potentially requiring more structured support to deepen their understanding and practical application.

8.3.3 Knowledge and Skills (Readiness) in Data Literacy (Section C)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Zdecydowanie się nie zgadzam), 2 = Disagree (Nie zgadzam się), 3 = Neither Agree Nor Disagree (Neutralny/neutralna), 4 = Agree (Zgadzam się), 5 = Strongly Agree (Zdecydowanie się zgadzam).



The first statement was: “I know of data analysis methods, techniques and tools”.

6. Znam metody, techniki i narzędzia analizy danych

102 responses

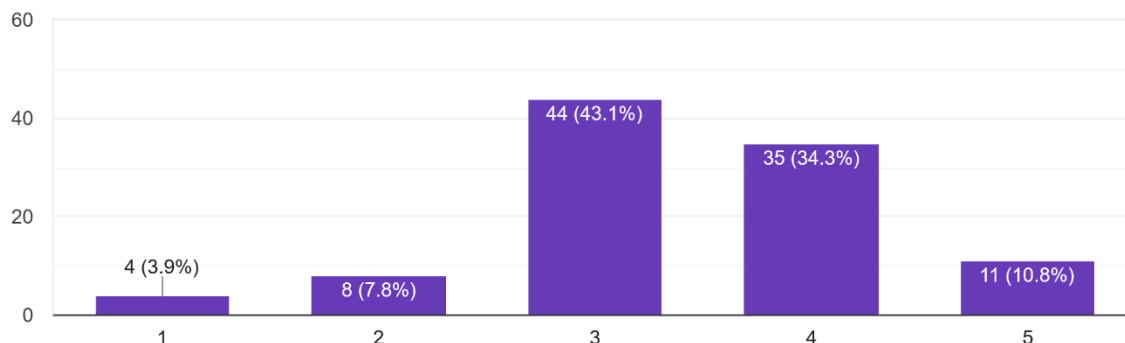


Figure 23. I know of data analysis methods, techniques and tools (Likert scale)

Figure 178 Poland Survey [I know of data analysis methods, techniques and tools]

The responses suggest a moderate but varied level of self-reported familiarity with data analysis methods, techniques, and tools. A total of 46 participants (45.1%) selected either 4 (Agree) or 5 (Strongly Agree). This indicates that nearly half of the respondents feel confident in their knowledge of data analysis practices, which is encouraging, especially given the increasing importance of these skills in education.

However, the largest single response group (43.1%) selected 3 (Neutral). This suggests a significant portion of respondents remain uncertain about their competence in this area. Such neutrality may reflect limited hands-on experience, lack of training, or exposure to only basic data practices. This group may benefit from targeted professional development to move from theoretical awareness to practical proficiency.

In contrast, 12 respondents (11.8%) expressed disagreement. While this is a minority, it signals that some educators feel they lack essential knowledge or have not been adequately prepared to engage in data analysis work.

Overall, the data reflects a relatively balanced distribution, with a strong core of respondents expressing confidence, a sizable group indicating uncertainty, and a small but meaningful number acknowledging gaps in their knowledge. These findings underscore the need for differentiated support strategies that can help educators at various skill levels build greater expertise in data analysis.

The statement “I know how to use digital tools to manage and organize data effectively.” followed.



7. Wiem, jak używać narzędzi cyfrowych do efektywnego zarządzania i organizowania danych

102 responses

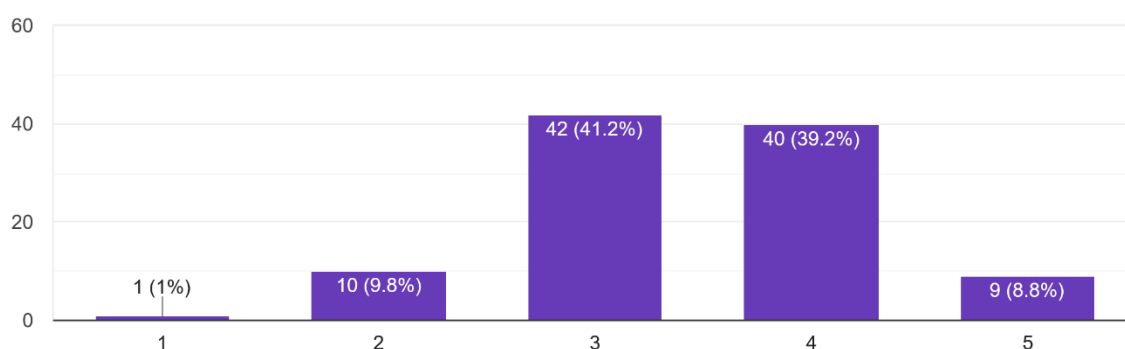


Figure 179 Poland Survey [I know how to use digital tools to manage and organize data effectively]

The responses reveal a generally positive but mixed self-assessment of proficiency in using digital tools for data management and organization. A combined 49 respondents (48.0%) selected 4 (Agree) or 5 (Strongly Agree), with 40 (39.2%) choosing 4 and only 9 (8.8%) choosing 5. This suggests that nearly half of the participants feel fairly confident, but only a small fraction express strong confidence, pointing to limited perceived mastery in this area.

The most common single response was 3 (Neutral), selected by 42 participants (41.2%), indicating that a large group is unsure or moderately familiar with the topic. This substantial neutrality may reflect a need for more experience or structured opportunities to use digital tools effectively in practice.

At the other end of the spectrum, 11 participants (10.8%) expressed disagreement. Though a minority, this group signals that some educators feel unprepared or lacking in this competency.

In summary, while foundational awareness is evident, the low proportion of strong agreement and the high number of neutral responses suggest that there is significant room to strengthen educators' practical digital data management skills through training and support.

The statement “I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information.” followed.



8. Wiem, jak czytać, rozumieć i interpretować wykresy, tabele i diagramy oraz korelować je z innymi informacjami

102 responses

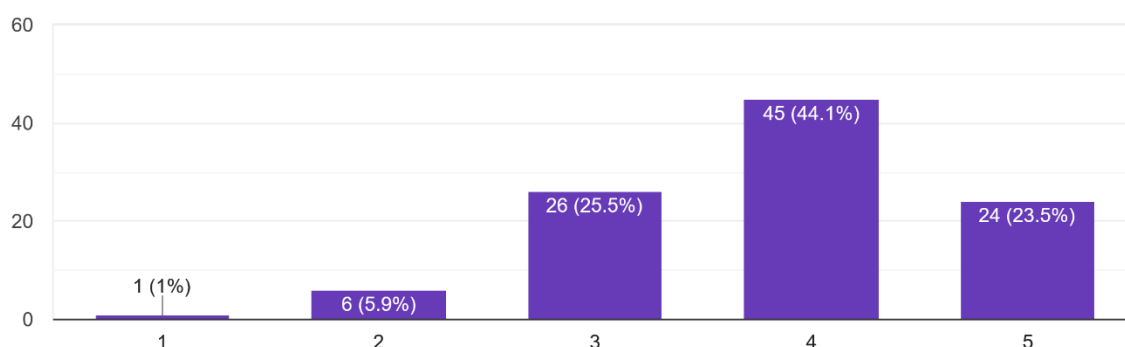


Figure 180 Poland Survey [I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information]

The responses suggest a generally positive level of confidence in reading, interpreting, and correlating data visualizations (such as charts, tables, and diagrams) with other information. A total of 69 participants (67.6%) selected either 4 (Agree) or 5 (Strongly Agree). This indicates that over two-thirds of respondents feel confident in their ability to interpret visual data and link it meaningfully to broader contexts.

A notable portion of the sample (26 participants) selected 3 (Neutral). This suggests that while many educators possess a working understanding, a significant group remains unsure about their interpretation skills or may lack consistent practice applying them in context. This neutrality may point to a need for more applied experience or clearer instructional support in data interpretation.

The minority of 7 participants likely represent individuals who feel underprepared or lack confidence in engaging with data visualizations.

In summary, the results reflect a strong baseline of data interpretation skills, with a sizable portion of respondents demonstrating confidence. However, the relatively high number of neutral responses and the small group expressing disagreement suggest that ongoing support, especially in applied or contextualized interpretation, could help reinforce and extend these competencies.

The statement “I know how to create charts, tables, and graphs to organize and visually present data.” followed.

9. Wiem, jak tworzyć wykresy, tabele i diagramy w celu organizacji i wizualnej prezentacji danych

102 responses

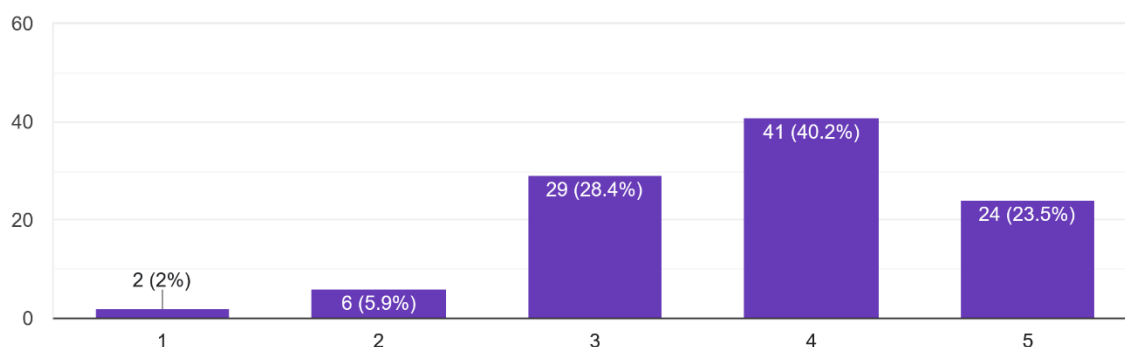


Figure 181 Poland Survey [I know how to create charts, tables, and graphs to organize and visually present data]

The distribution of responses reveals a comparable pattern to the previous question on interpreting data visualizations yet focuses here on production rather than comprehension. A majority of respondents (65 individuals) selected either 4 (Agree) or 5 (Strongly Agree), indicating that most participants feel capable of creating visual representations of data for organizational or communicative purposes.

Interestingly, the level of strong agreement (5) remained the same as in the previous question, reinforcing that a similar group of participants feel highly confident both in interpreting and producing visual data.

However, 29 participants (28.4%) selected 3 (Neutral), reflecting continued hesitation among over a quarter of respondents. This may suggest limited hands-on experience with charting tools, uncertainty about design choices, or a lack of exposure to data presentation tasks in their professional contexts.

A small minority (8 participants) reported low confidence. These individuals may benefit from focused, practical training on how to transform raw data into meaningful visual formats.

Overall, while the self-reported ability to create data visualizations mirrors the reported ability to interpret them, the consistently high number of neutral responses across both items highlights an area where more applied, confidence-building opportunities could be impactful, especially in helping educators move from basic familiarity to confident, intentional use.

The statement “I know how to make use of data to solve problems and make decisions related to my work.” followed.



10. Wiem, jak wykorzystać dane do rozwiązywania problemów i podejmowania decyzji związanych z moją pracą

102 responses

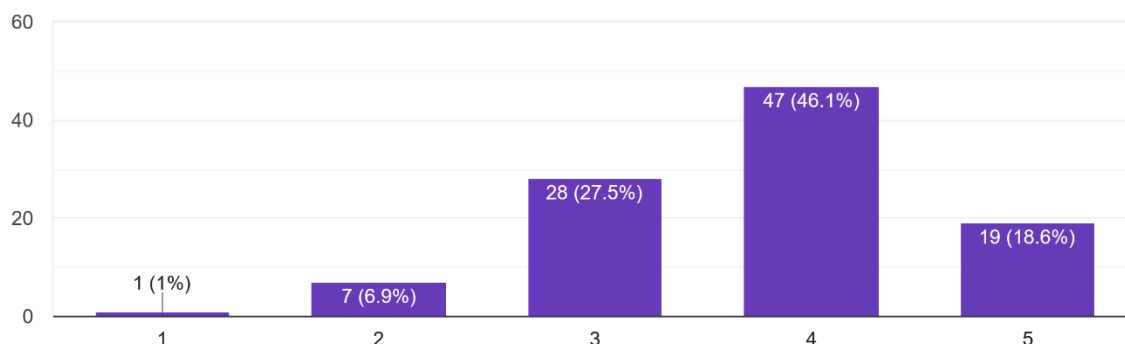


Figure 182 Poland Survey [I know how to make use of data to solve problems and make decisions related to my work]

The responses to the statement on using data for problem-solving and decision-making show a pattern similar to the previous three questions. A total of 66 participants (64.7%) selected 4 (Agree) or 5 (Strongly Agree), indicating a generally positive self-assessment, though the rate of strong agreement (18.6%) is slightly lower than for interpreting or creating data visualizations.

28 participants (27.5%) chose 3 (Neutral), continuing the trend of uncertainty seen across related items. This suggests that while many feel capable of handling and presenting data, applying it confidently in practice remains a challenge for a significant portion of respondents.

Only 8 respondents (7.8%) disagreed, mirroring the proportions from previous questions.

In summary, educators appear moderately confident in using data for decisions, but the lower level of strong agreement suggests a need for more support in translating data insights into concrete action.

8.3.4 Current Practices and Implementation (Section D)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Never (Nigdy), 2 = Rarely (Rzadko), 3 = Sometimes (Czasami), 4 = Often (Często), 5 = Very often (Bardzo często).

The first statement was: “I explore and collect data for my work (i.e. surveys, assessment results, participation statistics, etc.)”.

11. Badam i zbieram dane do mojej pracy (np. ankiety, wyniki ocen, statystyki udziału itp.)

102 responses

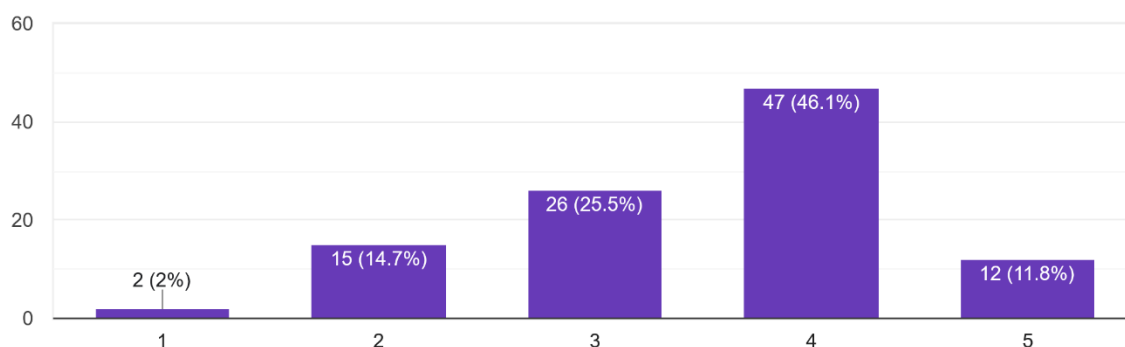


Figure 183 Poland Survey [I explore and collect data for my work (i.e. surveys, assessment results, participation statistics, etc.)]

The responses indicate a generally positive attitude toward the process of data collection in educational practice. A total of 59 participants (57.8%) selected either 4 (Often) or 5 (Very often), suggesting that data gathering is a regular or familiar activity for a majority of respondents. This may reflect institutional requirements, routine assessment practices, or increasing emphasis on evidence-based reporting in schools and universities.

However, a substantial portion (26 participants) chose 3 (Sometimes), signaling that while some educators may be engaged in data collection, they might not fully recognize it as a structured or intentional process. For these respondents, data gathering may be seen as a task required by policy rather than a meaningful part of professional reflection or pedagogical planning.

Notably, 17 participants selected 2 or 1, indicating limited or no engagement in data collection. This group might benefit from professional development that reframes data gathering not only as administrative duty but as a foundational step in understanding learners and improving teaching effectiveness.

Overall, while most educators report involvement in collecting data, the responses suggest a need to deepen the intentionality and perceived value of this activity within broader teaching and learning processes.

The statement “I assess and use data in my work” followed.

12. Oceniam i wykorzystuję dane w mojej pracy

102 responses

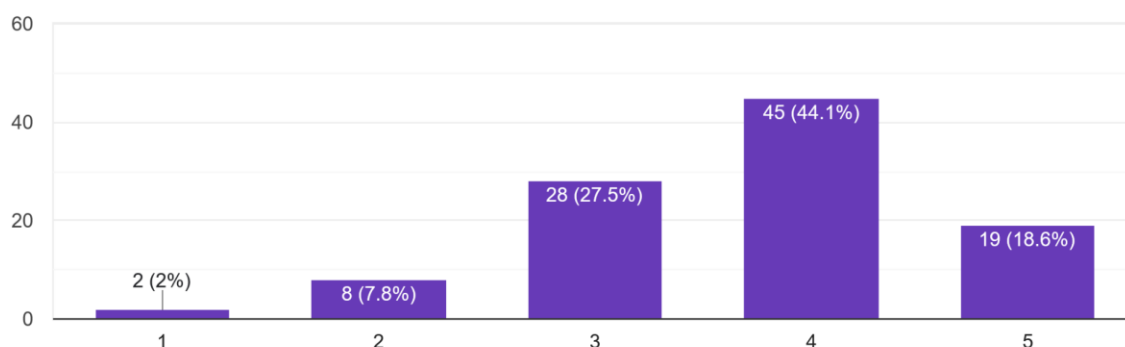


Figure 184 Poland Survey [I assess and use data in my work]

This item shows one of the strongest levels of agreement across all six questions. A total of 64 respondents (62.7%) selected 4 (Often) or 5 (Very often), indicating that a clear majority of educators feel confident not only in accessing data but also in interpreting and applying it within their professional contexts. This suggests growing awareness of the role of data in informing instructional planning, monitoring student progress, and making educational decisions.

Notably, 19 participants (18.6%) selected 5, which is relatively high compared to neighboring items. This indicates that for some respondents, data use is not just familiar, but an embedded and confident part of their routine practice. This group may serve as early adopters or peer leaders within institutions working to build a stronger culture of data use.

Still, 28 respondents (27.5%) chose 3 (Sometimes). Their uncertainty may stem from ambiguity around how data should be used or limited feedback on the effectiveness of their data-informed actions. Providing structured opportunities for collaborative reflection and sharing of best practices could help this group transition from passive data access to active data utilization.

Taken together, these results show a positive trajectory but also reveal a need to bridge the gap between knowing data is important and knowing how to act effectively on it.

The statement “I analyze and synthesize data for addressing a problem or question” followed.

13. Analizuję i syntezuję dane, aby rozwiązać problem lub odpowiedzieć na pytanie

102 responses

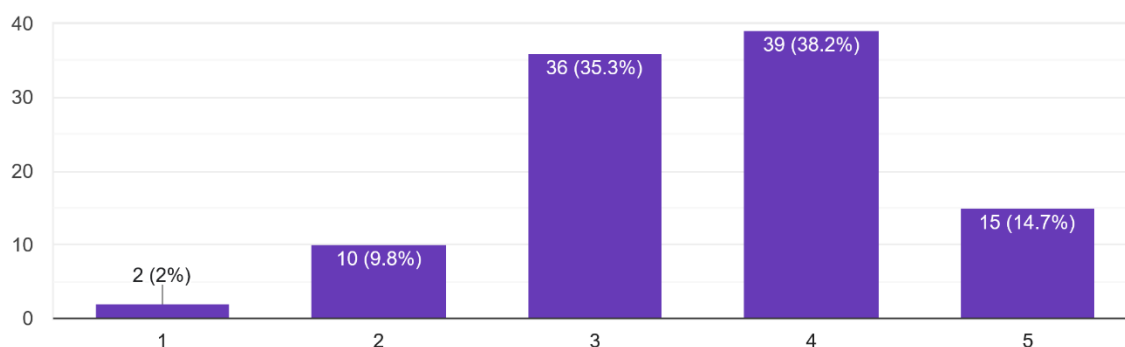


Figure 185 Poland Survey [I analyze and synthesize data for addressing a problem or question]

The responses to this item reflect a more complex picture. While 54 participants (52.9%) selected 4 or 5, indicating some level of confidence, this is lower than in previous questions related to data use or collection. Moreover, 36 participants (35.3%) chose 3 (Sometimes), the highest proportion of neutral responses across all six items.

This suggests that while educators may be able to collect and interpret data at a basic level, deeper engagement with data for problem-solving or inquiry remains less common. Analyzing and synthesizing data requires not just technical skills, but also critical thinking, contextual judgment, and time - all of which may be limited in everyday educational settings.

Additionally, 12 respondents (11.8%) selected 2 or 1, indicating that a notable minority feel underprepared for this type of work. This group may not have had the opportunity to engage in more complex, exploratory uses of data, such as identifying patterns, formulating hypotheses, or making evidence-based instructional changes.

In summary, while the foundations of data analysis are present, many educators may need support in moving toward higher-order data practices. Those that require not just understanding data but using it as a tool for meaningful inquiry and continuous improvement.

The statement “I use data visualizations in my work” followed.



14. Wykorzystuję wizualizacje danych w mojej pracy

102 responses

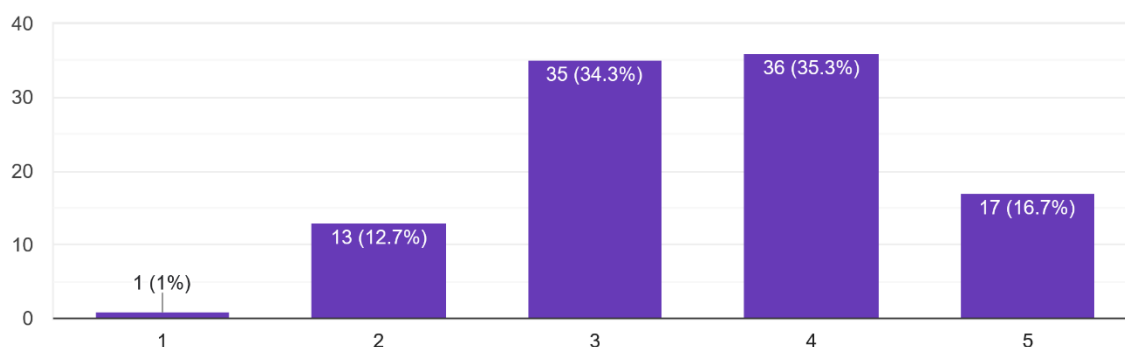


Figure 186 Poland Survey [I use data visualizations in my work]

Responses to this question suggest that data visualization is moderately practiced, but not yet widespread. A total of 53 respondents (52.0%) selected 4 or 5, a relatively modest proportion given the increasing emphasis on visual communication in data literacy. The remaining 49 respondents (48.0%) selected 3 or below, suggesting considerable room for growth.

With 35 participants (34.3%) selecting 3 (Sometimes), it appears many educators are familiar with visualization tools but may not be fully confident in applying them. This could be due to limited access to training, time constraints, or uncertainty about which formats (e.g., charts, graphs, infographics) are most effective for different audiences.

A further 14 respondents (13.7%) expressed disagreement (2 or 1), which aligns with broader challenges in transitioning from data interpretation to clear and engaging presentation. The skill of turning data into actionable, understandable visual content is increasingly critical, especially in collaborative or parent-facing contexts.

To enhance the impact of data use, institutions may benefit from offering targeted support in designing and interpreting visual data, as well as encouraging regular use of visuals as part of classroom, reporting, and planning practices.

The statement “I collaborate with colleagues on interpreting educational data” followed.



15. Współpracuję z kolegami przy interpretacji danych edukacyjnych

102 responses

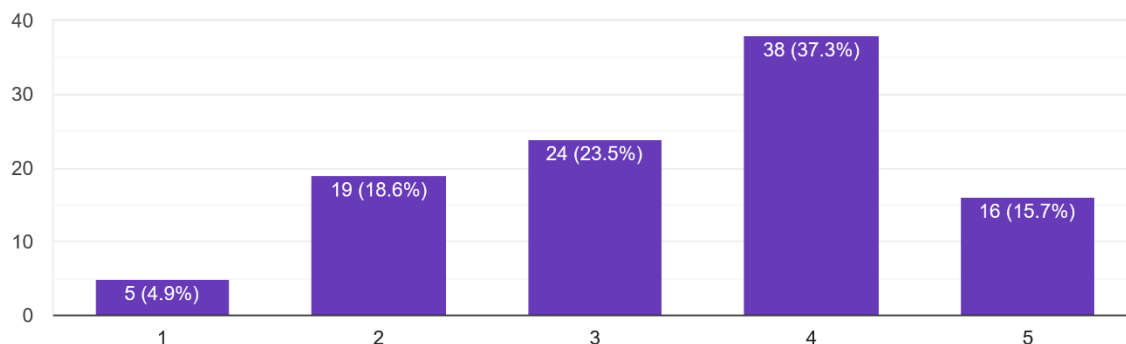


Figure 187 Poland Survey [I collaborate with colleagues on interpreting educational data]

Among the six items, this question yielded the lowest percentage of agreement: only 54 participants (52.9%) selected 4 or 5. This indicates that collaborative data interpretation is not yet a routine or embedded practice for many educators. While individual work with data is becoming more common, shared inquiry and team-based analysis may still be underdeveloped.

Significantly, 24 participants (23.5%) chose 3 (Sometimes) and 24 (23.5%) selected 2 or 1, suggesting that almost half of the respondents either lack confidence in this area or do not engage in collaborative data practices at all. This may be due to institutional barriers such as limited time, unclear roles, or lack of structures for professional dialogue around data.

The relatively low score here underscores the importance of fostering a culture of collaboration in data use. Interpreting data with peers can lead to richer insights, more consistent instructional responses, and shared responsibility for student outcomes.

In essence, strengthening collaborative data practices is not just about tools or skills, it's about enabling professional trust, structured opportunities, and shared purpose within educational teams.

The statement “I share data with students, parents, teachers, administration and others” followed.



16. Dzielę się danymi z uczniami, rodzicami, nauczycielami, administracją i innymi

102 responses

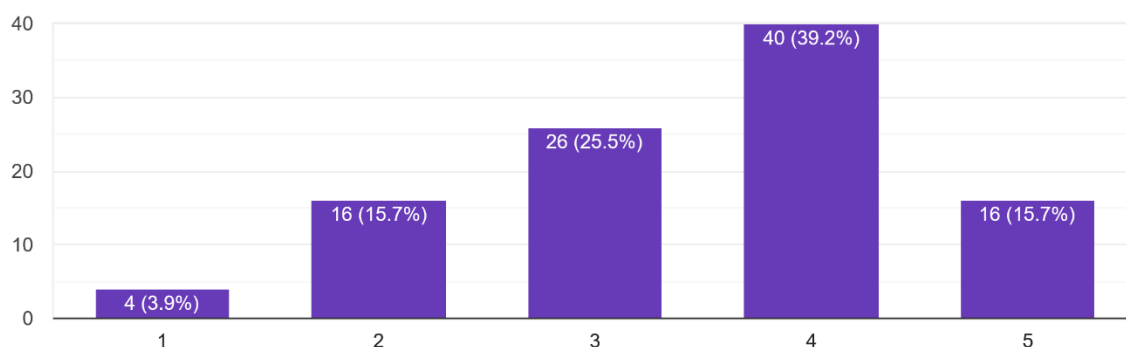


Figure 188 Poland Survey [I share data with students, parents, teachers, administration and others]

This item reveals a moderately positive but varied approach to data communication. A total of 56 participants (54.9%) selected 4 or 5, showing that over half of respondents actively engage in sharing data with various stakeholders. This practice is crucial for transparency, engagement, and informed decision-making at multiple levels of the educational ecosystem.

26 participants (25.5%) selected 3 (Sometimes), which may reflect hesitation or uncertainty about how much data to share, with whom, and in what form. Issues of data privacy, appropriateness, and confidence in interpretation may be contributing factors to this caution.

Notably, 20 respondents (19.6%) selected 2 or 1, the second-highest rate of disagreement across the six items, following the previous question. This suggests that some educators may lack clear guidance or training on effective and ethical data communication, particularly in sensitive contexts involving parents or students.

To advance this practice, institutions may need to offer clearer frameworks and protocols for responsible data sharing, while also building educators' capacity to translate data into accessible narratives that support dialogue and action.

Across the six items, a consistent pattern emerges: educators report engaging with basic data practices, particularly in independently gathering and using data, on a moderate to frequent basis. However, more advanced data activities—such as analysis, synthesis, visualization, collaboration, and communication—are practiced less often.

Neutral frequencies are consistently high, especially for items related to interpretation, teamwork, and presentation. This suggests many educators are at a transitional stage, where they occasionally engage in these practices but may lack the confidence or support to do so more consistently.

Infrequent responses (ratings of 1 or 2) are relatively uncommon overall but appear most often in areas involving collaboration and data sharing. This indicates these are still emerging aspects of professional practice and represent key areas for development.

In summary, educators are laying a foundation in data literacy through periodic engagement with core practices. To advance further, they would benefit from targeted support aimed at strengthening regular, strategic use of data, particularly in collaborative and communicative contexts.

8.3.5 Attitudes and Dispositions Towards Data Literacy (Section E)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Zdecydowanie się nie zgadzam), 2 = Disagree (Nie zgadzam się), 3 = Neither Agree Nor Disagree (Neutralny/neutralna), 4 = Agree (Zgadzam się), 5 = Strongly Agree (Zdecydowanie się zgadzam).

The first statement was: “In my opinion, data enhance: Learning, Teaching, Assessment”.

17. Moim zdaniem dane wzmacniają:

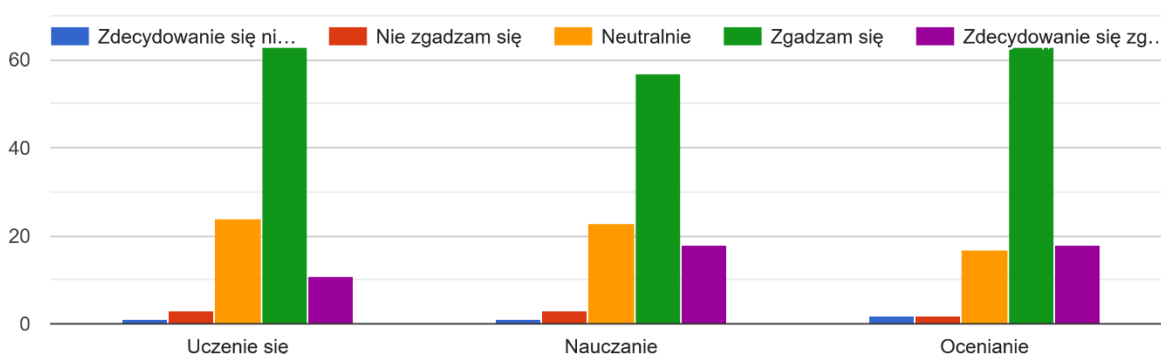


Figure 189 Poland Survey [In my opinion, data enhance: Learning, Teaching, Assessment]

Across all three areas: Learning, Teaching, and Assessment, the data shows a clear consensus on the empowering role of data in education:

- For Learning, a total of 74 participants (72.5%) either agreed (63) or strongly agreed (11) that data strengthens learning, highlighting a strong belief in its role in supporting student outcomes. Only 4 participants disagreed or strongly disagreed, while 24 (23.5%) remained neutral.
- For Teaching, responses were similarly positive, with 75 participants (73.5%) expressing agreement (57) or strong agreement (18). This suggests that most educators see clear instructional benefits in using data to guide planning and adapt teaching strategies. A small minority (4 participants (3.9%)) expressed disagreement, while 23 (22.5%) responded neutrally.
- For Assessment, the most favorable responses were recorded. A total of 81 participants (79.4%) agreed (63) or strongly agreed (18) that data enhances assessment practices, including monitoring progress and informing feedback. Only 4 participants (3.9%) expressed disagreement, and 17 (16.7%) were neutral.

Neutral responses across the three areas ranged from 16% to 22%, indicating a moderate group of participants who may be less confident in using data or less frequently exposed to its full potential in practice. Disagreement levels remained low in all categories (below 4%), suggesting minimal resistance and a generally favorable outlook on data's role in education.

The statement “I believe that data enhance personalization and differentiated teaching” followed.



18. Uważam, że dane wzmacniają personalizację i zróżnicowane nauczanie

102 responses

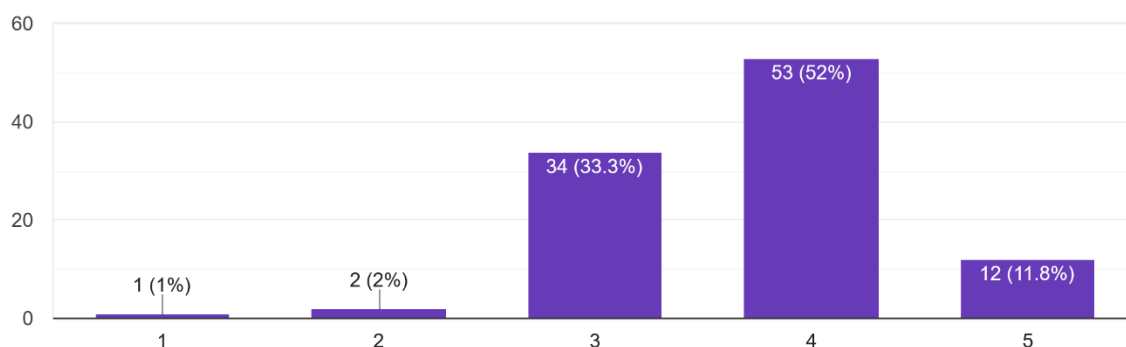


Figure 190 Poland Survey [I believe that data enhance personalization and differentiated teaching]

The results show a strong consensus in favor of the idea that data supports personalized and differentiated instruction. A total of 65 respondents (63.7%) either agreed or strongly agreed, reflecting a clear belief among educators that data can be used to better meet the diverse needs of students through more targeted strategies and individualized learning paths.

The 33.3% of neutral responses suggest that while many educators recognize this potential, a substantial number may still be uncertain about how to fully implement such practices. This neutrality could reflect a lack of access to the necessary tools, limited professional development, or insufficient time to translate data into differentiated classroom actions.

Only 3 respondents (2.9%) disagreed, indicating minimal resistance to the concept. This reinforces the idea that personalization is widely accepted as a valuable goal, and data is generally seen as a promising resource to help achieve it.

The statement “I believe that data-driven methods improve educational equity” followed.

19. Uważam, że metody oparte na danych poprawiają równość edukacyjną

102 responses

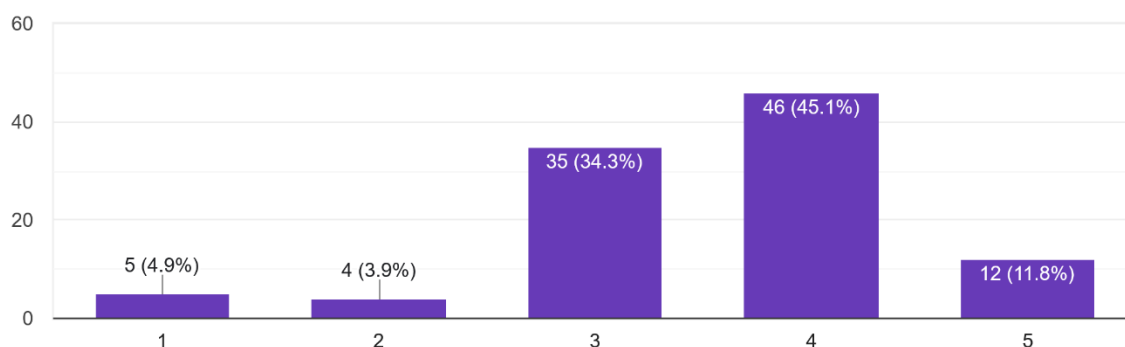


Figure 191 Poland Survey [I believe that data-driven methods improve educational equity]

Most participants (56.9%) view data-driven methods as tools that can enhance educational equity. This suggests that educators recognize the potential of data to identify learning gaps, target support, and promote fairness. However, a substantial portion of respondents (34.3%) remained neutral. This may indicate uncertainty about how equitably data is currently used in practice or a lack of visibility into its effects. Only 8.8% expressed disagreement, suggesting limited resistance to the idea, though some skepticism persists.

The statement “I believe that data-driven methods increase teachers' workload” followed.

20. Uważam, że metody oparte na danych zwiększają obciążenie pracą nauczycieli

102 responses

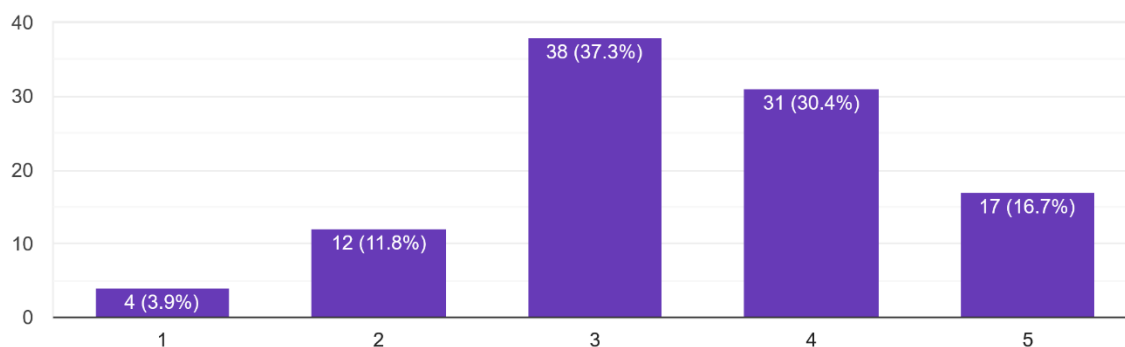


Figure 192 Poland Survey [I believe that data-driven methods increase teachers' workload]

A significant majority (47,1%) believe that data practices contribute to increased workload for teachers. Only 16 participants disagreed with the statement. The relatively high number of neutral responses (38) suggests that while many educators feel the burden of data-related tasks, others may experience it to a lesser degree, possibly depending on context, available tools, or support structures.

5.3.6 Policy and Curriculum Perspectives (Section F)

Participants were asked to indicate their level of agreement with a number of statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Zdecydowanie się nie zgadzam), 2 = Disagree (Nie zgadzam się), 3 = Neither Agree Nor Disagree (Neutralny/neutralna), 4 = Agree (Zgadzam się), 5 = Strongly Agree (Zdecydowanie się zgadzam).

The first statement was: “Educational system sufficiently promotes Data Literacy in schools”.

21. System edukacyjny w wystarczającym stopniu promuje umiejętność posługiwania się danymi w szkołach

102 responses

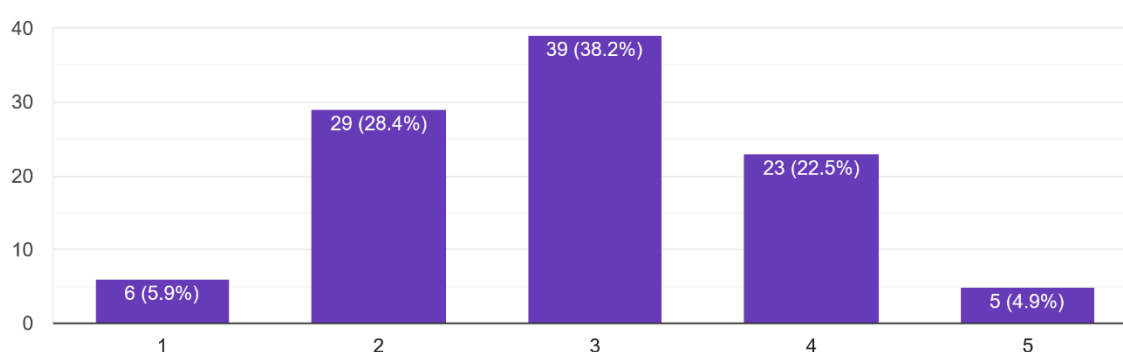


Figure 193 Poland Survey [Educational system sufficiently promotes Data Literacy in schools]

The data reflects a predominantly critical view of the educational system’s efforts to promote data literacy. A combined 34.3% of respondents disagreed (28.4%) or strongly disagreed (5.9%), pointing to widespread dissatisfaction or skepticism toward institutional support for this emerging skill set.

38.2% of respondents selected “Neither agree nor disagree”, signaling a high level of ambivalence, which may stem from inconsistent policies, varying local contexts, or a lack of visible system-level initiatives.

Only 27.4% of participants agreed (22.5%) or strongly agreed (4.9%) with the statement, suggesting that relatively few educators believe current systemic efforts are sufficient to build data-related competencies in schools.

The statement “School curricula effectively integrate Data Literacy concepts and methods” followed.



22. Programy nauczania w szkołach skutecznie integrują koncepcje i metody umiejętności posługiwania się danymi

102 responses

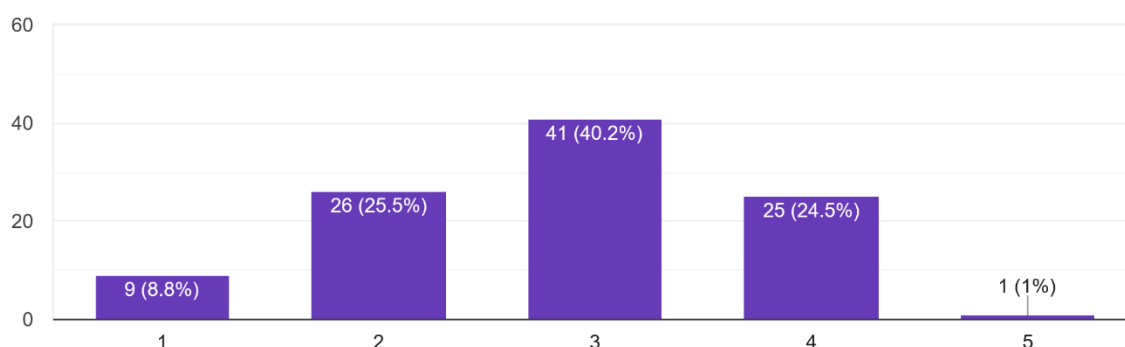


Figure 194 Poland Survey [School curricula effectively integrate Data Literacy concepts and methods]

Responses to this statement show a clear perception of inadequacy in curriculum design. A combined 34.3% disagreed (25.5%) or strongly disagreed (8.8%), while only 25.5% agreed (24.5%) or strongly agreed (1.0%).

A notable 40.2% of respondents remained neutral, suggesting uncertainty about how well data literacy is embedded in school programs. This may reflect a lack of clarity on where and how such skills are addressed in subject-specific contexts or a general absence of practical implementation.

The statement “School administrators play a critical role in successful Data Literacy integration” followed.



23. Administratorzy szkolni odgrywają kluczową rolę w skutecznej integracji umiejętności posługiwania się danymi

102 responses

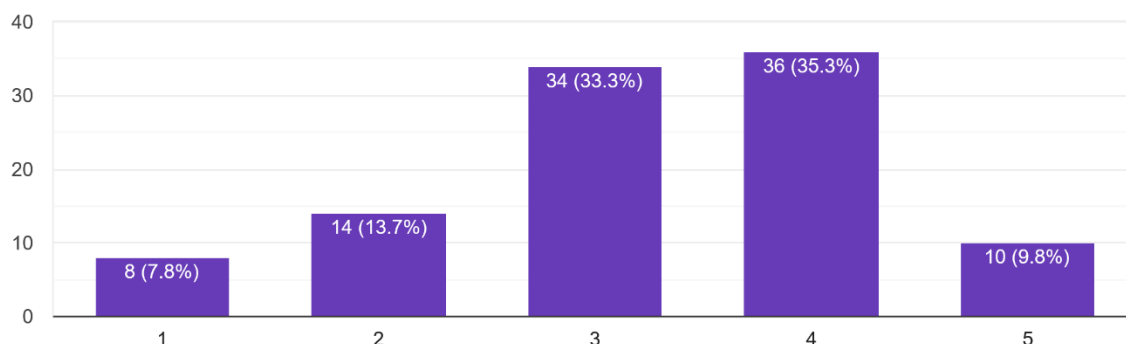


Figure 195 Poland Survey [School administrators play a critical role in successful Data Literacy integration]

The responses reveal a somewhat divided perspective on leadership. 45.1% of participants agreed (35.3%) or strongly agreed (9.8%), indicating recognition of the importance of administrative support in fostering data use in schools.

However, 33.3% of respondents selected “Neither agree nor disagree”, which may reflect uncertainty about the extent to which school leaders actively champion data literacy. A further 21.6% disagreed or strongly disagreed, suggesting that in some contexts, administrative leadership in this area is limited or not visible to staff.

The statement “Teachers have adequate knowledge to address ethical considerations related to educational data (privacy/security/responsible use)” followed.

24. Nauczyciele posiadają odpowiednią wiedzę, aby poruszać kwestie etyczne związane z danymi edukacyjnymi (prywatność/bezpieczeństwo/odpowiedzialne użycie)

102 responses

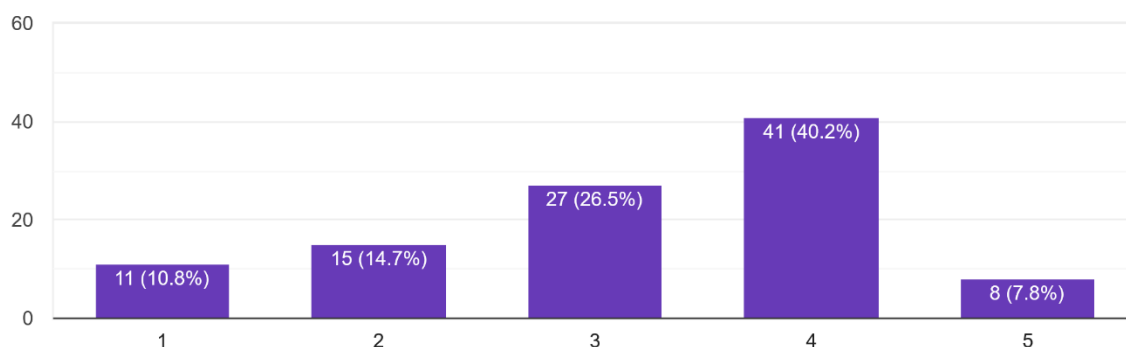


Figure 196 Poland Survey [Teachers have adequate knowledge to address ethical considerations related to educational data (privacy/security/responsible use)]

The data reveals a significant concern about teacher readiness in handling ethical aspects of data. A total of 36.3% of respondents disagreed (14.7%) or strongly disagreed (10.8%), and only 15.6% agreed (7.8%) or strongly agreed (7.8%).

A considerable 26.5% selected “neutral”, while 40.2% agreed, highlighting a split in perception: some educators feel equipped to manage data privacy and responsible use, but many others lack the training or confidence to do so. These results suggest a pressing need for professional development in ethical data literacy.

The statement “Teachers have adequate autonomy to implement data-driven methods” followed

25. Nauczyciele mają odpowiednią autonomię, aby stosować metody oparte na danych

102 responses

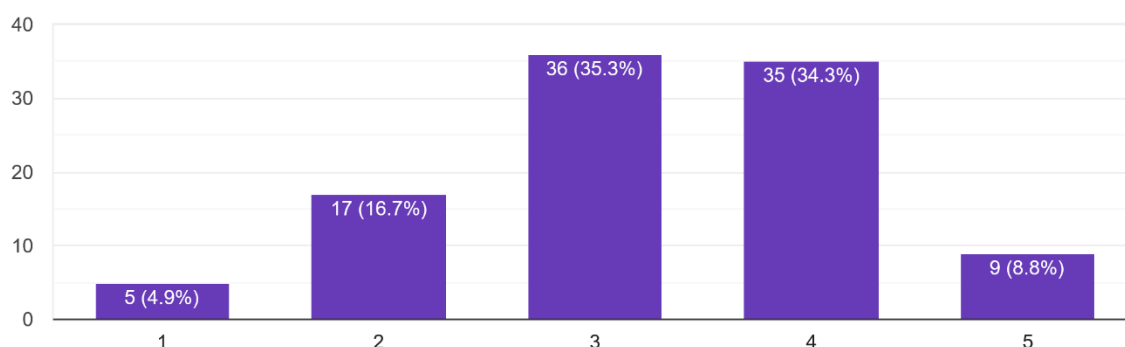


Figure 42. Teachers have adequate autonomy to implement data-driven methods (Likert scale)

Figure 197 Poland Survey [Teachers have adequate autonomy to implement data-driven methods]

Teacher autonomy received a relatively positive but mixed response. 34.3% agreed and 8.8% strongly agreed, indicating that over 43.1% of respondents feel empowered to use data in their practice.

However, 21.6% disagreed or strongly disagreed, suggesting that a significant minority still face constraints, possibly due to institutional policies, workload, or lack of resources. A further 35.3% remained neutral, pointing to uncertainty or varied experiences depending on school culture or leadership.

The survey results indicate that educators see clear gaps in systemic and curricular support for Data Literacy. While school leadership is generally acknowledged as important, visibility and impact vary significantly between schools. Ethical readiness and teacher autonomy are areas of uneven confidence, with many teachers feeling underprepared to navigate complex issues around data use.

The next statement was: “School curricula sufficiently cover:”

Five aspects were available: Data collection skills (Umiejętność zbierania danych), Data analysis skills (umiejętność analizy danych), Data interpretation skills (Umiejętność interpretacji danych), Data visualization skills (umiejętność wizualizacji danych), Data communication skills (Umiejętność komunikacji danych).

26. Programy nauczania w szkołach w wystarczającym stopniu obejmują

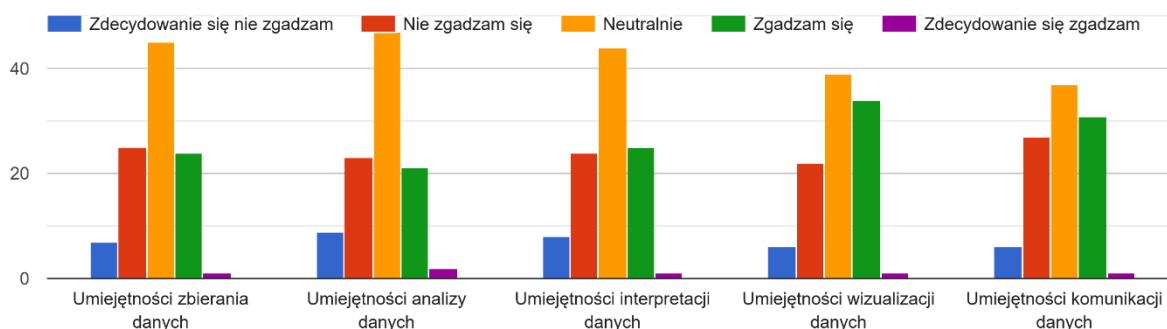


Figure 198 Poland Survey [School curricula sufficiently cover Data collection skills, Data analysis skills, Data interpretation skills, Data visualization skills, Data communication skills]

The results across all five areas: data collection, analysis, interpretation, visualization, and communication, reveal a consistent perception that school curricula insufficiently address Data Literacy skills.

Disagreement levels ranged from 27% to 32%, with the strongest concerns focused on data analysis and interpretation. Neutral responses were high across all categories (36% to 46%), indicating uncertainty or inconsistency in implementation.

The agreement was limited, ranging from 22% to 34%, with slightly more favorable views for data visualization and communication.

Overall, the findings suggest that data literacy remains a peripheral component of current curricula. Greater clarity, consistency, and integration are needed to ensure students build essential data skills across educational contexts.

The next statement was: “School curricula approach the use of Data Literacy:”

Two options were available: With STEM/ STEAM/ STEAME activities and With project-based learning across disciplines.

27. Podejście programów nauczania do wykorzystania umiejętności posługiwania się danymi odbywa się

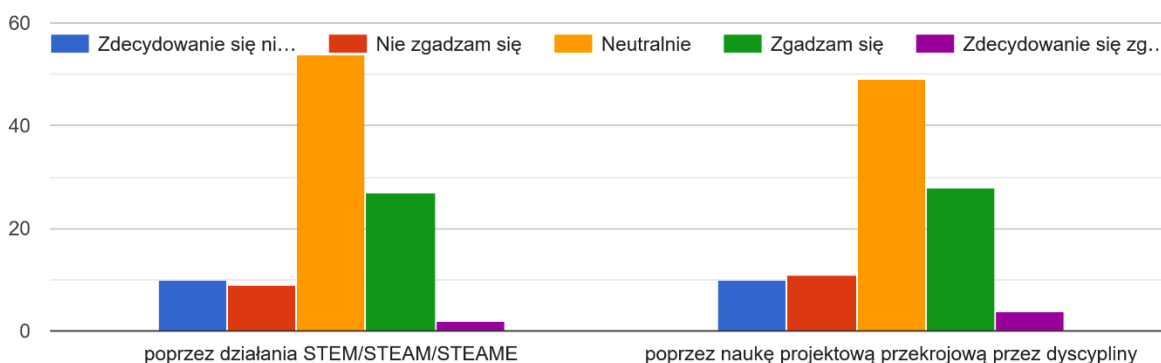


Figure 199 Poland Survey [School curricula approach the use of Data Literacy With STEM/STEAM/STEAME activities and With project-based learning across disciplines]

The data suggests that only a minority of respondents perceive a structured and intentional use of Data Literacy through either STEM/STEAM/STEAME activities or cross-disciplinary project-based learning.

For STEM/STEAM/STEAME, a combined 19 respondents (18.6%) disagreed or strongly disagreed, while only 29 (28.4%) agreed or strongly agreed that these activities are used to support Data Literacy. The majority - 54 respondents (52.9%) - chose neutral, highlighting a widespread perception of ambiguity or inconsistency in how these frameworks are applied.

Similarly, in the case of project-based learning, 21 respondents (20.6%) disagreed or strongly disagreed, while 32 (31.4%) agreed or strongly agreed. Again, a large portion - 49 respondents (48.0%) - remained neutral, indicating that the role of PBL in promoting Data Literacy is not clearly visible or uniformly implemented.

These patterns may reflect:

- A lack of transparency in how Data Literacy is embedded within interdisciplinary or experiential learning structures.
- Inconsistent application across schools or grade levels, depending heavily on individual teacher initiative or local leadership.
- Limited teacher support or curricular guidance, especially when integrating data skills into hands-on or cross-curricular projects.

While both STEM and project-based learning are internationally recognized as effective platforms for cultivating data competencies, the survey findings suggest that in this context, they are underutilized or not systematically aligned with Data Literacy goals.

Educators' responses point to a broader issue: the integration of Data Literacy through innovative instructional models remains fragmented, informal, and highly dependent on school-level implementation rather than national curricular design.

Open-ended responses further support the quantitative findings, highlighting a widespread lack of clarity regarding how Data Literacy is integrated into school curricula. Many participants responded with "I don't know," "no opinion," or left the field blank, reflecting uncertainty or

unfamiliarity. Others mentioned isolated practices such as “computer classes,” “ICT use,” “group work,” or “subject team collaboration,” indicating that Data Literacy is often addressed informally or incidentally rather than through structured approaches. A few comments pointed to personal initiative, like “self-improvement,” while some questioned the clarity of the survey itself. These insights reinforce the need for clearer curricular guidance, shared understanding, and stronger institutional support for meaningful and consistent implementation of Data Literacy.

8.3.7 Training and Professional Development Needs (Section G)

Participants were asked to indicate their level of agreement with a number of statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Zdecydowanie się nie zgadzam), 2 = Disagree (Nie zgadzam się), 3 = Neither Agree Nor Disagree (Neutralny/neutralna), 4 = Agree (Zgadzam się), 5 = Strongly Agree (Zdecydowanie się zgadzam).

The first statement was: “I believe that developing Data Literacy will significantly contribute to my professional development”.

28. Wierzę, że rozwijanie kompetencji w zakresie analizy danych znacząco przyczyni się do mojego rozwoju zawodowego

102 responses

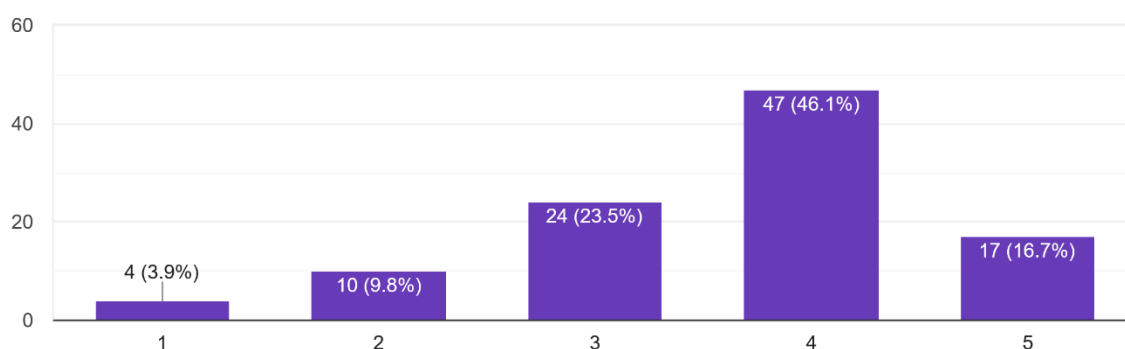


Figure 45. I believe that developing Data Literacy will significantly contribute to my professional development (Likert scale)

Figure 200 Poland Survey [I believe that developing Data Literacy will significantly contribute to my professional development]

The responses to this item reflect a broadly positive orientation among educators toward the professional value of developing data literacy skills. Specifically, 47 respondents (46.1%) selected “Agree” and 17 respondents (16.7%) selected “Strongly Agree”, meaning that 62.8% of participants view Data Literacy as a meaningful factor in their professional growth.

Meanwhile, 24 participants (23.5%) chose the neutral option, suggesting a degree of ambivalence or a lack of experience that might limit their ability to fully assess the impact of data literacy.

Only a small minority (14 respondents, 13.7%) selected “Disagree” or “Strongly Disagree”, indicating limited resistance to the idea.

Overall, these results affirm that the perceived relevance of Data Literacy to professional development is widely recognized, though further support may be needed to engage those who are uncertain or underexposed to its practical benefits.

The statement “I am interested in professional development related to Data Literacy” followed.

29. Jestem zainteresowany/a rozwojem zawodowym związanym z kompetencjami w zakresie analizy danych
102 responses

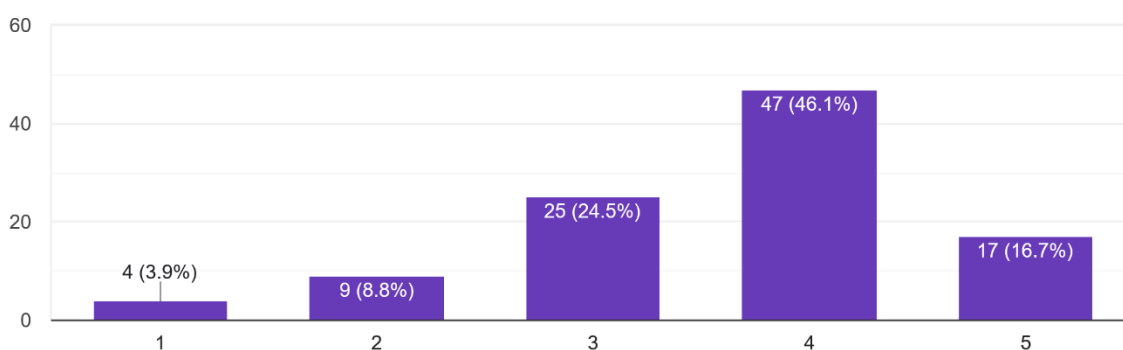


Figure 201 Poland Survey [I am interested in professional development related to Data Literacy]

This statement received similarly strong support, reinforcing the previous finding. 47 participants (46.1%) agreed and 17 (16.7%) strongly agreed, with a combined 62.8% expressing clear interest in data-focused professional development opportunities.

25 respondents (24.5%) chose “Neither Agree Nor Disagree”, which may indicate a lack of clarity about available offerings or unfamiliarity with what such training might involve.

Only 9 respondents (8.8%) disagreed and 4 (3.9%) strongly disagreed, indicating that active resistance is minimal. These results demonstrate that there is a strong demand and openness among educators to build their data-related competencies through structured professional learning.

The statement “The available professional development programs address my needs regarding data use” followed.



30. Dostępne programy rozwoju zawodowego odpowiadają moim potrzebom dotyczącym wykorzystania danych

102 responses

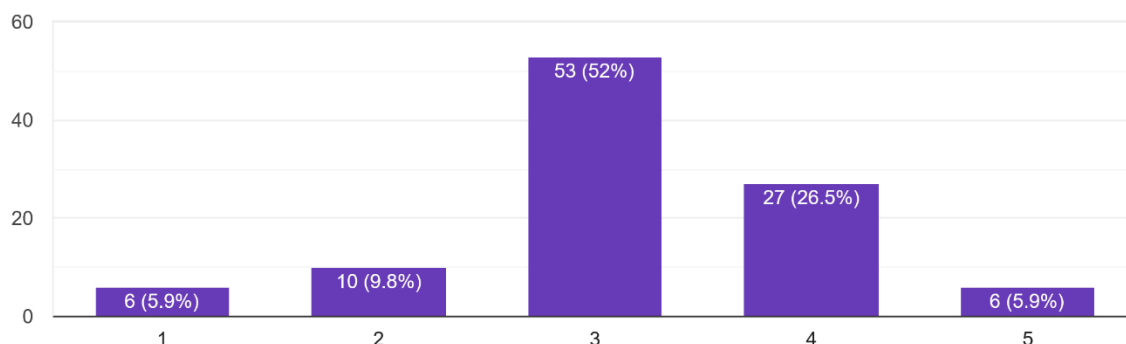


Figure 202 Poland Survey [The available professional development programs address my needs regarding data use]

The responses to this item suggest a less favorable perception of the professional development programs currently available. Only 27 participants (26.5%) agreed and 6 (5.9%) strongly agreed, totaling 32.4% of respondents who feel their needs are being met.

By contrast, 53 participants (52%) selected “Neither Agree Nor Disagree”, pointing to a significant degree of uncertainty or limited awareness regarding the scope or relevance of existing training.

A noteworthy 16 respondents (15.7%) disagreed and 6 (5.9%) strongly disagreed, making up 21.6% of the sample expressing dissatisfaction. These figures suggest that there is a disconnect between the professional development currently offered and the specific expectations or needs of educators regarding data use.

The next statement was: “What type of support do you need to effectively implement Data Literacy methods in your curriculum?”.

Four aspects were available: Workshops and seminars (Warsztaty i seminaria), Mentoring (Mentoring), Peer collaboration (Współpraca z rówieśnikami), Online resources (zasoby online). The results reflect a strong interest in structured, accessible, and collaborative forms of professional support for integrating Data Literacy.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Zdecydowanie się nie zgadzam), 2 = Disagree (Nie zgadzam się), 3 = Neither Agree Nor Disagree (Neutralny/neutralna), 4 = Agree (Zgadzam się), 5 = Strongly Agree (Zdecydowanie się zgadzam).

31. Jakiego rodzaju wsparcia potrzebujesz, aby skutecznie wdrożyć metody analizy danych w swoim programie nauczania?

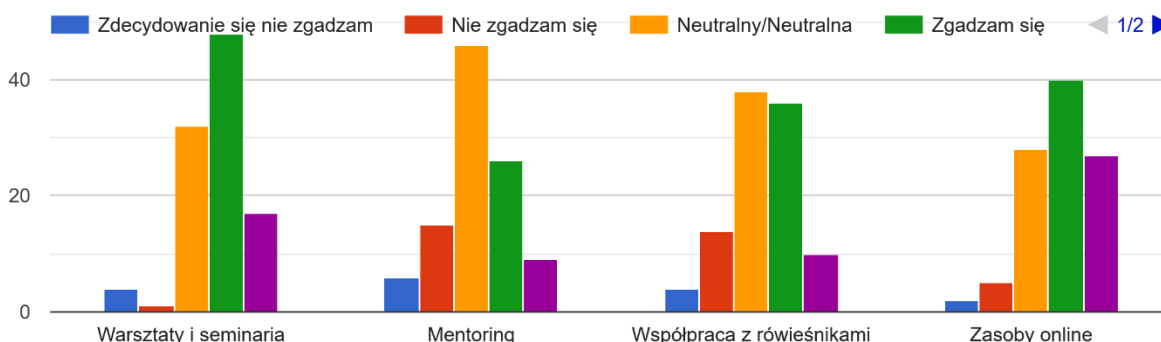


Figure 203 Poland Survey [What type of support do you need to effectively implement Data Literacy methods in your curriculum?]

Workshops and seminars received the highest endorsement, with 63.8% agreeing or strongly agreeing. Only 4.9% disagreed, and 31.4% were neutral, confirming a broad demand for structured, hands-on training that offers practical strategies and guided implementation.

Online resources were similarly well-rated, with 65.7% agreement, showing strong interest in flexible, on-demand formats that educators can access independently. Low disagreement (6.9%) reinforces their appeal for self-paced learning.

Peer collaboration was positively viewed by 45.1%, though 37.3% were neutral and 17.6% disagreed, suggesting that while many value collaboration, opportunities for structured peer exchange may be inconsistent or underutilized.

Mentoring received more cautious support, with 34.3% in agreement and 45.1% neutral. This suggests limited access or unclear implementation, despite general appreciation for its potential value. Disagreement stood at 20.6%.

Overall, the findings show that educators are motivated to adopt Data Literacy practices, but need targeted, context-sensitive support. Strong preferences for workshops and digital resources point to the importance of combining formal training with flexible tools, while the mixed views on mentoring and collaboration indicate a need to strengthen professional learning communities and institutional support structures.

Open-ended responses about support needs for implementing Data Literacy methods show varied perspectives. Many respondents left the field blank or answered “I don’t know,” indicating uncertainty or lack of awareness. Others emphasized the need for “training,” “workshops,” and “courses,” pointing to ongoing demand for structured professional development. Some suggested practical tools like ready-made programs, peer support, or school-based training. A few expressed no need for support, citing self-sufficiency or upcoming retirement. Overall, the answers reflect diverse levels of readiness and suggest a need for flexible, tailored support options.

The next statement was: “What are your current training needs?”



Six aspects were available: Understand basic Data Literacy concepts (Zrozumienie podstawowych pojęć z zakresu analizy danych), Acquire skills in interpreting complex data visualizations (Nabycie umiejętności interpretacji złożonych wizualizacji danych), Organize classroom interventions with my students (Organizowanie interwencji w klasie z moimi uczniami), Get familiar with data-driven decision making in school (Zapoznanie się z podejmowaniem decyzji opartym na danych w szkole), Understand the ethical use of educational data (Zrozumienie etycznego wykorzystania danych edukacyjnych), Know how to integrate data literacy with other literacies (Znajomość integracji analizy danych z innymi obszarami kompetencji).

32. Jakiek są Twoje obecne potrzeby szkoleniowe?

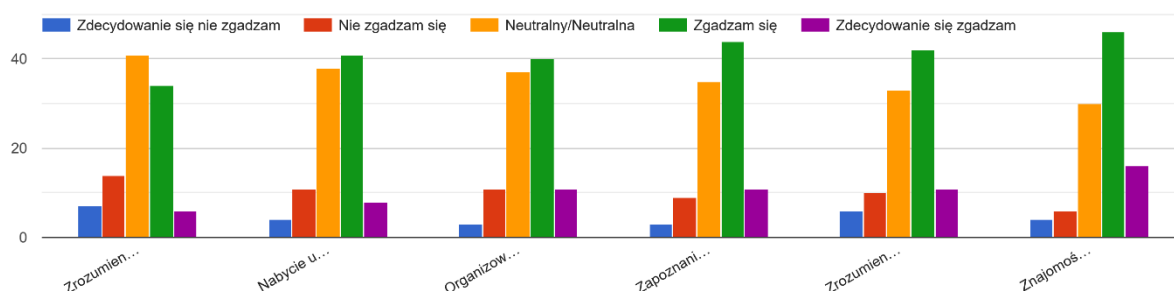


Figure 204 Poland Survey [What are your current training needs?]

The strongest area of need identified was integrating Data Literacy with other competencies, with 60.8% of respondents agreeing or strongly agreeing. This indicates a high level of interest in cross-curricular approaches that connect data use with broader educational goals such as digital literacy or critical thinking.

Similarly, 53.9% expressed a need to become familiar with data-driven decision making in schools, reflecting a strong desire to understand how data informs institutional planning and leadership. Close behind, 52% indicated interest in understanding the ethical use of educational data, emphasizing the importance of addressing privacy, responsibility, and security concerns in professional development efforts.

Half of respondents (50%) also reported the need for training in organizing classroom interventions using data, pointing to a desire for practical strategies that support personalized instruction. Interest in interpreting complex data visualizations was also significant (48%), while understanding basic Data Literacy concepts received slightly less support (39.2%), possibly indicating that some educators already feel confident in foundational areas or prioritize more applied skills.

Across all categories, neutral responses ranged from 29% to 40%, suggesting openness to learning, but also reflecting uncertainty or a lack of prior exposure to data-related content in current training.

Overall, the findings demonstrate that educators are motivated to strengthen their Data Literacy skills, particularly in ways that are practical, ethical, and connected to broader educational practices. Effective professional development should focus on clarifying key concepts, contextualizing ethical use, and building confidence in applying data in both classroom and school-wide contexts.

Open-ended responses to the question about current training needs largely echoed uncertainty or a lack of clarity. Many participants left the field blank or gave non-informative answers such as

“no,” “I don’t know,” or “none,” suggesting either limited awareness of their own development needs or low engagement with the topic. However, a few pointed to specific areas of interest such as learning to use data-related software, understanding online platforms for data analysis, or applying data through artificial intelligence examples. Some also highlighted the need for better-formulated questions or expressed that existing training options were sufficient. These varied responses underscore the importance of clearer communication about Data Literacy goals and more individualized or context-aware professional development pathways.

8.3.8 Challenges and Obstacles (Section H)

Participants were asked to indicate their level of agreement with a number of statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Zdecydowanie się nie zgadzam), 2 = Disagree (Nie zgadzam się), 3 = Neither Agree Nor Disagree (Neutralny/neutralna), 4 = Agree (Zgadzam się), 5 = Strongly Agree (Zdecydowanie się zgadzam).

Focusing on the challenges and obstacles, the relevant statement was: “Which of the following do you think constitute challenges and obstacles for Data Literacy in education?”

Seven were mentioned: Insufficient resources (i.e. labs, equipment, software, etc.) for data-driven activities (Niewystarczające zasoby (np. laboratoria, wyposażenie, oprogramowanie itp.) do działań opartych na danych), insufficient time for data-driven activities (Niewystarczająca ilość czasu na działania oparte na danych), Insufficient training programs in Data Literacy (Niewystarczające programy szkoleniowe w zakresie analizy danych), Resistance among educators towards adopting Data Literacy methods (Opór wśród nauczycieli przed wdrożeniem metod analizy danych), Lack of support or encouragement from school administrators (Brak wsparcia lub zachęty ze strony dyrekcji szkoły), Unclear national policies regarding Data Literacy implementation (Niejasne krajowe polityki dotyczące wdrażania analizy danych), Ethical concerns and privacy issues in educational data handling (Obawy etyczne i problemy z prywatnością w przetwarzaniu danych edukacyjnych).

33. Które z poniższych uważasz za wyzwania i przeszkody dla analizy danych w edukacji?

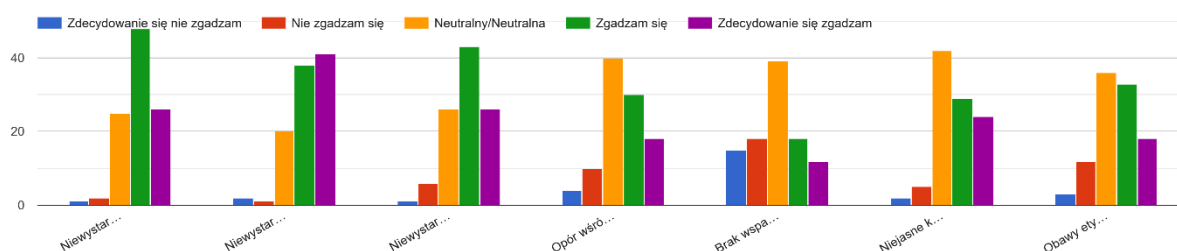


Figure 205 Poland Survey [Which of the following do you think constitute challenges and obstacles for Data Literacy in education?]

Insufficient resources, such as labs, equipment, and software, emerged as a major concern. A combined 74 respondents (48 Agree, 26 Strongly Agree; 72.5%) identified this as a key obstacle, with only 3 participants expressing disagreement. This reflects the widespread perception that schools lack the technical infrastructure needed to support data-driven activities.

Similarly, insufficient time was seen as a significant barrier, with 79 respondents (38 Agree, 41 Strongly Agree; 77.5%) highlighting it as a challenge. This is the most strongly agreed-upon obstacle, pointing to the pressure of overloaded schedules that limit teachers’ ability to engage meaningfully with data-related practices.



Insufficient training programs were also frequently cited, with 43 respondents agreeing and 26 strongly agreeing (total 69; 67.6%). This indicates a strong need for accessible and relevant professional development, confirming earlier findings related to educators' interest in training and skill-building in this area.

The issue of resistance among educators received moderate concern, with 48 respondents (30 Agree, 18 Strongly Agree; 47.1%) acknowledging it, while 40 (39.2%) remained neutral. This suggests that while cultural barriers exist, they may be localized or not uniformly experienced, possibly depending on school context or prior exposure to data use.

Lack of support or encouragement from school administrators received a more varied response. Only 30 respondents (18 Agree, 12 Strongly Agree; 29.4%) identified this as a challenge, while 33 (32.3%) disagreed and 39 (38.2%) remained neutral. This indicates that institutional support varies widely, with some schools offering stronger leadership and others falling short.

Unclear national policies were also a notable concern, with 53 participants (29 Agree, 24 Strongly Agree; 52%) identifying policy-level ambiguity as a barrier, and 42 (41.2%) responding neutrally. These results reflect limited visibility or coherence of national strategies for Data Literacy implementation in education.

Lastly, ethical concerns and privacy issues were cited by 51 participants (33 Agree, 18 Strongly Agree; 50%). Although 36 respondents (35.3%) were neutral, the level of agreement suggests that data protection, ethical use, and privacy remain important and sensitive issues that require more structured guidance and awareness-raising.

The most pressing challenges identified by educators are: Lack of time for data-related activities (77.5%), Inadequate technical resources (72.5%) and Insufficient training opportunities (67.6%). Policy-level ambiguity (52%) and ethical concerns (50%) also pose significant obstacles, underscoring the need for clear frameworks and data governance standards. While teacher resistance and lack of administrative support were rated lower overall, they still represent important contextual barriers, especially where school cultures are less open to innovation.

These findings emphasize a clear call for investment in infrastructure, time allocation, and professional development, as well as the creation of coherent policy guidance and ethical frameworks. Addressing these barriers will be essential to fully enabling the integration of Data Literacy into teaching and learning across educational systems.

8.3.9 Future Intentions (Section I)

The relevant statement was: “In the future, I intend to use data more frequently in my work for”.

Six options were mentioned: Administrative tasks (Zadań administracyjnych), Instructional design (Projektowania instrukcji), Communication and collaboration (Komunikacji i współpracy), Assessment and feedback (Oceny i informacji zwrotnej), Counseling and parent engagement (Doradztwa i zaangażowania rodziców), Broader management responsibilities (Obowiązków zarządczych).

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree (Zdecydowanie się nie zgadzam), 2 = Disagree (Nie zgadzam się), 3 = Neither Agree Nor Disagree (Neutralny/neutralna), 4 = Agree (Zgadzam się), 5 = Strongly Agree (Zdecydowanie się zgadzam).



34. W przyszłości zamierzam częściej wykorzystywać dane w mojej pracy do:

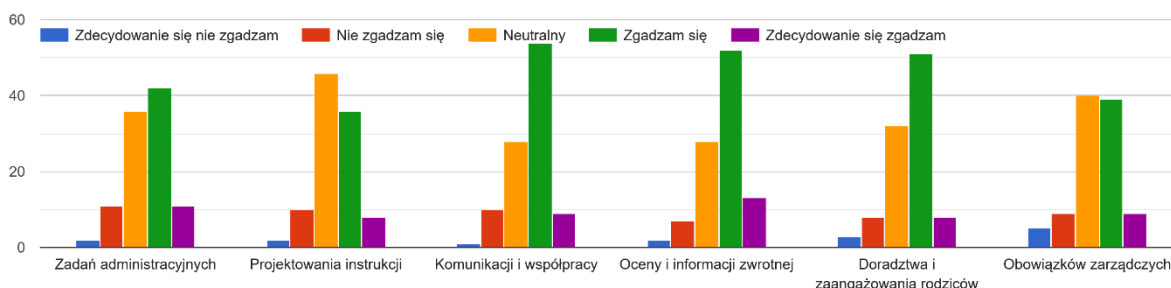


Figure 51. In the future, I intend to use data more frequently in my work for: (Likert scale)

Figure 206 Poland Survey [In the future, I intend to use data more frequently in my work for:]

A combined 53 respondents (52.0%) expressed intent to use data more often in administrative work, suggesting a growing interest in data-informed school operations. However, the relatively high neutrality (35.3%) implies that many educators may lack clarity on what this would entail or may not be directly involved in administrative processes.

With 43.1% of respondents agreeing or strongly agreeing, there is notable interest in using data to inform lesson planning and instructional strategies. However, nearly half of respondents remained neutral, suggesting a need for clearer guidance or professional development on how to integrate data into curriculum design.

Communication and teamwork areas received one of the highest levels of endorsement, with 63 respondents (61.7%) expressing intent to use data more in communication and teamwork. These results highlight growing awareness of data's role in professional collaboration, parent communication, and stakeholder engagement.

With 65 respondents (63.7%) indicating a plan to increase data use for assessment and feedback, this was the most strongly supported area. This shows educators increasingly see the value of using data to personalize evaluation and provide targeted feedback to students.

A total of 59 respondents (57.8%) foresees a role for data in counseling and working with families. While the agreement is high, the substantial neutrality may reflect limited current practice or unclear strategies for applying data in these interpersonal domains.

In the leadership category, 47.0% of participants signaled intent to apply data to broader leadership or operational tasks. However, neutrality remains high (39.2%), which may suggest that not all respondents are in decision-making roles with management duties.

Assessment and feedback (63.7%), communication and collaboration (61.7%), and counseling and parent engagement (57.8%) emerged as the top areas where educators intend to use data more frequently, reflecting a strong focus on student-centered, communicative, and supportive practices.

Moderate support was seen for administrative tasks (52.0%) and management responsibilities (47.0%), suggesting that educators recognize data's potential beyond the classroom but may need institutional support to expand its use.

Instructional design showed slightly lower agreement (43.1%) with a notably high neutrality (45.1%), highlighting a need for clearer instructional models and training that link data to lesson planning.



Overall, educators appear motivated to expand their use of data across diverse professional areas, particularly in ways that enhance teaching quality, student feedback, collaboration, and engagement. However, to realize this potential, clarity, training, and structural support will be essential, especially in less commonly supported contexts such as instructional design and administrative decision-making.

Open-ended responses to the question “In the future, I intend to use data more frequently in my work for...” mostly reflected uncertainty or disengagement, with many participants providing blank or vague answers like “don’t know” or “no opinion.” However, a few mentioned practical uses such as student assessment, communication with parents and staff, or tracking progress. One respondent expressed skepticism, saying they saw “no purpose” in using data. These findings suggest a need for clearer guidance and concrete examples to help educators see the relevance of data in their professional practice.

8.3.10 Open-ended Questions (Section J)

In your opinion, what are the most important factors for implementing successful data-driven methods in education in [country]?

The open-ended feedback revealed a diverse set of perspectives on what educators believe is essential for successfully implementing data-informed practices in schools. While a significant portion of responses consisted of non-substantive entries (“no opinion,” “don’t know,” “-”), many others offered insightful reflections grouped into several recurring themes:

Training and Professional Development

Many respondents emphasized the need for relevant, high-quality training tailored to different teaching levels. Comments such as “training,” “good workshops,” “training adapted to the educational stage,” and “training with practical tools for data analysis” highlighted the expectation for hands-on, applicable support. This also included methodological clarity, with participants pointing to the necessity for “clear objectives,” “awareness of potential benefits,” and “teacher readiness.”

Infrastructure and Technological Resources

Several educators pointed out the importance of adequate infrastructure, noting needs such as “technical and material resources,” “reliable internet,” “labs for children, workshops for teachers,” and “a unified, free educational software platform.” These responses suggest that without basic access to tools and technology, implementation efforts will remain limited.

Leadership and Institutional Support

A recurring theme was the role of school leadership and institutional will. Comments included “engagement of school leaders,” “open attitude of principals and teachers,” and “support from authorities, including financial.” Educators clearly called for top-down encouragement, structured support systems, and alignment with educational policy.

Time and Motivation

Many respondents flagged lack of time as a major challenge, noting that “sufficient time for preparation and analysis” is a critical condition for using data effectively. Some linked this to the need for “motivation,” “teacher commitment,” and “consistent action.” This highlights that structural adjustments and work planning are just as important as technical readiness.

Pedagogical Clarity and Student-Centered Use

Numerous responses emphasized the educational rationale behind data use. Teachers stressed the importance of “individualization,” “student-teacher interaction,” “example-based learning,” and “visual teaching methods.” Others noted that data should serve to “monitor student



progress,” “enhance instructional quality,” and “help with formative assessment.” Several saw a need to connect data practices to real-life teaching examples and practical learning benefits.

Ethical Use and Awareness

Though less frequent, some responses raised concerns about ethical issues and clarity in applying data. Terms like “ethics,” “transparency,” “data protection,” and “secure access to relevant data” were mentioned as factors that should not be overlooked in implementation planning.

Systemic Change and Curriculum Integration

Some educators pointed to the broader context, suggesting that curriculum changes and systemic reform are essential for meaningful adoption. Comments like “update subject curricula,” “integrate into public teaching systems,” and “promote the benefits of data use” reflect a demand for long-term vision and national strategy.

Culture of Collaboration and Openness

Finally, several teachers stressed the value of a collaborative and open culture, mentioning “teacher-parent collaboration,” “colleague cooperation,” “readiness to implement,” and “openness to innovation.” These suggest that cultural and relational factors are equally critical in shaping successful outcomes.

The open-ended responses reinforce the idea that effective implementation of data-driven educational practices depends on a holistic ecosystem—including training, infrastructure, time, motivation, leadership, curriculum support, and ethical frameworks. While individual readiness varies, the collective voice of educators reveals a strong demand for well-structured, adequately supported, and purpose-driven integration of data literacy in education. These insights should inform both policy development and professional learning design to ensure sustainable and equitable implementation.

8.3.11 Summary

The survey gathered responses from 102 participants in Poland, mostly educators (85) and mostly female teachers aged 41–60 with master's degrees and considerable teaching experience. The majority rated their ICT skills as moderate to high, but fewer had received formal training in data literacy, most learned informally.

Awareness and Understanding

Respondents reported strong familiarity with digital and information literacy, but less so with data literacy, statistical literacy, AI literacy, and learning analytics. While many recognized the connections between these areas, understanding of AI and analytics remained limited.

Skills and Readiness

Most teachers felt confident interpreting and creating basic data visualizations. However, fewer were sure about analyzing data or using it for decision-making. The ability to manage data digitally was seen as a moderate strength, though many educators remained neutral, indicating uncertainty or lack of practice.

Current Practices

Many participants said they often collected and assessed data. Yet, more complex practices, like synthesizing data to solve problems, collaborating with colleagues on data interpretation, and using visualizations, were less frequent. Sharing data with others (e.g., parents or students) was moderately practiced, suggesting room for improvement in communication.

Attitudes and Values



Educators widely agreed that data enhances learning, teaching, and assessment. They believed in its value for personalization and equity, though many also acknowledged it increases workload. There was strong support for integrating data use into professional roles, but some concern about implementation burdens.

Policy and Curriculum Views

Participants criticized the education system's weak promotion of data literacy. Many felt the curriculum only minimally covered key data skills (e.g., analysis, communication), and that integration through STEM or project-based learning was unclear or inconsistent. There was modest confidence in administrative support and teacher autonomy, but widespread concern over ethical preparedness.

Professional Development Needs

Teachers expressed strong interest in professional development related to data literacy, especially workshops, online resources, and integrating DL with other literacies. However, they felt the current offerings were inadequate. Training needs included ethical use of data, data-informed decision-making, and applying data in classrooms.

Barriers Identified

Top obstacles were lack of time, resources (tech/tools), and formal training. Other challenges included policy ambiguity, ethical concerns, and limited institutional support. Teacher resistance and administrative disengagement were seen as lesser, but still relevant.

Future Intentions

Respondents showed a willingness to expand data use in assessment, communication, instructional design, and parent engagement. However, intentions were tempered by uncertainty, especially regarding leadership tasks and administrative functions.

Conclusion

The findings reveal that while Polish educators recognize the importance of data literacy and show motivation to grow their competencies, systemic shortcomings, in training, infrastructure, and curricular clarity, hinder progress. Targeted support, clear policies, and stronger integration into educational practices are needed for sustainable change.

8.4 Focus group

8.4.1 Understanding (Section A)

1. How would you define data literacy? What key skills and competencies do you associate with it?

Participants described data literacy as the ability to collect, interpret, and critically assess data. Particularly in contexts that involve real-world decision-making. It was viewed not merely as a technical skill but as a broader competency that requires both analytical and critical thinking.

A strong link was drawn between data literacy and other forms of literacy, especially digital and statistical literacy, which were often described as foundational or overlapping. One participant summarized this relationship by stating: “We can’t talk about data literacy without talking about digital and statistical literacy - these are like its parents.” (entrepreneurship teacher)

The practical dimension of data literacy was also emphasized. Participants highlighted the importance of equipping students with skills to recognize patterns, understand graphs, and evaluate data sources.



As one participant noted: “For me, data literacy is like learning to speak the language of numbers but also learning how not to be fooled by them.” (math teacher) This reflects the dual focus on technical fluency and critical awareness that many participants associated with data literacy.

Overall, data literacy was seen as both an individual and systemic competency. Necessary not only for navigating complex information landscapes, but also for fostering responsible, data-informed participation in educational, social, and professional domains.

2. Do you believe data literacy should be an essential competence for teachers and students today? Why or why not?

There was strong agreement among participants that data literacy should be considered a core competence for both teachers and students in today’s world. The rationale was clear: data permeates nearly every aspect of modern life, from social media algorithms to targeted advertising and political messaging. Without the skills to interpret and question it, young people risk becoming passive consumers of information.

As one science teacher put it: “Data is everywhere: from online shopping to fake news. If our students can’t read it, they’ll be lost.” This sentiment echoed a broader concern that students often encounter complex or misleading data without the tools needed to critically assess its credibility or context.

At the same time, participants acknowledged a significant gap in teacher preparation. Many educators admitted they lacked formal training in data literacy and felt underprepared to support students in navigating data-rich environments. This mismatch between the demands of the digital age and the current state of teacher education was a recurring theme.

Overall, the discussion underscored a shared belief that developing data literacy is not optional, but essential, both as a means of empowerment and as a foundation for responsible digital citizenship. Equipping teachers with the skills and confidence to model and teach data literacy was seen as a necessary step toward achieving this goal.

8.4.2 Views (Section B)

3. How would you view the generation and use of data in compulsory education overall?

Participants viewed the current use of data in schools as largely bureaucratic, focused on administrative metrics such as attendance, grades, and exam results. Many felt that while large amounts of data are collected, they are rarely used to improve teaching or understand student needs.

As one school administrator noted: “We collect a lot of data, but it mostly ends up in reports. Teachers rarely use it to understand student needs.” Teachers often lack the time, training, or support to interpret data pedagogically.

A data manager from industry reflected: “There’s potential, but right now data in schools is more about control than learning.” Overall, the group called for a shift toward more meaningful, reflective use of data focused on learning, not just accountability.

4. In your opinion, what types of data do teachers use in schools?

Participants noted that teachers mainly work with administrative data such as grades, attendance, and test scores, primarily for reporting rather than teaching. This use is often shaped by institutional expectations, leaving little space for formative or reflective practices.

Some participants mentioned gathering informal observations, though these are rarely formalized or supported. As one teacher put it: “Mostly we use what’s required: grades, attendance etc. We don’t often go beyond that unless we really have to.”



There was a shared view that teachers need more support and autonomy to use data meaningfully, to better understand students and guide instruction.

5. In your opinion, how do teachers use that data?

Participants explained that teachers primarily use data to complete required documentation, monitor attendance, and report on student performance. The process is often task-oriented and focused on fulfilling institutional obligations rather than on supporting teaching and learning in a deeper way.

Some participants observed that although schools generate large amounts of data, much of it is not effectively used to inform day-to-day instructional decisions. Data tends to be viewed as something external, imposed by the system, rather than as a resource for pedagogical reflection.

As one teacher commented, “We use it to fill in documents and evaluate students, but not really to help them learn better.” This reflects a broader concern that data is used mostly for summative rather than formative purposes.

A few participants noted efforts to interpret test results or track classroom behavior to adjust teaching, but these examples were rare. The overall sense was that teachers lack both the time and confidence to engage with data meaningfully. The discussion highlighted the need for cultural and structural changes that would allow educators to use data as a practical tool for improving student learning, not just for fulfilling administrative expectations.

6. In your opinion, what are the ethical implications of using student data? How do you evaluate the credibility and accuracy of data used in compulsory education?

Participants raised several ethical concerns related to the use of student data in schools. A major issue was the lack of transparency around how data is stored, who has access to it, and how it is protected. Teachers expressed uncertainty about whether parents, school staff, or external providers see the data, and noted the absence of clear school-level policies. One school administrator shared, “Sometimes I wonder who really sees this data? Parents? IT staff? Nobody tells us how it's managed.”

Privacy and consent were also key themes, particularly in the context of digital platforms that collect student information. Participants questioned whether students and families truly understand how their data is used or have the opportunity to give informed consent.

Concerns about data accuracy were raised as well. Some teachers felt that standardized assessments provide an incomplete or even misleading picture of student abilities. As one math teacher remarked, “One test on a bad day can define a student in the system. That’s not fair or reliable.”

Overall, the discussion pointed to a need for clearer policies, more ethical guidance, and critical reflection on what kinds of data are collected, how they are interpreted, and for what purpose. Group members emphasized that schools should not only use data responsibly, but also help students understand their rights and the implications of being measured and monitored.

7. In your opinion, what are the main barriers and challenges of data literacy in compulsory education?

Participants identified the lack of formal teacher training as a major barrier to developing data literacy in schools. Many teachers have never been taught how to interpret or use data effectively and are expected to figure it out on their own. One entrepreneurship teacher remarked, “We’re expected to use data, but no one explains how. We’re just left to guess.”

Time constraints were another significant challenge. With already full timetables and demanding curricula, participants felt there was little room to meaningfully integrate data-related activities



into everyday teaching. A primary school teacher explained, “There’s no space in the schedule. Data work sounds great but feels like an extra burden.”

The discussion pointed to a need for both structural support and targeted professional development, so that data literacy is not treated as an added task but as an integral part of effective teaching.

8.4.3 Professional Development (Section C)

8. What type of support and training do you believe that teachers need to effectively implement data-driven educational practices?

Group members clearly emphasized the need for practical, hands-on training that shows teachers how to use data meaningfully in everyday practice. Rather than abstract theory or complex tools, they called for step-by-step guidance rooted in real classroom scenarios. As one science teacher put it, “We need simple tools and examples, not just theory. Show me how to use data to help a struggling student.”

There was a strong preference for training that connects directly with decision-making in teaching, such as identifying learning difficulties, adapting instruction, or evaluating progress. Participants felt that data literacy should not be treated as a technical add-on, but as a skill that can directly enhance pedagogical effectiveness.

Some teachers stressed that one-time workshops are not enough to build real competence. As one math teacher explained, “A one-time workshop won’t help. We need regular support, just like with new teaching methods.” Ongoing opportunities for learning, reflection, and peer collaboration were seen as essential for building confidence and consistency in working with data.

In addition, participants pointed to the importance of access to digital tools, clear examples, and mentoring from more experienced colleagues. They emphasized that support must be continuous, contextualized, and aligned with teachers’ subject areas and daily responsibilities.

The discussion highlighted that building data literacy requires more than isolated training sessions. It needs a sustained professional development strategy embedded in the broader culture of the school.

9. Would you prefer training sessions focused specifically on data literacy or integrated within broader pedagogical topics such as digital literacy or problem-based learning? Why?

Most participants expressed a preference for integrated training, where data literacy is embedded within broader educational themes such as digital competence, STEM education, or project-based learning. This approach was seen as more relevant and natural, allowing data-related skills to emerge in meaningful classroom contexts. As one school administrator put it, “It makes more sense to link it with what we already teach. Like statistics or digital tools. That’s where data naturally fits.”

At the same time, some participants supported the idea of offering initial standalone sessions to build foundational understanding of data concepts before moving into integrated applications. This would help teachers feel more confident when applying data skills across subject areas.

Regardless of the structure, there was strong agreement that any training must be practical, connected to real teaching tasks, and directly applicable in the classroom. Participants emphasized that relevance to everyday pedagogy matters more than format. Effective training should help teachers recognize how data literacy supports their work, whether through curriculum design, formative assessment, or student support.



The discussion suggested that flexible training pathways may be most effective. Starting with core skills, then expanding through interdisciplinary, contextual practice.

8.4.5 National Policy and Curriculum Integration (Section D)

10. In your opinion, is the educational system able to support and promote data literacy for teachers and students?

Most participants felt that the current system is not yet prepared to support data literacy in a meaningful way. They pointed to a lack of clear policy direction, limited space in the curriculum, and inadequate teacher preparation. As one primary school teacher put it, “Right now, the system expects us to do more with less. There’s no structure for teaching data literacy.”

There was concern that data literacy is not prioritized in national education agendas, and that without formal support, efforts remain inconsistent. Participants emphasized the need for dedicated time, training, and leadership support to make data literacy a real part of educational practice.

11. What is your opinion on the current national education policy regarding data literacy? Are there any gaps or inconsistencies you have identified that you would like to comment on?

Participants generally agreed that data literacy is not clearly or consistently addressed in national education policy. Where it does appear, i.e. within mathematics or informatics, it tends to be fragmented and lacks a coherent framework. Teachers reported an absence of clear guidance from the Ministry on how data literacy should be understood or implemented as a cross-curricular skill.

This lack of clarity was a source of frustration for some, particularly given the strong policy focus on digitalization. As one entrepreneurship teacher noted, “We talk a lot about digital tools, but not about how to understand or question the data they produce.” Participants felt that while schools are encouraged to use technology, there is little attention paid to the critical competencies needed to interpret and evaluate the data those technologies generate.

Another teacher observed, “There’s no consistency. One subject mentions data in passing, another ignores it. It’s fragmented.” This inconsistency was seen as a barrier to building a shared understanding of data literacy across the school system.

The discussion highlighted a need for national policy to more explicitly define data literacy, position it as a key educational priority, and support its integration across subjects and teaching practices.

12. Critically, how do you assess your national school curriculum in terms of integrating data literacy? What would you suggest improving it?

Participants felt that the current national curriculum addresses data literacy only in a limited and superficial way. It is typically introduced through subjects like mathematics, mainly in the form of statistics or informatics, but rarely linked to real-world applications or critical thinking. Teachers noted that this narrow approach fails to equip students with the ability to evaluate, interpret, or question the data they encounter in everyday life.

One math teacher reflected, “We teach charts and averages, but not how to spot misinformation or biases in data.” This view was echoed by others who felt that students are exposed to technical skills without the broader competencies needed for data-informed decision-making.

Participants recommended integrating data literacy more meaningfully across subjects through interdisciplinary projects. They emphasized the importance of curricular flexibility that allows students to engage with authentic, context-rich data. A science teacher suggested, “Let students



work with real data: climate change, social trends, even their own school surveys. That's how they'll learn."

The group called for a shift from isolated lessons to project-based, inquiry-driven approaches that position data literacy as both a practical skill and a critical capacity essential for modern citizenship.

In closing, a few teachers highlighted the importance of student agency in data literacy. They emphasized the value of allowing students to ask their own questions and use data to explore issues that matter to them. As one entrepreneurship teacher put it, "Students love investigating real problems. Data gives them power, if we let them use it."

8.4.6 Summary

The focus group brought together 12 participants with diverse professional backgrounds, including teachers and school administrators as well as one representative from the data industry. The group consisted of 8 women and 4 men. Their combined perspectives provided a well-rounded view of how data literacy is understood, practiced, and supported in compulsory education.

Understanding of Data Literacy. Participants broadly defined data literacy as the ability to collect, interpret, and critically evaluate data, particularly in real-world decision-making contexts. They emphasized that data literacy goes beyond technical proficiency and includes critical thinking, ethical judgment, and the ability to contextualize and question data. Many noted its overlap with other literacies; particularly digital and statistical; which they considered foundational. Teachers also stressed the need for students to develop practical skills such as interpreting graphs, spotting patterns, and assessing the reliability of data sources.

Current Practices and Challenges in Schools. The group expressed concern that data use in schools is largely bureaucratic, shaped by administrative requirements such as grades, attendance, and exam results. Teachers often lack the time, training, or autonomy to use data as a tool for teaching and learning. While significant volumes of data are collected, they are rarely used to adjust instruction or respond to individual student needs. Ethical concerns also emerged, particularly regarding transparency, data privacy, and the credibility of standardized test data. Participants felt that students and teachers alike often remain unaware of how data is stored, shared, or interpreted.

Professional Development Needs. Participants consistently called for hands-on, practical training tailored to the realities of classroom teaching. One-off workshops were seen as insufficient. Instead, they emphasized the need for step-by-step guidance using real examples, along with mentoring and regular opportunities for collaborative reflection. While most favored integrating data literacy into broader topics like STEM or digital competence, some suggested that foundational training sessions be offered first. Relevance and applicability to daily teaching were seen as more important than the exact format.

National Policy and Curriculum Gaps. Participants agreed that national policy does not yet meaningfully address data literacy. Where it appears - primarily in math or informatics - it tends to be fragmented and lacking in coherence. Teachers reported no clear expectations or curricular space to engage students in meaningful, interdisciplinary data work. Despite policy emphasis on digitalization, little attention is paid to developing students' critical understanding of data. Participants advocated for more flexible, inquiry-driven curriculum structures that allow students to work with real data related to issues they care about.

The discussion revealed broad consensus that data literacy is essential for modern education but remains weakly integrated into practice, training, and policy. Participants stressed the need to



move beyond compliance-focused data use and toward a culture of informed, ethical, and reflective engagement with data, both for teachers and students.

Participants recommended that data literacy be embedded more coherently across the curriculum, connected to broader competencies such as digital and statistical literacy. They also emphasized the need for sustained practice-oriented teacher development that includes mentoring, collaboration, and access to real-life classroom applications.

8.5 Country Summary

8.5.1 Conceptualization of the term ‘Data Literacy’

In the Polish context, **data literacy** is not yet a well-defined or consistently used educational concept. Across policy, curricula, and practice, it is often conflated with broader digital or statistical competences. Stakeholders, particularly educators, tend to understand data literacy as a cross-disciplinary ability to collect, interpret, critically evaluate, and ethically use data for informed decision-making. However, this understanding is rarely formalized in national documents or supported through systematic implementation.

Survey and focus group results indicate that educators associate data literacy with interpreting graphs, analyzing statistics, and drawing conclusions, but also with recognizing bias, assessing reliability, and applying insights in real-world scenarios. Teachers and administrators emphasized that data literacy is deeply connected to critical thinking, media literacy, and ethical awareness, not just technical skill.

Practically, data literacy is delivered through fragments of content in mathematics (e.g., descriptive statistics), computer science (e.g., spreadsheets, visualizations), and informatics. There is no dedicated subject or curricular thread devoted exclusively to data literacy. It is rarely approached holistically, and pedagogical coherence across subjects is lacking.

Educators expressed a strong belief that data literacy is a necessary skill for both students and teachers in today’s data-driven world. Yet most also reported limited training and confidence in teaching it. They viewed data literacy as essential for modern citizenship and digital participation, particularly in an environment shaped by algorithms, misinformation, and vast information flows.

The theoretical concept of data literacy seems to be intuitively understood by many Polish educators as a blend of technical, analytical, and critical capacities, however there is no unified or formal national definition. Its development depends heavily on teacher initiative and is embedded inconsistently within the broader educational landscape.

8.5.2 Challenges and Gaps

The national research revealed several systemic, institutional, and pedagogical barriers to the effective development of data literacy in Poland’s compulsory education system. The challenges span across curriculum design, teacher preparation, resource availability, and national policy alignment.

Data literacy is not formally defined in Polish education policy. It is frequently interpreted through the lens of digital competence or mathematical skills, without recognizing its interdisciplinary or critical dimensions. This conceptual ambiguity results in inconsistent understanding among educators and a fragmented curricular presence, limited mainly to isolated elements in mathematics or computer science.

Although data-related topics (e.g., statistics, graphing, spreadsheet use) appear in subjects like mathematics or informatics, these are not linked to a broader pedagogical vision of data literacy. Teachers report that curricula fail to connect technical skills with real-world applications, critical



evaluation, or ethical reflection. This limits students' opportunities to engage with data meaningfully and across disciplines.

Most teachers surveyed had not received formal training in data literacy. Many relied on self-study or informal peer exchanges. This lack of structured professional development leaves educators underprepared to use data confidently or integrate it effectively into their teaching. Ethical dimensions of data use such as privacy, consent, and responsible sharing are especially neglected in training programs.

Educators identified a lack of time, digital infrastructure, and access to user-friendly tools as major barriers. Teachers are often overburdened with administrative tasks, leaving little room for experimentation or reflective data use. Many schools, particularly in rural areas, lack the technology and technical support necessary for implementing data-rich practices.

Focus group participants emphasized that most data collected in schools (attendance, test scores, grades) is used for reporting and compliance rather than for instructional improvement. This undermines teachers' sense of agency and discourages the development of data-informed pedagogical strategies.

National policies related to digital education emphasize infrastructure and technology access, but pay little attention to data literacy as a distinct and critical educational goal. Teachers and administrators described a lack of leadership and policy coherence, resulting in uncertainty about how data literacy should be addressed at school or system level.

There is limited understanding of ethical and legal considerations in data handling among educators. Many teachers are unclear about data privacy rules, access rights, and appropriate data sharing practices. This creates hesitation and risk in data use, particularly involving student data.

These gaps reveal that while there is growing awareness of the importance of data literacy, the structural and institutional conditions for its development are still weak. Without clearer policy direction, targeted teacher training, curricular coherence, and investment in support systems, data literacy will remain marginal in Polish education.

8.5.2 Best practices and recommendations

Poland lacks a systematic national framework for data literacy in education, however several promising practices and insights emerged from the national research. These illustrate how schools and teachers can begin to embed data literacy through innovative, practice-oriented approaches. Building on these examples and on the analysis of challenges, this section outlines both best practices observed and actionable recommendations for policy and implementation.

Best Practices Identified

1. Project-based and gamified learning:

Case studies involving Minecraft Education and ArcGIS demonstrated how game-based and inquiry-driven methods can successfully engage students in data-related tasks. These activities helped learners develop skills in data collection, visualization, and interpretation, while also fostering teamwork and digital citizenship.

2. Integration into real-life contexts:

Projects like "Create a map of your school area" showed the potential of using local, relevant data to promote spatial thinking, pattern recognition, and digital tool use. Such activities make data literacy tangible, particularly when they connect to students' own environments and interests.

3. Teacher-led innovation and informal training:



Despite the absence of formal structures, many teachers reported independently developing lessons or engaging in peer learning to build their data skills. Some schools fostered collaborative environments where educators exchanged experiences and supported each other in applying data to formative assessment and classroom decisions.

4. Emphasis on ethical awareness in digital education:

Several lessons, such as “Cyberlekcje 3.0”, included components on copyright, responsible use of online content, and safe data handling. These illustrate a valuable link between data literacy and digital ethics: critical in the current landscape of surveillance technologies and misinformation.

Recommendations

For Policymakers:

- Establish a clear, cross-curricular definition of data literacy in national education policy that includes technical, analytical, ethical, and critical dimensions.
- Integrate data literacy systematically across subjects and educational stages, ensuring coherence with digital, statistical, and media literacy.
- Develop national guidelines and frameworks that promote interdisciplinary approaches (e.g., through STEM, STEAM, and project-based learning models).
- Ensure alignment between curricula, teacher training standards, and digital education strategies, explicitly including data literacy as a core component.

For Educational Authorities and School Leaders:

- Invest in targeted, ongoing professional development, with a focus on practical, hands-on training using classroom-relevant examples.
- Promote collaborative teacher networks and mentoring schemes to facilitate peer learning and build a community of practice around data use.
- Provide adequate digital infrastructure and user-friendly tools to support data-driven teaching, especially in under-resourced or rural schools.

For Teacher Educators and Trainers:

- Embed data literacy into initial teacher education and induction programs, not as an add-on, but as an essential aspect of contemporary pedagogy.
- Prioritize ethical and critical aspects of data use, including privacy, bias, and equity, ensuring that educators can model responsible data practices.
- Encourage inquiry-based and student-centered approaches, allowing learners to engage with real datasets, ask their own questions, and explore social issues through data.

For Schools and Teachers:

- Use local and student-generated data to make learning meaningful and relevant.
- Explore interdisciplinary projects that combine data analysis with storytelling, citizenship education, science, or geography.
- Foster a reflective data culture that values formative use of data for supporting students, not just administrative compliance.

While national policy in Poland has yet to fully embrace data literacy as a standalone educational goal, there is strong momentum at the grassroots level. By scaling up these emerging practices and aligning them with structural reforms, Poland can foster a more data-literate generation of learners and educators alike.

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9. National Report [Portugal]

The Portugal National Report was authored by Piedade Vaz-Rebelo, Graça Bidarra, João Fernandes, Carlos Barreira.

This national report examines the state of data literacy in Portugal's compulsory education system, drawing on a comprehensive literature review, a national survey with educators, and focus group interviews with teachers and education stakeholders. It reveals a growing awareness of the importance of data literacy, though its implementation is still often implicit.

Data literacy is embedded across various subjects in a progressive and interdisciplinary way. In early education, data literacy is introduced through simple data collection and representation tasks. From primary to secondary school, data literacy is increasingly formalised, particularly within mathematics, sciences, ICT, and citizenship education. Topics such as statistics, probability, data interpretation, and critical thinking are introduced and expanded upon across grade levels. Recently, pilot schools have launched a dedicated subject called 'Literacies and Data', reflecting growing institutional recognition of data literacy as a cross-curricular competence.

Findings from the survey and interviews indicate that educators conceptualize data literacy as a multidimensional competence involving technical, analytical, and ethical dimensions. Teachers see data literacy as essential for fostering critical thinking, informed citizenship, and responsible digital engagement. Nevertheless, respondents also report challenges:

- Data literacy is rarely named explicitly in national policies or curriculum frameworks.
- Teacher training—both initial and continuous—lacks adequate focus on data literacy-related topics.
- There is limited support for cross-disciplinary collaboration across schools.
- Practical tools for assessment and implementation are scarce.

Despite these challenges, examples of best practices emerged, including co-teaching between teachers and librarians, project-based learning involving real-world data, or critical analysis of media and statistics. Innovative pilot initiatives, such as the new 'Literacies and Data' subject, indicate a shift toward greater institutional commitment.

To consolidate progress, this report recommends:

- Establishing a clear national strategy that explicitly incorporates data literacy as an educational goal.
- Enhancing teacher education with emphasis on statistical thinking, ethics, and interdisciplinary teaching.
- Developing assessment frameworks and pedagogical resources for data literacy.

9.1 Literature review

9.1.1 National curricula

9.1.1.1 Compulsory education description

Education in Portugal is organised according to the democratic principles established by the Constitution of the Republic (1976), particularly the freedom to teach and learn (Art. No 43), as well as citizens' rights and duties of the state in this area (Art. No 73-77). These same principles were the foundation of the Education Act (1986), which defines educational objectives, structures and modes of organisation.

Pre-primary education, basic, upper secondary and higher education, as well as out-of-school education, are the responsibility of the Ministry of Education, Science and Innovation (MECI). As such, it is responsible for defining, coordinating, implementing and assessing national policy regarding the education system, as well as articulating education policy with qualification and vocational training policies.

In Portugal, compulsory education covers a period of 12 years, from age 6 to 18, as established by **Law no. 85/2009, of August 27**. This includes the full cycle of **Basic Education** (grades 1 to 9) and **Upper Secondary Education** (grades 10 to 12).

Basic Education - 9 years

- 1st cycle: Grades 1-4 (ages 6-10)
- 2nd cycle: Grades 5-6 (ages 10-12)
- 3rd cycle: Grades 7-9 (ages 12-15)

Basic education has the same track for all students. However, in some schools there is artistic education, which adds complementary training in an artistic area to the general curriculum (specialised artistic courses).

Upper secondary education - 3 years

- Grades 10-12 (ages 15-18), with several educational pathways:
 - *General/Scientific-humanistic courses* (e.g., sciences, humanities, economics)
 - At the same time, there are courses with their own plans, specialised artistic courses, vocational courses, recurrent secondary education and vocational courses.

Upper secondary education aims to provide students with diversified training and learning, according to their interests. This is done with a view to pursuing further studies and/or entering the labour market.

The **national curriculum** is defined centrally by the Ministry of Education and includes the following core areas.

The Curriculum [Guidelines](#) for Pre-Primary Education (OCEPE) are based on the overall educational objectives defined by the Framework Law (Law No. 5/97 10 February) and are designed to support the construction and management of kindergarten curriculum, which is each pre-primary teacher's responsibility in conjunction with the educational team of the school/cluster. According to the OCEPE, the curriculum should be adapted to the social context, to the profile of the children and their families and to the development of each child and the group.

The OCEPE (established by Despatch No. 9180/2016, 19 July) are compulsory for all pre-primary establishments on the national network (public and private networks, for and not-for-profit). These guidelines were issued in 2016 by the Ministry of Education and are the result of comprehensive efforts that included contributions from pre-primary teachers, initial training teachers, researchers, and other experts in this area.

For children aged 3 years and over, the OCEPE identifies three main content areas, which are:

- social and personal education - Cross-curricular area, with its own content and purpose, that is part of all the educational work undertaken in kindergartens. This area covers the development of attitudes, postures and values that allow children to continue to successfully learn and become independent, conscious, and supportive citizens
- knowledge of the world - Area in which children learn about the different sciences in a coordinated way, using a process of questioning and organised search for knowledge, which allows children a better understanding of the world that surrounds them.



- expression and communication - Area that includes different languages that are essential for children to interact with others, making sense of and representing the world that surrounds them. This area is divided into four sub-areas: artistic education (visual arts, drama, music, dance); spoken language and introductory writing; mathematics; and physical education.

In the **1st cycle of basic education in Portugal** (from 1st to 4th grade), the curriculum is organised in such a way as to focus on the overall development of students. It operates on a mono-teaching basis (a single teacher per class for most subjects), which allows for an integrated and contextualised approach to learning, facilitating articulation between different areas of knowledge. The **main curricular components** include the subjects of **Portuguese, Maths, Environmental Studies** and **Artistic and Physical-Motor Expressions** (which include plastic, dramatic, musical and motor expression activities).

From the **3rd year** onwards, **English** is introduced as a compulsory subject.

In addition, students can attend other classes such as **Study Support**, which aims to reinforce essential learning, especially in Portuguese and Maths; **Complementary Offer**, defined by each school, which can include citizenship or technology content; and also **Curricular Enrichment Activities** (optional), generally promoted in conjunction with external organisations, focusing on areas such as sport, music, ICT or other artistic expressions.

There is also the possibility of taking the subject of **Moral and Religious Education**, which is optional according to the choice of the parents.

<https://files.diariodarepublica.pt/1s/2014/12/24000/0606406068.pdf>

From the **2nd cycle of basic education in Portugal** (5th and 6th grades), there is a transition to a multi-teacher system (different teachers for specific subjects), with greater subject specialisation and, at the same time, an increased challenge of articulation between areas.

In this 2nd cycle, the curriculum is organised into subject areas that include several compulsory subjects. In the **Languages and Social Studies** area, students take **Portuguese, English** and **History and Geography of Portugal**. The **Maths and Science** area includes **Maths** and **Natural Sciences**. The **Artistic and Technological Education** component includes **Visual Education, Technological Education** and **Music Education**. There is also **Physical Education**, which is an area of its own and is compulsory. In addition, students can choose to take **Moral and Religious Education**, which is optional. The curriculum can also include a **Complementary Offer**, defined by the school, and **Study Support** periods, designed to consolidate learning, especially in Portuguese and Maths.

https://www.dge.mec.pt/sites/default/files/Basico/Legislacao/dl_139_2012.pdf

<https://www.dge.mec.pt/matriz-curricular-do-2o-ciclo>

In the **3rd cycle of basic education** in Portugal, corresponding to the 7th, 8th and 9th years of schooling, the curriculum is organised into subject areas that make up a diverse set of compulsory subjects.

In the area of **Portuguese Language**, students attend the subject of **Portuguese**.

The **Foreign Languages** component includes the subject of **English** and a **second foreign language**, which could be **French, Spanish** or **German**, depending on what the school offers.

In the area of **Humanities and Social Sciences**, students have the subjects of **History** and **Geography**.

Maths is a compulsory subject of the same name.

In the area of **Physical and Natural Sciences**, students take the subjects of **Natural Sciences** and **Physical Chemistry**.

The area of **Expressions and Technologies** includes the subjects of **Visual Education**, **Information and Communication Technologies (ICT)**, a **school offer** (defined locally) and **Physical Education**.

In addition, students can take the subject of **Moral and Religious Education** on an **optional basis**, subject to the decision of their parents.

<https://www.dge.mec.pt/matriz-curricular-do-3o-ciclo>

Secondary education in Portugal, as established in **Decree-Law no. 139/2012, of 5 July**, as amended by **Decree-Laws no. 91/2013** and **no. 176/2014**, is diversified and geared towards meeting the different needs, interests and pathways of students. This organisation aims to guarantee the completion of compulsory education and preparation for higher education or entry into the world of work.

The **scientific-humanistic courses** are aimed at students wishing to pursue studies in higher education and are organised into four areas: Science and Technology, Socio-Economic Sciences, Languages and Humanities, and Visual Arts. These courses combine a common general education, which includes Portuguese Language, Philosophy, Foreign Languages), Physical Education, with specific subjects in the chosen area of specialisation (e.g., Biology, Physics, Economics, History), Citizenship and personal development projects (e.g., Project Area).

9.1.1.2 Data literacy in national curricula

Level	Discipline / Course	Description
Pre-school	Area of Expression and Communication - Maths	In pre-school education, organising and processing data is one of the components of the approach to mathematics. The process of collecting, organising and processing data is based on classifying, counting and comparing. This process stems from curiosity and answering questions that make sense to the child (for example, finding out which vegetables are the children's favourites). In kindergarten life, there are many opportunities to collect, organise and interpret quantitative data from everyday situations and from carrying out experiments and projects. It is up to the teacher to support the formulation of the questions to be answered, the collection of data and its organisation (sets, tables, graphs, Venn diagrams, etc.). In order to understand that data collected in a particular context cannot be generalised, the teacher can also support the children in making conjectures about other samples, such as finding out if the children in another room have the same preferences (OCEP, 2016, 78). Learning to be promoted Collect relevant information to answer questions, using appropriate methodologies (lists, drawings, etc.). <i>Use simple graphs and tables to organise the information collected and interpret it in order to answer the questions posed.</i> These learnings can be observed, for example, when the child: She asks questions and participates in collecting data about herself, her daily life and her environment. Participates in organising the information collected using tables, simple pictograms, etc. Try to interpret the data presented in tables, pictograms and bar charts, identifying the modal category as corresponding to the highest frequency. You realise that the treatment presented is a way of describing a reality. The teacher promotes this learning when, for example: It leads the children to ask questions that don't have an immediate answer (how many children have been present this week, how many boys and girls are there in the room, etc.). Help the children define what they want to find out and how they want to collect and organise the data, support them in collecting and organising the information using a variety of representations (pictograms, tables, etc.) appropriate to the type of data and questions asked.



		Provide different materials (lids, beads, chopsticks, lego pieces, etc.) that make it easier to concretise and organise data, leading to its representation in more elaborate forms (graphs, tables, etc.). It helps children to "read" and interpret the data they have collected and to understand the different frequencies and the mode of each distribution. Supports children in using the data records they have drawn up to communicate the information they have collected and the conclusions they have reached to others (family, other groups, kindergarten, school, etc.) (OCEP, 2016, 79-80).
1st Cycle (1st to 4th grade)	Maths	In primary school, learning and strategies related to data literacy are mainly found in maths. In this cycle, we invest in developing children's ability to deal with data, with the aim of getting to know their surroundings better, substantiating decisions, asking themselves new questions and dealing with uncertainty. It is important for children to have the opportunity to develop two different types of work that are equally relevant from the perspective of enhancing statistical literacy. One of them consists of the study of real concrete situations of interest, to be done regularly and in connection with other curricular areas, involving the child in all the phases of a statistical investigation. The formulation of questions initially focuses on qualitative characteristics, expanding in 4th grade to discrete quantitative characteristics. Data collection involves deciding on the source and methods to be used, whether public or private, and data analysis relies on the production of various graphs, including bar charts, to be produced using technology. The other type of work consists of analysing real graphs and infographics found in publications or in the media, which children should be able to read and progressively appreciate critically. It is also worth emphasising the importance of probabilistic reasoning from Year 3 onwards. It should be emphasised that the children may also have had significant experiences in pre-school in this area, particularly in the context of exploring the various data collection maps that are often found in kindergarten classrooms (New Essential Learning - Maths).
1st Cycle (1st to 4th grade)	Environmental studies	Learning and strategies related to data literacy are also mentioned in Environmental Studies: Selective recording of previous ideas, data collected and conclusions drawn from the data Collection of data and opinions related to the themes under study Analysing facts and situations, identifying their elements or data
1st Cycle (1st to 4th grade)	Art Education	In Art Education, learning and strategies related to Data Literacy are also mentioned, albeit implicitly: Theatre, Dance, Visual Arts - Appropriation and reflection Promote strategies that involve the student's creativity: - mobilising knowledge and processes through which they perceive, select and organise data and give it new meanings; Dance - Experimentation and reflection Create, individually or in groups, short movement sequences and/or choreographic compositions based on concrete or abstract data, in processes of improvisation (free or partially conditioned) and composition (intentionally anticipating forms of entry, progression in the action, and finalisation, rehearsed for later reproduction/presentation).
1st Cycle (1st to 4th grade)	English	Learnings and strategies related to data literacy are also mentioned in the Essential Learning in English. In Year 3, under Communicative Competences, and with a view to developing the student's profile as a researcher, strategies are proposed that involve the student: - collecting data and opinions; - incipient and focussed research. In 4th grade, in addition to the above, strategies are also proposed that involve the student: - tasks of planning, reviewing and monitoring learning; - selective dossier registration; - organisation (e.g. building summaries, observation records, visit reports, according to criteria and objectives); - drawing up general plans or schemes; - promoting progressively autonomous study with the support of the teacher;



		- identifying difficulties and ways of overcoming them.
1st Cycle (1st to 4th grade)	ICT	In ICT, learnings and strategies related to data literacy are also mentioned, namely: - Encourage the development of tasks for processing and organising collected data in different formats, for example storyboards, diagrams, infographics, digital posters, multimedia presentations, etc. - Formulate questions to guide the collection of relevant data or information
1st Cycle (1st to 4th grade)	Physical Education	In the PHYSICAL ACTIVITIES AREA, and in order to promote the profile of the Critical/Analytical and Self-Evaluating/Hetero-Evaluating student (transversal to all areas), learning and strategies related to Data Literacy are also mentioned as those that enable students, in all situations: - appreciate their performances; - identify weaknesses and strengths in their learning; - use the data from their self-assessment to get involved in learning;
2nd Cycle (5th and 6th years)	English	Learnings and strategies related to Data Literacy are also mentioned in the Essential Learning of English, in the 2nd cycle in: Profile of the student as researcher Promote strategies that involve the student: - collecting data and opinions; - research with progressive autonomy.
2nd Cycle (5th and 6th years)	History and Geography	Learning and strategies related to Data Literacy - Analysing facts and situations, selecting certain elements or data, in particular location and historical and geographical characteristics; p.5 - Collect and select data from reliable historical sources to analyse the themes under study; p.5 - Organise guided debates that require supporting statements, elaborating opinions or analysing facts or data; p.7 - Learn to selectively record the historical and geographical data obtained. Pag8
2nd Cycle (5th and 6th years)	Maths	Learning and strategies related to Data Literacy Use of absolute and relative frequency tables, bar, circular and line graphs; calculation and interpretation of mean, mode and range
(2nd and 3rd Cycles)	Natural Sciences	Learnings and strategies related to Data Literacy Observing, recording and analysing experimental data; Construction of graphs and tables based on natural and environmental phenomena; Critical interpretation of scientific results based on data gathered from experiments or various sources.
2nd Cycle (5th and 6th years)	Visual Education	Learning and strategies related to data literacy Promoting strategies that involve student creativity, in order to mobilise knowledge and processes through which they perceive, select, organise and use data.
2nd Cycle (5th and 6th years)	Technological Education	Learning and strategies related to Data Literacy Using scientific and technological processes and phenomena, asking questions, seeking information and applying knowledge acquired in making informed decisions between possible options.
2nd Cycle	ICT	Learnings and strategies related to Data Literacy 5th and 6th years



(5th and 6th years)		The student plans an online investigation and is able to: Plan research strategies to be carried out online; Formulate questions to guide the collection of relevant data or information; Define keywords to locate information, using simple search mechanisms and functions; Use the computer and other digital devices as tools to support the research process; Learn about the potential and main functionalities of tools to support the research process and online research; Carry out research, using selected and relevant terms according to the theme to be developed; Critically analyse the quality of information; Using the computer and other digital devices to organise and manage information. The student knows digital strategies and tools to support creativity, explores ideas and develops computational thinking and produces creative digital artefacts, being able to: Get to know the potential of different digital applications, for example creative writing, by exploring programming environments; 6th grade Learn about the potential of digital getting started with data organisation and processing; Plan investigation and research strategies to realise online: Formulate questions to guide the collection of relevant data or information; Define keywords to locate information, using simple search mechanisms and functions; Using the computer and other digital devices such as tools to support the research process and research; Know the potential and main functionalities of applications to support the research process and online research; Carry out searches using the selected terms and relevant, according to the theme to be developed; Critically analyse the quality of information; Use the computer and other digital devices, from in order to organise and manage information.
3rd cycle (7th to 9th grade)	English	Learning and strategies related to Data Literacy 7th grade Profile of the student as researcher - Encouraging people to search for and deepen their knowledge; - collecting data and opinions to analyse the issues under study (p.7) 9th grade Student profile as reflective or critical -elaborating opinions or analysing facts or data (p.6)
3rd cycle	Geography	Learnings and strategies related to Data Literacy Reading and interpreting statistical data relating to population, migration, the economy and the environment; Graphical representation of geographic information;



		Analysing georeferenced data sources.
3rd cycle (7th to 9th grade)	History	Learnings and strategies related to Data Literacy -Analyse facts or situations, learning to select elements or historical data relevant to the subject under study -Organise guided debates that require supporting statements, elaborating opinions or analysing facts or historical data - Collect and select data from relevant historical sources to analyse the subjects under study, learning to research in a progressively autonomous way -Prepare short summaries based on data collected from analysed historical sources.
3rd Cycle (7th to 9th grade)	Maths Organising and processing data 9th grade	Learning and strategies related to Data Literacy Introduction of measures such as median, quartiles and interquartile range; carrying out statistical studies with samples and population; introduction to probability. - Interpreting and producing statistical information and using it to solve problems and make informed decisions. - Collect, organise and represent data using different representations, including histograms, and interpret the information represented. - Analyse and interpret information contained in a set of data using the most appropriate statistical measures and recognise its meaning in the context of a given situation and formulate conjectures. - Plan and carry out studies involving statistical procedures and interpret the results obtained using statistical language, including comparing two or more sets of data by identifying their similarities and differences. - Solve problems involving the organisation and processing of data in a variety of familiar contexts and use statistical measures to interpret and make decisions. - Solve problems involving the notion of probability in different contexts and assess the reasonableness of the results obtained. - Develop the ability to understand and construct statistical and probabilistic arguments and reasoning.
3rd Cycle (7th to 9th grade)	Natural Sciences	Learnings and strategies related to Data Literacy -Analysing facts, theories, situations, identifying their elements or data --Organise guided debates that require the support of assertions, the elaboration of opinions or the analysis of facts or data
3rd cycle	Physical Chemistry	Learnings and strategies related to Data Literacy Planning and carrying out scientific experiments; Collecting, organising and interpreting experimental data; Graphical representation of results. Promote strategies that involve the student: - mobilising knowledge to question a situation; - Encouraging people to search for and deepen their knowledge; - collecting data and opinions to analyse the issues under study
3rd cycle	ICT	Learnings and strategies related to Data Literacy 7th grade, 8th grade Plan research strategies to be carried out online; formulate questions to guide the collection of relevant data or information; Define keywords to locate information, using simple search mechanisms and functions; Use the computer and other digital devices as tools to support the research process; Learn about the potential and main functionalities of applications to support the research process and online research; Carry out research, using selected and relevant terms according to the theme to be developed;



		Critically analyse the quality of information; Using the computer and other digital devices to organise and manage information 8th grade Adopt safe practices when using digital applications and browsing the Internet; Know and use validation criteria for information published online; Know and use the rules (relating to copyright, intellectual property and licensing) concerning the resources and content they use in their work, combating plagiarism; Know and use the recommendations on accessibility when creating and publishing digital content, even in an elementary way; Know behaviours aimed at protecting privacy; adopt safe behaviours when using digital applications. Differentiate the potential and constraints of different strategies and applications to support creativity and innovation, applying relevant, previously validated analysis criteria; Be aware of the impact of emerging technologies (e.g. virtual reality, augmented reality and artificial intelligence) on society and everyday life; Adopt safe practices when using mobile devices (e.g. risks of access via public networks, installation of applications for mobile devices from credible sources and data collected during use); Know and use the potential of digital applications for data representation and statistics; Know and explore the concepts of the "Internet of Things" and other emerging technologies (e.g. virtual reality, augmented reality and artificial intelligence);
2nd and 3rd cycles	Literacies - Complementary School Offer	Literacies is a complementary subject, compulsory for all 2nd and 3rd cycle students at Escola Básica e Secundária Pintor José de Brito, Santa Marta de Portuzelo, Viana do Castelo, since 2011/2012. Every week, the students have 45 minutes in their timetable dedicated to this subject, which is taught, in terms of programme and methodology, by the complementary subject teachers (who simultaneously teach a subject) and the teacher librarian, in co-teaching situations. In the school library or in the classroom, students, usually organised in groups, learn about the syllabus of the subject involved and at the same time develop information skills: they research in books, magazines and/or on the Internet, learn to evaluate sources, use an information research guide, organise information clearly and rigorously, make bibliographical references and communicate using different strategies. The process and the products created are also evaluated simultaneously by the complementary subject teacher and the teacher librarian. In addition to the knowledge inherent to the subjects involved, knowledge, skills and attitudes are also assessed, which materialise in transversal competences in the areas of language, information and communication, reasoning and problem-solving, critical and creative thinking, interpersonal relationships, and the students' personal development and autonomy (CNEDU, 2023, 191) https://cnedu.pt/content/DICA/DICA_2023/Vivencias_2023/Literacias_como_disciplina_de_oferta_complementar.pdf



Secondary education	Maths A	Throughout secondary education, statistics is dealt with in a progressive and articulated manner, contributing to the development of statistical literacy, critical citizenship and the The Core Learning Outcomes for Mathematics A recognise statistics as a central area for young people's mathematical education, not just as a technical tool, but as a language for understanding the world. The progression of content, combined with the development of transversal competences and applied projects, contributes to preparing students to exercise informed, critical and participatory citizenship and the ability to make informed decisions based on data. Year 10: Statistics and Mathematical Models for Citizenship - Contents covered: - Collecting, organising and representing data; - Measures of central tendency and dispersion; - Analysing statistical distributions; - Interpretation of graphs and tables; - Formulating conclusions based on the data. - Skills developed: - Critical understanding of statistical information; - Application of statistical methods in real contexts; - Ability to communicate mathematically based on data; - Carrying out project work, with an emphasis on collecting and analysing data in everyday situations. 11th grade: Transversal integration - Although there is no exclusive Statistics subject, there are links with Discrete Maths (e.g. counting techniques) and Functions, which prepare for subjects such as probability and inference. Year 12: Probability and Statistical Inference (optional subject) - Probability is compulsory and covers: - Random phenomena; - Calculating probabilities (simple and conditional); - Probabilistic models (including the normal model). - Statistical Inference is an optional subject: - Basics of sampling; - Point and interval estimates; - Critical interpretation of inferential results; - Link between descriptive statistics and inference. Common methodological and didactic aspects - Promoting the resolution of real problems with data; - Systematic use of technology (graphic calculators, spreadsheets, statistical software); - Valuing collaborative work and mathematical communication; - Involving students in statistical projects, reinforcing the link between statistics and citizenship; - Encouraging critical reading of statistical studies published in the media and in science.
Secondary education	Biology and Geology	Learnings and strategies related to Data Literacy Using data to validate scientific hypotheses; Analysing and processing biological and geological data in real contexts.
Secondary education	Physical Chemistry	Learnings and strategies related to Data Literacy Promote strategies that involve the student: - mobilising knowledge to question a situation; - Encouraging people to search for and deepen their knowledge; - collecting data and opinions to analyse the issues under study; - research tasks framed by problem questions and supported by work guides, with progressive autonomy.



Secondary education	Economy	Learnings and strategies related to Data Literacy Developing a critical spirit and openness to different perspectives for analysing economic reality; - Gathering information using different means of research and using physical sources (books, newspapers, etc.) and/or digital sources (Internet); - Interpreting statistical data presented in different media; - Selecting information, drawing up summaries of the content of the documentation analysed;. Promote strategies that involve the student: research and selection of relevant information, using different sources such as texts, graphs, tables and maps; - collecting and processing statistical data to analyse the Portuguese and European economic reality; - reading statistical data presented in various forms (texts, graphs, tables and maps) and drawing relevant conclusions about a given economic situation; - carrying out calculations (namely rates of change and variable weights) in order to draw conclusions about the variables or aggregates in question; - mobilising argumentative discourse (oral and written) (expressing a position, thinking about and presenting arguments and counter-arguments, rebutting counter-arguments on the Portuguese and European economic reality); - organising debates that require the support of assertions, the elaboration of opinions or the analysis of economic facts or data; - research tasks based on criteria, with progressive autonomy; - Encouraging people to search for and deepen their knowledge; - collecting data and opinions to analyse the issues under study.
Secondary education	MACS	Over the two years, the MACS course is structured around action-orientated statistical learning and critical interpretation. Students develop the skills to: • Formulate relevant statistical problems; • Collect and organise data rigorously; • Apply statistical tools to interpret and communicate information; • Critically evaluate the data presented in the public sphere. Statistics at MACS is more than just a subject: it is a language for understanding the world, a tool for citizenship and a means of thinking critically about social reality. Year 10 The 10th grade programme is organised around the construction of statistical knowledge from the formulation of the problem to the communication of the results. Essential learning: • Recognising variability as a central element in statistical analysis; • Understanding of the concepts of population, sample, variable and data collection instrument; • Working with univariate and bivariate data, including their organisation and graphical representation (tables, histograms, scatter diagrams, etc.); • Calculation and interpretation of measures of central tendency (mean, median, mode) and measures of dispersion (amplitude, standard deviation, variance); • Analysis of correlation between variables and introduction to the regression line. Methodological dimension: • Strongly orientated towards project work, with a focus on collecting and analysing real data; • Valorisation of technological exploration, particularly using software and spreadsheets; • Encouraging the formulation of statistical questions with social significance. Year 11



		In Year 11, statistical understanding is deepened with a focus on its social and economic applicability, maintaining the link to analysing real data. Essential learning: • Review and extension of the analysis of quantitative and qualitative statistical variables; • Consolidation of graphical representations and statistical measures; • Critical reading of graphs and tables, with a focus on interpreting information in a social context; • Introduction to probability, based on relative frequencies and intuitive approaches; • Application of statistics to problems in the social sciences, economics, marketing, etc. Pedagogical approach: • Integration of Statistics with other areas of the social sciences, promoting interdisciplinary thinking; • Development of critical skills, such as analysing news and statistical studies in the media; Continuation of research projects, now with greater analytical depth.
Secondary education	Pilot projects for pedagogical innovation (PPIP) https://diariodarepublica.pt/dr/detalhe/despatcho/9128-2024-876110755	Learning and strategies related to Data Literacy c) The common component also includes a subject focussed on various literacies, called Literacies, with approved AEs. One of the novelties added by the PPIPs is the creation of a new subject, integrated into the general training component, common to all four scientific-humanistic courses, called "Literacies and Data". This new subject, which joins Portuguese, Philosophy, Foreign Language and Physical Education, will be "focussed on various literacies" and will have the "AE [Essential Learning] approved", the order states. In response to the Lusa news agency, the Ministry of Education, Science and Innovation (MECI) clarified that the curriculum for the new subject includes financial literacy, without specifying further. https://www.dn.pt/sociedade/projetos-piloto-de-inovacao-pedagogica-secundario-com-nova-disciplina-literacias-a-partir-do-proximo-ano-letivo

Table 23 Portugal Report [DL in national curricula]

9.1.1.3 Frameworks for data literacy in education

Although the school curriculum in Portugal **does not adopt a specific structured model** to address data literacy, it is influenced by international benchmarks, for example **DigComp 2.2 (European Digital Competence Framework for Citizens)**, which includes a dimension dedicated to **Information and Data Literacy**, involving three competences listed below:

Competence 1.1: Browsing, searching and filtering data, information and digital content

To articulate information needs to search for data, information and content in digital environments, to access them and to navigate between them. To create and update personal search strategies.

Competence 1.2: Evaluating data, information and digital content

To analyse, compare and critically evaluate the credibility and reliability of sources of data, information and digital content. To analyse, interpret and critically evaluate the data, information and digital content.

Competence 1.3: Managing data, information and digital content

To organise, store and retrieve data, information, and content in digital environments. To organise

9.1.1.4 Summary

Data literacy is integrated into the Portuguese curriculum in a progressive, interdisciplinary way and with varying levels of explanation, from pre-school to secondary education.

In pre-school, the approach is implicit but meaningful: children collect, organise and interpret data based on everyday situations (e.g. the class's food preferences), using simple representations (tables, pictograms). The educator plays a central role in supporting the formulation of questions and the construction of meaning, promoting initial reasoning with data.

In primary school, the subject of math introduces regular data processing and graphics activities.

Data literacy also appears in Environmental Studies and ICT, in tasks involving recording, observation and the use of digital tools.

In the 2nd Cycle, work is done with tables, graphs, averages and frequencies. Science and History/Geography integrate the processing of observational and factual data.

ICT introduces research and data organisation with digital support.

In the 3rd Cycle, concepts such as median, quartiles and linear regression are introduced. Data analysis cuts across several subjects, including Physics and Chemistry and Citizenship. Critical literacy is reinforced in ICT and, in some schools, in the "Literacies" subject.

In secondary school, data literacy becomes more formalised and in-depth. Maths A and MACS explore descriptive and inferential statistics, probability, analysis of variance and correlation. In Economics, Biology or Geography, students apply these skills to analysing real data. Pilot projects introduce the subject "Literacies and Data", which formalises this competence as transversal and interdisciplinary.

To summarise, data literacy is present at all levels of the Portuguese education system and is a skill that is continually being developed throughout compulsory education.

Although Maths is the main structuring axis, there is a clear trend towards cross-curricular integration, especially from the 2nd cycle onwards, involving subjects such as Science, ICT, Economics, History and Geography. This integration allows students to apply statistical skills to real contexts and develop analytical and critical thinking based on data. The creation of specific subjects such as "Literacies" and "Literacies and Data" shows the growing recognition of data literacy as an essential skill for citizenship, employability and digital and scientific literacy.

To maximise its potential, it will be essential to invest in teacher training, interdisciplinary practices and systematic monitoring of its implementation in the field.

9.1.2 Policy context

9.1.2.1 National educational policy bodies

Policy body/institution	Brief description	URL
Ministry of Education	The Ministry of Education, Science and Innovation is the government department whose mission is to formulate, conduct, execute and evaluate national policy regarding the education system, and articulate national qualification and vocational training policies	https://www.portugal.gov.pt/pt/gc24/area-de-governo/educacao-ciencia-e-inovacao
Directorate-General for Education	The Directorate-General for Education (DGE) is a central service of the State's direct administration with administrative autonomy. Its mission is to ensure the implementation of policies relating to the pedagogical and didactic component of pre-school education, basic and secondary education and out-of-school education, providing technical support for their formulation and monitoring and evaluating their implementation. It also coordinates the planning of the various	https://www.gov.pt/entidades/direcao-geral-da-educacao

	tests and exams and designs, organises and implements risk prevention, security and violence control measures in schools.	
Directorate-General for Education and Science Statistics	The mission of the Directorate-General for Education and Science Statistics (DGEEC) is to guarantee the production and analysis of statistics on education and science, providing technical support for policy formulation and strategic and operational planning, and to observe and evaluate the results obtained by the educational, scientific and technological systems as a whole, in conjunction with the other services in the government areas of science, technology, higher education and education.	https://www.dgeec.medu.pt/
Teacher training Institutions: Schools of Education and Universities	Schools of Education and Universities provide teachers' professional qualification. This is obtained after having attended and passed an initial teacher training course offered at higher education institutes and universities, structured in accordance with teacher-education profiles. Such courses lead to a master's degree-level professional qualification according to terms laid down in the law governing teaching qualifications for teachers in pre-school, basic and upper secondary education. https://eurydice.eacea.ec.europa.eu/eurypedia/portugal/teachers-and-education-staff	e.g. University of Coimbra https://apps.uc.pt/courses/en/course/421 https://apps.uc.pt/courses/en/course/1440
Teacher Training Centres for Continuous Professional Development (CFAE)	The School Association Training Centres (CFAE) should draw up an annual or multi-annual training plan, considering the priorities indicated by the associated schools. The continuing education courses that are part of the Centres' training plans are submitted for accreditation by the Continuing Education Scientific-Pedagogical Council . The CFAE may establish collaboration protocols with public, private and cooperative bodies to provide training in priority areas. https://eurydice.eacea.ec.europa.eu/eurypedia/portugal/continuing-professional-development-teachers-working-early-childhood-and-school	e.g. https://novo.cfagora.pt/index.php https://www.cfae-minerva.edu.pt/
Teachers' Associations, for example, Association of Mathematics Teachers, Portuguese Mathematical Society,	e.g. The Association of Maths Teachers (APM) is a Portuguese association of teachers linked to maths education, which covers the whole of Portugal and all levels of education, from pre-school to higher education.	https://www.apm.pt/ https://www.appbg.pt/
School Clusters	Portugal's school network is organised into school clusters and non-clustered schools, managed by the Ministry of Education, Science, and Technology (MECI). School clusters, which may include pre-school, basic, and upper secondary levels, have some autonomy in pedagogy, curriculum, and managing staff. Reforms have also extended autonomy to curriculum management and assigned responsibilities to municipalities regarding investment, maintenance, and provision of services.	e.g. https://www.aecoimbraoes.te.pt/
National Education Council	The National Education Council, abbreviated to CNE, is an independent body with advisory functions, which operates within the Ministry of Education and Science (MEC) and enjoys administrative autonomy.	https://www.cnedu.pt/en/

Table 24 Portugal Report [National educational policy bodies]

9.1.2.2 Educational policies for DL in CE

Policy body/institution	Resource type	URL	Author(s)	Description
Curriculum Guidelines for Pre-School	Document/legislation	https://www.dge.mec.pt/ocepe/	Isabel Lopes da Silva (coord.) Liliana Marques	The Curriculum Guidelines for Pre-School Education are based on the overall pedagogical objectives defined by the aforementioned Law and are intended to

Education (OCEP)			Lourdes Mata Manuela Rosa	support the construction and management of the curriculum in kindergarten, which is the responsibility of each educator, in collaboration with the educational team of the educational establishment/school grouping.
<i>Students' Profile by the End of Compulsory Schooling</i> PASEO	Document/legislation	https://dge.mec.pt/sites/default/files/Curriculo/Projeto_Autonomia_e_Flexibilidade/perfil_dos_alunos.pdf Order no. 6478/2017, 26th July	(Martins et al., 2017).	It realises an educational policy measure aimed at promoting improved quality of learning and success for all students at the end of the 12 years of compulsory schooling, providing the framework for building a curriculum for the 21st century. With Order No. 6605-A/2021 of 6 July , the <i>Profile of Students Leaving Compulsory Schooling</i> is defined as one of the curricular benchmarks for the various dimensions of curriculum development, including external assessment.
Essentials Learnings New Essential Learning	https://www.dge.mec.pt/aprendizagens-essenciais-0	https://www.dge.mec.pt/aprendizagens-essenciais-0	Various authors	The Curriculum Guidelines for Pre-School Education are based on the overall pedagogical objectives defined by the aforementioned Law and are intended to support the construction and management of the curriculum in kindergarten, which is the responsibility of each educator, in collaboration with the educational team of the educational establishment/school grouping.
Data organisation and processing. DGIDC, 2011.	Document/legislation	https://www.researchgate.net/publication/354890313_ORGANIZACAO_E_T RATAMENTO_DE_D ADOS	Martins, M. E. G., & Ponte, J. P.	Curriculum guidelines for teaching statistics
National Strategy for Citizenship Education	Document/legislation	https://www.dge.mec.pt/sites/default/files/Projetos_Curriculares/Aprendizagens_Essenciais/estrategia_cidadania_original.pdf	DGE Working Group (GTEC) (2017)	The National Strategy for Citizenship Education (ENEC) , proposed by the Directorate-General for Education, guides the integration of citizenship into the curriculum from pre-school to secondary education, through the Citizenship and Development component. Structured into 17 domains, ENEC promotes democratic values, human rights, inclusion, critical thinking and active participation. The compulsory areas include Media Education, Financial Literacy and Digital Citizenship, in which critical analysis of information, the conscious use of technology and evidence-based decision-making are worked on across the board. Although the term "data literacy" does not appear explicitly in ENEC, several areas involve the development of skills associated with interpreting, analysing and using data responsibly. Understanding media messages, financial phenomena and digital dynamics requires the mobilisation of fundamental data reading and analysis skills. In conclusion, ENEC offers a solid basis for integrating data literacy into the curriculum, either through the domains already defined or through interdisciplinary projects and



				pedagogical practices centred on critical and informed citizenship.
Pedagogical Innovation Pilot Projects	Document/legislation & news	https://diariodarepublica.pt/dr/detalhe/despacho/9128-2024-876110755 http://diariodarepublica.pt/dr/detalhe/despacho/4517-2025-914768708 https://cnnportugal.iol.pt/projeto-piloto/literacia-financeira/ha-sete-escolas-que-vao-ter-mais-uma-disciplina-no-ensino-secundario/20240814/66bcdd55d34e94b829042aa7	Education, Science and Innovation - Office of the Assistant Secretary of State for Education and Office of the Secretary of State for Educational Administration and Innovation	Pilot pedagogical innovation projects that envisage the creation of a subject on Data Literacy In 2024-2025, the pilot project is being applied in seven schools, five of which are public, one private and one vocational school: Agrupamento de Escolas (AE) de Alcanena, AE de Caneças (Odivelas), AE de Cristelo (Paredes), AE n.º 3 de Elvas, AE de Marinha Grande Poente, Colégio Pedro Arrupe (Lisbon) and Escola Profissional de Jobra (Albergaria-a-Velha).
Literacies as a complementary subject in DICA: Disseminate, Innovate, Collaborate, Learn - 2023	Good practice	https://cnedu.pt/content/DICA/DICA_2023/Vivencias_2023/Literacias_como_disciplina_de_oferta_complementar.pdf	Carla Pires and Raquel Ramos (RBE)	Literacies is a complementary subject, compulsory for all 2nd and 3rd cycle students at Escola Básica e Secundária Pintor José de Brito, Santa Marta de Portuzelo, Viana do Castelo, since 2011/2012. Every week, the students have 45 minutes in their timetable dedicated to this subject, which is taught, in terms of programme and methodology, by the complementary subject teachers (who simultaneously teach a subject) and the teacher librarian, in co-teaching situations. In the school library or in the classroom, students, usually organised in groups, learn about the syllabus of the subject involved and at the same time develop information skills: they research in books, magazines and/or on the Internet, learn to evaluate sources, use an information research guide, organise information clearly and rigorously, make bibliographical references and communicate using different strategies. The process and the products created are also evaluated simultaneously by the complementary subject teacher and the teacher librarian. In addition to the knowledge inherent to the subjects involved, knowledge, skills and attitudes are also assessed, which materialise in transversal competences in the areas of language, information and communication, reasoning and problem-solving, critical and creative thinking, interpersonal relationships, and the students' personal development and autonomy.
Data Literate project	Project	https://www.data literacyproject.eu/pt/home-pt/	Vilniaus Universiteta, Vilniaus jezuitu gimnazija (LT),	Data Literate project had a mission to train educators in Digital Data Literacy. Aligned to such mission, the specific objectives were:

	The project was funded under the European Commission's Erasmus+ Programme as a Strategic Partnership in Response to the Covid-19 Situation.	https://erasmus-plus.ec.europa.eu/projects/search/details/2020-1-LT01-KA226-SCH-094766	Agrupamento de Escolas Sebastião da Gama (PT), Instituto Tecnico Economico e Tecnologico "Girolamo Caruso" (IT), INOVA+ - INNOVATION SERVICES, SA (PT), DATANINJA SRL (IT), Virolai E.M.S.A. (ES)	- To raise awareness of DDL relevance in an increasingly digital world. - To build capacity on DDL applied to educational purposes. - To create a CPD course under the DDL topic for educators. - Build digital education readiness (through DDL) and thus mitigate the impact of COVID19 in education. - Ensure that teachers know how to communicate, marshal resources, and tailor practice to student needs, especially in a digital context. - Promote, support, and motivate quality, ongoing teachers' CPD that is based on DDL use to improve instruction. - Contribute to a cultural change at the participating institutions regarding attitudes towards DDL and openness. - Significantly increase teachers' and student's data competencies and thus increase their academic success and qualify them for a successful career by adapting to the growing needs for DDL competencies in the increasingly data-driven job markets. - To strengthen the capacity of school leaders to deepen understanding of student and school data.
FCT DSL Developing Statistical Literacy (2010), which includes the case study by Canavarro and Patrício (2015).	Project Funded by the Foundation for Science and Technology	https://dspace.uevora.pt/rdpc/handle/10174/17121	Canavarro et al.	In Portugal, the mathematics syllabus for basic education, which began to be implemented in 2009, gave a greater emphasis on statistics, presenting more demanding learning goals, since the elementary levels. This represented a challenging situation for practicing teachers, requiring them to develop new perspectives about the teaching and learning of statistics. In this context, the project Developing statistical literacy: Student learning and teacher education was planned aiming to study the development of statistical literacy from elementary to secondary education, with special attention to two main issues: i) the characterisation of key aspects of students' statistical literacy, particularly regarding the ability to formulate questions, collect data and represent them to answer those questions, and ii) the development of statistical and didactical knowledge for teaching in different schools levels. As the project unfolded, another research strand associated with students' statistical reasoning and the necessary conditions for its development emerged.

Table 25 Portugal Report [Educational policies]

9.1.2.3 Strategic plans for DL in CE

Strategic plan	URL	Author(s)	Description
Media education reference Pre-school education Primary education	https://www.dge.mec.pt/sites/default/files/Noticias_documentos/referencial-epm-	Sara Pereira, Manuel Pinto, Eduardo Jorge Madureira	The new <i>Media Education Framework</i> is a flexible and up-to-date document that aims to develop students' critical and responsible competences for interacting with the



Secondary education (2023)	versaoatualizada-dez2023_11dez.pdf		media, especially in a complex and constantly changing digital context. Main objectives: Promoting critical thinking and ethics in the consumption and production of information. Understand how the media works and its impact on society. Encourage critical analysis of content and the distinction between facts and opinions. Develop media communication and expression skills. Combat disinformation and emphasise fact-checking practices. Strengthening digital, information and media literacy as essential dimensions of citizenship. Current characteristics of the Benchmark (2024): Aligned with the <i>National Strategy for Citizenship Education</i> and the <i>Profile of Students Leaving Compulsory Schooling</i>. Applicable from pre-school to secondary school, in formal and non-formal contexts. It reflects contemporary challenges: social networks, AI, algorithms, radicalisation and post-truth. It integrates international guidelines (EU, UNESCO, Council of Europe). Reduction from 12 to 8 main themes, with new sub-themes and pedagogical suggestions. It emphasises the autonomy of schools in the integration of the media curriculum. This framework responds to the urgent need to train citizens who are prepared to deal with the risks and opportunities of the digital world, promoting a critical, informed and participatory culture. The Benchmark includes: - A summary of the issues addressed in the Core Competencies, proposed in the form of "Ten main principles of Media Education"; - A section with the structure and content of the Core Competencies, including: themes that cut across the Core Competencies; themes and learning outcomes; themes, sub-themes and objectives by level of education and teaching cycles; themes, sub-themes, objectives and performance descriptors by level of education and teaching cycles; - A section that presents curricular approach strategies: suggestions are made for the transversal development of Media Education - for example, in the 1st Cycle and in Secondary Education - or through the subject of Citizenship and Development - in the 2nd and 3rd Cycles - or globally, in school projects, in the school library, through different methodologies, adjusted to the age group of the students; - A glossary of theoretical-methodological and instrumental concepts, in many cases referring to other specialised glossaries.
National Media Literacy Plan	https://www.sg.pcm.gov.pt/a-sgpcm/noticias/2025/fevereiro/plano-literacia-mediatica/	General Secretariat of the Presidency of the Council of Ministers	It aims to structure an effective response to the challenges of disinformation and promote a more transparent, plural and inclusive media environment. The plan is structured around four main axes, each with measures, targets, people responsible and indicators: • Education and training → Training teachers, journalists, librarians and other mediators; → Integrating media literacy into primary, secondary and higher education curricula;



			→ Creation of pedagogical resources and good practices. • Participation and Inclusion → Actions for vulnerable audiences and those with less digital access; → Involvement of local communities and minorities; → Combating hate speech and social exclusion online. • Co-operation and networking → Partnerships between schools, universities, media, libraries, municipalities, digital platforms and civil society; → Participation in national and international media literacy networks. • Monitoring and Evaluation → Annual reports and final report by 2029; → Performance indicators, impact and quality of actions; → Strategic adjustments based on results and evidence.
INCoDe.2030 - National Digital Skills Initiative (Digital Portugal)	https://www.incode2030.gov.pt/		Digital, information and data literacy is promoted as a basis for meeting the challenges of the digital society and ensuring inclusion and full citizenship.
Strategic media literacy plan (2025-2029)	https://milobs.pt/wp-content/uploads/2024/03/Plano-estrat%C3%A9gico.pdf	Regina dos Santos Duarte et al.	It aims to develop critical reading, analysis and comprehension skills in relation to the media, as well as production and expression skills. It includes objectives, measures and targets for the next five years of implementation of the National Media Literacy Plan (PNLM) and is a platform for support, cooperation and guidance for organisations working in the field. This National Plan is framed by the National Reading Plan and the Interministerial Commission that coordinates it. The Strategic Media Literacy Plan 2025-2029 is part of the national public policy for the media and digital citizenship, promoted by the Government of Portugal. It aims to guarantee the development of media skills for all citizens, strengthening democracy, social cohesion and the fight against disinformation. This plan has a national scope, covering all areas: • All educational levels and age groups • Formal, non-formal and informal contexts • Media, culture, education and science sectors • Urban and rural territories, with a focus on social and territorial inclusion Strategic Objectives 1. Promoting media literacy throughout society as an essential 21st century skill. 2. Combat disinformation and hate speech by promoting critical thinking and fact-checking. 3. Consolidate media literacy as a pillar of digital citizenship and human rights. 4. Integrating media literacy into school curricula and the training of teachers and mediators. 5. Strengthen regional, local and public media as agents of media education. 6. Taking advantage of synergies with other literacies (data, digital, algorithmic, scientific). 7. Strengthen inter-institutional co-operation, including digital platforms, universities, libraries, schools and civil society. 8. Promote digital and territorial inclusion, guaranteeing equitable access to media content and skills. 9. Continuously monitor and evaluate the actions implemented and their impact.

			Axes of Intervention Education and Training Teacher training, curriculum integration and development of teaching resources. Participation and Inclusion Fostering safe, inclusive and civic-minded media practices in diverse communities. Co-operation Networking between public, private and third sector organisations. Monitoring and evaluation Annual follow-up with indicators, clear targets and public reports

Table 26 Portugal Report [Strategic plans]

9.1.2.4 Summary

The review of Portuguese national educational policy bodies and documents reveals a growing awareness and gradual integration of data literacy (DL) across different levels of education. Several public institutions, including the Ministry of Education, the Directorate-General for Education (DGE), and the Directorate-General for Statistics in Education and Science (DGEEC), play a key role in shaping curricula, teacher training, and statistical data collection. These bodies form the institutional backbone for supporting DL in schools, either directly through policy or indirectly through pedagogical and teacher development resources.

Teacher education institutions-Schools of Education and Universities-are also instrumental, due to their role in the framework for initial teacher qualification and ongoing professional development. The CFAEs (Teacher Training Centres for Continuous Professional Development) further support the lifelong learning of educators, including in emerging areas like DL. In parallel, teacher associations (e.g., APM) and school clusters contribute to local implementation and pedagogical innovation.

Regarding the policy documents reviewed, DL is rarely mentioned explicitly, but is implicitly present across several frameworks:

- The Orientations for Preschool Education, Profile of Students at the End of Compulsory Education, and Essential Learnings embed statistical and critical thinking competencies relevant to DL.
- The National Strategy for Citizenship Education (ENEC) and the Referencial for Media Education promote transversal competencies aligned with data interpretation, responsible digital behaviour, and civic participation.
- The Organisation and Treatment of Data document (DGIDC, 2011) remains one of the few that explicitly addresses statistical reasoning and DL.
- Recent pilot projects and good practices-such as the introduction of a subject on "Literacies" or the Data Literate Erasmus+ project-demonstrate practical advances in implementing DL-focused pedagogies.

Strategic planning for DL is becoming increasingly prominent. The National Media Literacy Plan (2025-2029) and the Strategic Media Literacy Plan outline specific axes of intervention in education, inclusion, cooperation, and monitoring. Although focused on media literacy, they recognise the synergy between media, digital, and data literacy. The INCoDe.2030 initiative also reinforces the national commitment to digital and data skills.

Portugal's educational framework supports data literacy development mainly through transversal and integrative approaches. While explicit DL policies remain limited, relevant skills are embedded across media, citizenship, and digital education strategies. The emerging trend in national plans and pilot initiatives suggests a growing institutional commitment to incorporating

DL in both curricula and teacher training, paving the way for a more data-aware generation of students and educators.

9.1.3 Scientific Research

Summary	Educational level, discipline
Ribeiro, C. M., & Martins, F. M. L. (2010). Teachers - current or future - need to know more than just the content from the user's point of view (knowing whether something is correct or not), which is seen as knowing how to do things. They must also have specific knowledge of their profession, which is related to knowing how to teach. In this text we discuss and analyse a conceptualisation of the type of knowledge that we, as maths teachers, need in order to teach (Mathematical Knowledge for Teaching), contextualising it in the field of Data Organisation and Processing, specifically discussing what the implications are, in the subsequent exploration of the tasks, between carrying out a census and a survey (studying a significant sample of the population under study). We end with some implications and potential of this type of approach for teaching/teacher training, also discussing the demands that these potentials place on us as teacher trainers.	Maths, Teacher training
Mateus, J., & Fonseca, C. (2011) There are different types of maths tasks, but all of them have the main objective of involving students by rousing their interest and critical thinking, because only in this way can they effectively acquire knowledge/skills. Tasks can be proposed by the teacher, challenged by the student or arise as a result of collective dialogue. The reflection inherent in carrying out the task is of fundamental interest throughout the process. In this article, we reflect on the concept of a mathematical task and discuss the different types of mathematical tasks. A task can be considered to be the work to be carried out by the student, in a given period of time, with the objective that they develop their capacity to, for example, represent, relate and operate, solve problems and investigate in the context of the various mathematical themes and taking into account their connection to real-life situations that are familiar to them. The aim This can be achieved by using different types of mathematical tasks, such as games, exercises, problems, projects and investigations. These types of tasks are not watertight, in that that what is considered an appropriate problem for a particular level of education could be a simple exercise at later levels of education or even for certain students. These and other reflections have to be taken into account when designing and presenting tasks. We explored the use of tasks in the classroom, using EXCEL software, on the subject of Organisation and Data Processing in Primary Education in Portugal. Examples will be presented implemented in the classroom, as well as a critical analysis of the results obtained.	5th year of the 2nd Cycle of Basic Education, Maths
Gregório, M., Henriques, A., & Ponte, J. P. (2013) The media's constant use of graphics to report on the most diverse subjects means that students need to develop their ability to interpret statistical data and their critical sense. The school, through the activities it promotes, has a crucial role to play in developing these skills, creating teaching contexts in which interpreting graphics has purpose and meaning for the students. In this paper, we assume that using graphs of news stories in the media can be a good strategy for teaching statistics, motivating and challenging students to relate the use of graphs in school and out-of-school contexts. In this communication, we present the results of a study aimed at analysing the graphical interpretation skills of 5th grade students during a teaching unit that uses media reports to work with different data representations. The documents written by the students serve as the basis for qualitative and interpretative study. The results indicate the potential of using news graphics to develop students' ability to interpret statistical data, thereby promoting their statistical literacy.	5th year of primary school
Veia, L., Brocardo, J., & Ponte, J. P. (2014) This paper seeks to understand the way in which a primary school teacher leads her students through a task of organising and processing data, and the reflections she makes. This work is part of a study that follows an interpretative and qualitative research methodology in the form of a case study. The results show that, when exploring the task, the teacher's teaching practice takes into account the different phases of the statistical research cycle in different ways. The teacher pays particular attention to the students' participation in decision-making about the procedures to be followed. In her reflection, she identifies the main moments of the lesson, values the decisions made and highlights the data collection phase as the most significant moment. In this paper, we analyse how a primary school teacher leads students in doing a task involving data handling, as well as the reflection. The results indicate that, in the exploration of the task, the practice of this teacher includes in different ways the phases of a statistical investigation. The teacher showed particular concern with the participation of the students in making decisions about the procedures to follow. During her reflection, she identifies the main moments of the lesson, values the decisions made and highlights the phase of data collection as the most meaningful moment.	1st year of primary school
Veia, L., Brocardo, J., & Ponte, J. P. (2015)	5th grade



The media's constant use of graphics to report on the most diverse subjects means that students need to develop their ability to interpret statistical data and their critical sense. The school, through the activities it promotes, has a crucial role to play in developing these skills, creating teaching contexts in which interpreting graphs has purpose and meaning for the students. In this paper, we assume that using graphs of news stories in the media can be a good strategy for teaching statistics, motivating and challenging students to relate the use of graphs in school and out-of-school contexts. In this communication, we present the results of a study aimed at analysing the graphical interpretation skills of 5th grade students during a teaching unit that uses media reports to work with different data representations. The documents written by the students serve as the basis for the qualitative and interpretative study. The results indicate the potential of using news graphics to develop students' ability to interpret statistical data, thereby promoting their statistical literacy.	Teaching unit that uses media reports to work on different data representations
Oliveira, H., Canavarro, A. P., Henriques, A., & Colaço, S. (2015) Recent international and national mathematics curriculum guidelines indicate the development of students' statistical literacy, at different levels of schooling, as a major educational aim. In Portugal, the mathematics syllabus for basic education, which began to be implemented in 2009, gave a greater emphasis on statistics, presenting more demanding learning goals, since the elementary levels. This represented a challenging situation for practicing teachers, requiring them to develop new perspectives about the teaching and learning of statistics. In this context, the project Developing statistical literacy: Student learning and teacher education was planned aiming to study the development of statistical literacy from elementary to secondary education, with special attention to two main issues: i) the characterisation of key aspects of students' statistical literacy, particularly regarding the ability to formulate questions, collect data and represent them to answer those questions, and ii) the development of statistical and didactical knowledge for teaching in different schools levels. As the project unfolded, another research strand associated with students' statistical reasoning and the necessary conditions for its development emerged.	Basic education
Oliveira, H., Henriques, A., da Ponte, J.P. (2016) Recent mathematics curriculum orientations stress the importance of developing students' statistical literacy at different school levels. Many students can read and understand tables, charts, and graphs and perform the procedures to find statistical measures, but they miss the conceptual abilities to interpret and draw conclusions from graphs, or to make decisions on which calculation is appropriate to study a particular situation (Shaughnessy, 2007). In Portugal, the mathematics syllabus for basic education which started in 2010 presented more demanding learning objectives for statistics. This was a challenging situation for teachers requiring them to develop new perspectives and professional knowledge, since many of them did not have a suitable preparation in statistics. In this context, we planned a project aiming to construct knowledge about statistical literacy development, with two main foci: (1) the characterisation of students' statistical literacy from preschool to secondary levels, and the possibilities and constraints for its development, and (2) the development of teachers' statistical and didactical knowledge for teaching in in-service and preservice teacher education settings. A review of literature supported both the planning and development of teaching experiments in classrooms at different school levels, based on sequences of tasks and the use of technological tools and the planning of courses in preservice education of educators and elementary school teachers and in-service teacher education, as well as creating contexts of collaborative work with teachers. The project used a design research methodology in teaching and teacher education experiments. Data was collected by a variety of methods including interviews, classroom observations, students' written work, tests, and questionnaires. Data analysis included mainly qualitative approaches.	Various levels of education
Ferreira, A. F., & Fernandes, D. (2017) Within a context of a supervised teaching traineeship, a set of classes on the Data Treatment and Organisation (DTO) was developed as part of the subject of Mathematics. This intervention was carried out with a class from the 6th grade involved in a social project called "Qualify to Include", which was used to frame mathematical knowledge. When creating the classes, we used the previous knowledge obtained by the children on this matter, and we have used technology (mobile phone, computer, projector, videos) to record and think about the autonomously developed productions. Along with establishing the context and individual monitoring, these strategies resulted in an added inherent motivation. They have also resulted in an active participation of the class in a continuous path of learning, where some of the produced work revealed more sensible and meaningful learning practices for the child. Therefore this didactic proposal is presented as appropriate and consistent in creating a more solid mathematical knowledge for the student.	6th grade, Maths
Souza, A., Rodrigues, M., & Ponte, J. P. (2021) In this communication, we focus on the work carried out on the basis of a task to organise and process data, from the perspective of exploratory teaching, in order to understand how the lesson study promotes the development of the didactic knowledge of the primary school teachers involved. We paid particular attention to the phase of choosing and preparing a task for the research lesson, the work carried out in the classroom and the post-class reflection. The research is part of the interpretive paradigm and follows a qualitative approach. The participants are five primary school teachers and the first author, who organised the lesson study. The data was collected through participant observation by the first author of this communication, with the preparation of a logbook, documentary collection and audio recording of the work sessions and video	1st Cycle of Basic Education. Teacher training

recording of the lesson attended. The results show that the participating teachers value exploratory teaching with challenging tasks and that they recognise the importance of taking advantage of situations close to the students' reality, using meaningful mathematical tasks capable of making learning contextualised and cross-curricular. When preparing the task, they try to anticipate difficulties and introduce adaptations that make the students' work easier, without reducing the difficulty of the task. In post-class reflection, they consider that the decisions made in preparing the lesson and anticipating the students' difficulties contributed to the effectiveness of the lesson management and they value the discussion and presentation of strategies on the board. The opinion of the students expressed at the end of the lesson reinforces the importance of this type of task.	
Gomes, M. L., Rodrigues, R. N., Santos, P., Rato, V., & Martins, F. (2022) Statistical literacy is a theme that has been gaining relevance in the academic context, since the primacy given to active methodologies and to the experiencing of knowledge framed in everyday life means that teachers and future teachers have to provide significant learnings that can be understood actively. Thus, the following question emerges: How can we promote comprehension of the concepts of Data Treatment and Organisation in Basic Education? This report focuses on the topic of Data Treatment and Representation for Grade 3 of primary school. The goal is to promote statistical literacy and contribute to the improvement of the students' learning process, in an interdisciplinary perspective. The educational practice presented in this study had the objective to promote statistical literacy and interdisciplinarity, developed in a series of sessions where the students, individually and in groups, solved several problematic situations	Data Treatment and Representation for Grade 3 of primary school.

Table 27 Portugal Report [Scientific research]

9.2 Case studies

9.2.1 Description

Case study 1: Vieira, I. S. (2012). Organising and processing data: A case study in the 5th year of school [Master's degree report, Polytechnic Institute of Leiria].	
URL	https://core.ac.uk/download/pdf/61796903.pdf
Educational level/context	5th year of school. Master's report in Maths Education and Technology
Description	Nowadays, statistical literacy is considered essential for exercising critical, informed and participatory citizenship (NCTM, 1991), which has led Statistics, in the Basic Education Mathematics Programme (PMEB) (ME, 2007) under the heading of <i>Data Organisation and Processing</i> (OTD), to a prominent place in Mathematics Education. In view of this situation and within the scope of mathematics didactics, the aim was to analyse the statistical thinking of students in a 5th grade class.
Methodology	Following an interpretative qualitative methodology, using two case studies, we sought to identify the strategies and difficulties shown by the students in carrying out the tasks in the proposed chain, within the theme of OTD, with reference to the levels of statistical literacy proposed by Gal (2002).
Technology	Excel - central for simulating, analysing and visualising data. Physical materials
Outcomes	It was noted that the students mainly used strategies characteristic of statistics, with progressively greater ease, which allowed them to formulate questions, plan and carry out the main steps underlying statistical investigations. On several occasions, they used strategies that cut across other mathematical topics. There were difficulties in Gal's (2002) three levels of literacy: interpretation, criticism and production. The results suggest that the main problems may stem from five types of difficulty: (1) basic mathematical procedures, (2) interpretation of questions, (3) lack of specific knowledge of certain everyday contexts, (4) statistical procedures, concepts and ideas, and (5) communication of ideas. Although the difficulties of types (1), (2) and (3) are not related to statistical ideas and procedures, and those of type (5) are of a transversal nature, they jeopardised the students' performance in the field of OTD. However, it should be noted that the work carried out led to the acquisition and consolidation of various skills, both in statistics and other mathematical subjects, which could contribute to the development of the students' mathematical competence and statistical literacy, at the levels defined by Gal (2002).
Case study 2: Canavarro, A. P., & Patrício, M. (2015). 2nd cycle teachers' curricular knowledge of data organisation and processing: What manifestations of statistical literacy? <i>Quadrante</i> , 24(1), 3-28	
URL	http://hdl.handle.net/10174/17027



Educational level/context	The aim of this article is to characterise the curricular knowledge that 2nd cycle mathematics teachers reveal in relation to the topic of Data Organisation and Processing, as set out in the Mathematics Programme for Basic Education approved in 2007 (ME, 2007), and to discuss the extent to which this knowledge reflects their concern with developing students' statistical literacy, here seen as the ultimate goal of teaching statistics, which includes the ability to interpret and understand statistical information, to critically assess and evaluate it and to express an opinion on the value and implications of statistical studies, within the framework of situations contextualised in relevant reality. To what extent does teachers' curricular knowledge reflect their concern with developing students' statistical literacy?
Description	Maths, Teacher training
Methodology	This is an interpretive approach, realised through case studies of three teachers, each of whom was able to characterise their knowledge of the curriculum in terms of aims and objectives, content and its approach, and tasks for the classroom.
Technology	Calculator, Computer, Digital graphs and tables
Outcomes	This research, which involved three maths teachers, two female teachers and one male teacher, from the same school, involved in collaborative work, revealed, through semi-structured interviews and content analysis, according to the categories of curricular knowledge based on Gal's model (2002), that the teachers' curricular knowledge is predominantly located in their knowledge of the aims and objectives for teaching Data Organisation and Processing, and is not as evident in the other areas of the curriculum (content and tasks). In the case of the female teachers, who have already taught the programme for the second time, not only do they reveal that they know the programme, but there are more notes linked to statistical literacy and also more apprehension about the challenges it represents, in order to deal with statistics in a more informed and critical way. This view is not present in the case of the male teacher, who not only does not know the programme, but also reveals more confidence in teaching statistics, with less sensitivity to statistical literacy. The cross-sectional analysis of the three cases, taking into account aspects associated with statistical literacy, points to the interpretation and comprehension of statistical information and its critical appraisal and evaluation, while the expression of opinion regarding the value and implications of statistical studies and the reality portrayed in the tasks adopted is not as evident as the most relevant in promoting statistical literacy. The authors conclude that teachers do not explicitly refer to the concept of statistical literacy, although they do include its less sophisticated aspects in their characterisation of the objectives for teaching Data Organisation and Processing. In their discourse on curriculum guidelines, they choose tasks that, although they refer to some context, do not necessarily refer to situations that could significantly contribute to the development of statistical literacy. The study also reveals that the teachers who are familiar with the 2007 maths programme are more sensitive and aligned with the ideas relating to the development of statistical literacy than the teachers who are not.
Case study 3: Dias, C., & Santos, C. (2021). The Maths Teacher, the Teaching of Statistics and Initial and Continuing Training: a case study. REMATEC, 16(38), 199-217.	
URL	https://doi.org/10.37084/REMATEC.1980-3141.2021.n38.p199-217.id345
Educational level/context	The main aim of this study was to find out about teachers' experience of teaching statistics and their knowledge/development of statistics content in the classroom, to characterise teaching and identify teachers' difficulties in teaching statistics topics, and to study the extent to which these professionals seek to update their training in the area of mathematics/statistics. The results of the questionnaire carried out with a sample of 130 teachers revealed little training in Statistics, with most of the respondents having had no contact with Statistics, either during their initial training or afterwards. Despite this gap in teacher training, there is evidence of a lack of investment in initial and continuing training for teachers who teach statistics in primary and secondary schools.
Description	A survey of teachers
Methodology	A mixed descriptive approach was adopted, using a 20-question questionnaire as the data collection tool.
Technology	Excel, Computer, Multimedia projector. Although not specified in detail, the study mentions the use of digital resources in the teaching of statistics
Outcomes	The results of the questionnaire carried out with a sample of 130 teachers revealed a lack of training in Statistics, with most of the respondents not having had any contact with Statistics, either during their initial training or afterwards. Despite this gap in teacher training, there is evidence of a lack of investment in initial and continuing training for teachers who teach statistics in primary and secondary schools.

Case study 4: WEIWE(R)BE Programme - Literacy with School Libraries	
URL	https://www.rbe.mec.pt/np4/o-programa-weiwe(r)be.html
Educational level/context	The WEIWE(R)BE programme arose from the need to promote the articulated and systematic development of literacy skills, including digital literacy, in schools. In fact, with the European Digital Competence Framework for Educators (DigCompEdu), among other frameworks for educational action, not only educators are targeted, particularly teachers in the case of schools, but also learners, namely students. Thus, among other proposals and in order to support the implementation of this programme, teacher training is provided for the teachers involved - librarian teachers and other teachers from the most diverse recruitment groups - after which they are expected to explore and promote learning scenarios conducive to integrating these competences into their curricular practices.
Description	Collaboration between RBE (School Libraries) and Universidade Aberta, for the systematic development of digital/informational literacy in schools. It involved training teachers from various disciplines and Teacher Librarians and the production of pedagogical scenarios applied to the critical use of data in a school environment
Methodology	In this context, we defined the following objectives for the case study: to identify how the integrated and systematic development of literacy skills is carried out, especially in collaboration with the school library; to map the pedagogical innovation that results from it, particularly in hybrid contexts. The data, collected through infographics and individual reports, is analysed using descriptive statistical analysis and content analysis respectively, allowing for triangulation in a mixed methodological approach based on the pragmatic paradigm.
Technology	Excel, Multimedia projector / Interactive whiteboard, Digital platforms that support students' autonomous work, communication and collaboration during data analysis projects. Internet as a source of real data
Outcomes	The results show, in addition to the characterisation of the actors participating in the programme, skills acquired and/or further developed, as well as strengths and facilitating factors in carrying out activities triggered by the implementation of the programme, along with weaknesses and aspects for improvement. The conclusion is that through collaborative work between the school library and the classroom, considering different sources and resources, such as Wikipedia, it is possible to stimulate tasks aligned with DigCompEdu areas, in a strategy to enhance the professionalism of educators and the success of learners, in a word, the articulated and systematic development of literacy skills.
Case study 5: Mouro, A.P. et al. (2025). I've finished secondary school! Now what?	
URL	https://www.youtube.com/watch?vQ_f6Jhx8vV0
Educational level/context	The video was made by three 12th grade students who are finishing secondary school and intend to enter higher education next year under the guidance of Prof Ana Paula Mouro. The main aim is to convey the idea that, in situations such as the one described, we should base some decisions and knowledge on official data from official organisations such as the National Statistics Institute and the Bank of Portugal. Well-informed citizens make more appropriate and responsible decisions. Secondly, the university a student enters may not be in their place of residence. That's why another of the video's aims is to draw attention to an important issue such as the choice of accommodation. Finally, it's also important to get to know the city/region where you want to go to university better, in terms of, for example, cultural heritage, health, local cuisine and leisure. Having a good understanding of the region can help students adapt more quickly and make the most of the university experience. Through a virtual student, who is also a pre-university student, we are alerted to aspects that we can and should research, among many others, before entering university. Due to the nature of the content of this video, the target audience will be students who, like us, are finalising their secondary education, although we believe it could also be useful for other students at this level. The protagonist of this video is a future medical student (another field could have been chosen) who would like to study at one of the following universities: Minho (Braga), Coimbra, Porto or Lisbon. To do this, he collects data from the Bank of Portugal and the National Statistics Institute (INE) and emphasises the importance of choosing these organisations. To help solve the question of accommodation, buying or renting, start your research on the Banco de Portugal website, particularly regarding the issue of mortgage loans (analyse the variation in the interest rate on loans over the last year and see that it has been falling). Then, still on this subject, check the INE website to compare figures for the median value of bank valuations (€/m²) of flats and the median value of new rental contracts. Compare the situation in the four cities mentioned above and draw some conclusions. The situation seems to be more favourable in the city of Braga, although the values have been increasing in the 2020-2023 quadrennium, which is a negative factor if the trend continues. With regard to the first indicator (bank valuation) and in percentage terms, the sharpest rise was in Braga; with regard to the second indicator, this was in Porto.

	As the protagonist is a future medical student and because health is an important factor, some statistical indicators in this area are mentioned, namely the number of doctors and nurses per 1000 inhabitants in the three-year period 2021-2023. Coimbra leads the way in both cases. Given that knowing about cultural heritage is fundamental to understanding a country's history, traditions and identity, here are some figures for the four cities, in particular the number of museums and monuments. Which was the most attractive city to visit in 2023? As you might expect, the capital of Portugal leads the way in this statistical indicator, with a far greater number of museums and monuments. To finalise the video, two factors that drive tourism in Portugal were taken into account: gastronomy and our beaches. Local gastronomy in Portugal is rich and varied, reflecting the diversity of the country's regions. Because of this, the number of typical restaurants in 2023 was compared in the sub-regions in which the four cities involved in the work are located. And although there is a strong linear correlation between population density and the number of typical restaurants per sub-region, the Coimbra Region has a higher figure in percentage terms, given that of the four sub-regions considered, it has the lowest population density. The Portuguese coastal zone is rich and diverse, offering a combination of stunning natural landscapes, marvellous beaches and picturesque towns. The number of Blue Flag beaches was researched in the sub-regions of Cávado, Área Metropolitana do Porto, Região de Coimbra and Grande Lisboa. In this case, the linear correlation between population density and the number of Blue Flag beaches is only moderate. In this case too, the Coimbra Region has the highest percentage. At the end of the video, the virtual student leaves it open to analyse the observed data and considers that it might be a good decision to join at the University of Coimbra.
Description	European Statistics Competition (ESC) 2025. In this case, we present the video that came first in Portugal in the European Statistics Competition, developed by three students under the guidance of Prof Ana Paula Mouro. The European Statistics Competition is a competition organised by Eurostat (the Statistical Office of the European Union) and several National Statistical Institutes, aimed at pupils in the 3rd cycle of basic education and secondary education, with the purpose of familiarising them with statistics and the sources of official statistics. The competition's general objectives are: - Promote students' curiosity and interest in official statistics; - Encourage teachers to use new materials to teach statistics, promoting the use of official statistical data and the application of acquired statistical knowledge; - Show students and teachers the role of official statistics in various aspects of society; - Promote teamwork and collaboration in order to achieve common goals.
Methodology	We used official data and analysed the statistics and reflected on them, using appealing graphs, tables and simple comments, making the video accessible so as to make it easier for the target audience to understand the messages we wanted to convey. Once we had the idea, we drew up an initial version of the video script. We consulted the INE and Banco de Portugal websites to select the statistical indicators. Once the data had been collected, we each drew up some graphs which we then tried to standardise in visual terms. A took the images and edited the video. The female voice is by P and the male voice is by Artificial Intelligence. One of the main challenges we faced was the length of the video. As a result, we were forced not to consider statistical indicators that would have made the work more complete. They were selected to address different issues such as housing, health, culture and leisure. On the other hand, comments on the graphs were also limited by time, so we restricted ourselves to what we considered essential. We also had some difficulty collecting data in terms of time, but we tried to consider periods that would lead us to some conclusions. The fact that we didn't master video editing also caused some constraints which, with some patience and persistence, were overcome.
Technology	The video was produced using the <i>CapCut</i> video editing programme. Google images were selected beforehand, and graphs were entered using Microsoft Excel, with data supplied by the National Statistics Institute and the Bank of Portugal.
Outcomes	

Table 28 Portugal Report [Case studies]

9.2.2 Summary

In summary, data literacy is addressed in the case studies analysed, either explicitly (when the concept is directly referred to and operationalised) or implicitly (when it is present in the practices and objectives, but not clearly named).

1.Vieira (2012) - Case Study in Year 5



In this study, data literacy is addressed implicitly, since the concept is not named directly. However, it is clearly present in the objectives and in the analysis of the students' learning, through reference to the three levels of statistical literacy defined by Gal (2002): interpretation, criticism and production.

The students took part in a sequence of tasks to organise and process data, showing progress in formulating questions, planning investigations and interpreting results. The difficulties observed - such as shortcomings in basic mathematical procedures, interpreting questions, lack of knowledge of context, statistical concepts and communicating ideas - are obstacles to building data literacy, even if they are not directly recognised as such.

Despite these obstacles, the study shows that involving students in authentic statistical tasks led to the effective development of competences associated with data literacy, even without explicit reference to it. Literacy was built implicitly, through practice, without the students or teachers themselves identifying it as such.

2. Canavarro & Patrício (2015) - Teacher curriculum knowledge

This study analysed the curricular knowledge of three 2nd cycle teachers on the subject of organising and processing data, using the 2007 Mathematics Programme as a framework. The authors explicitly refer to the concept of statistical literacy, recognising it as the ultimate goal of statistics teaching - which includes the ability to interpret and understand information, critically evaluate data and give an informed opinion on statistical studies in real contexts.

However, in the teachers' speeches, data literacy appears only implicitly. None of the teachers use the term directly, although they show concern for understanding and analysing statistical information. The tasks selected rarely promote links to real-life contexts or encourage critical thinking. In addition, the teachers focused more on content than on the transversal competences associated with data literacy.

The study highlights that the two teachers with more experience of the curriculum showed greater sensitivity to the challenges of statistical literacy and greater alignment with its principles. In contrast, the teacher with less knowledge of the programme showed a more traditional approach, focused on procedures, with less attention to critical and interpretative aspects.

Thus, this case shows how data literacy can be present implicitly in teaching practice, but that its development requires specific training and pedagogical intentionality so that it is no longer marginal or accidental.

3. Dias & Santos (2021) - Teacher training in statistics

In this study, data literacy is addressed indirectly and implicitly. The authors don't use the term directly, but the results show that teachers' lack of training in statistics jeopardises their ability to develop data literacy skills in their students. The lack of contact with statistics in initial training and the scarcity of ongoing training result in teaching that is centred on procedures and devoid of critical thinking about data.

4. WEIWE(R)BE programme - Literacy with school libraries

The approach to data literacy in this programme is explicit and integrated into a broader framework of digital and information literacy. Through teacher training and the creation of pedagogical scenarios with school libraries, the critical use of information sources, including statistical data, is promoted. The programme is aligned with the DigCompEdu framework and presents a structured strategy for integrating data literacy skills into curricular practices.

5. Mouro et al. (2025) - Competition First place winner in the national phase of the European Statistics Competition



This case stands out for the practical and applied way in which data literacy is promoted. Although the term is not used explicitly in the video, the work carried out by the students involves collecting, analysing, visualising and critically interpreting official data to support relevant decisions. This is a clear example of data literacy in action.

Analysing the case studies show that data literacy is often present implicitly in the discourses and practices of teachers and students. The organisation and processing of data is beginning to be worked on in a more structured way in schools from the 1st cycle onwards. Practices that involve students in statistical research tasks tend to develop fundamental skills such as data interpretation, question formulation and critical analysis.

Despite visible progress, significant difficulties persist among students, especially in interpreting contexts, understanding statistical concepts and communicating results. These difficulties are often compounded by gaps in basic maths skills and unfamiliarity with everyday contexts.

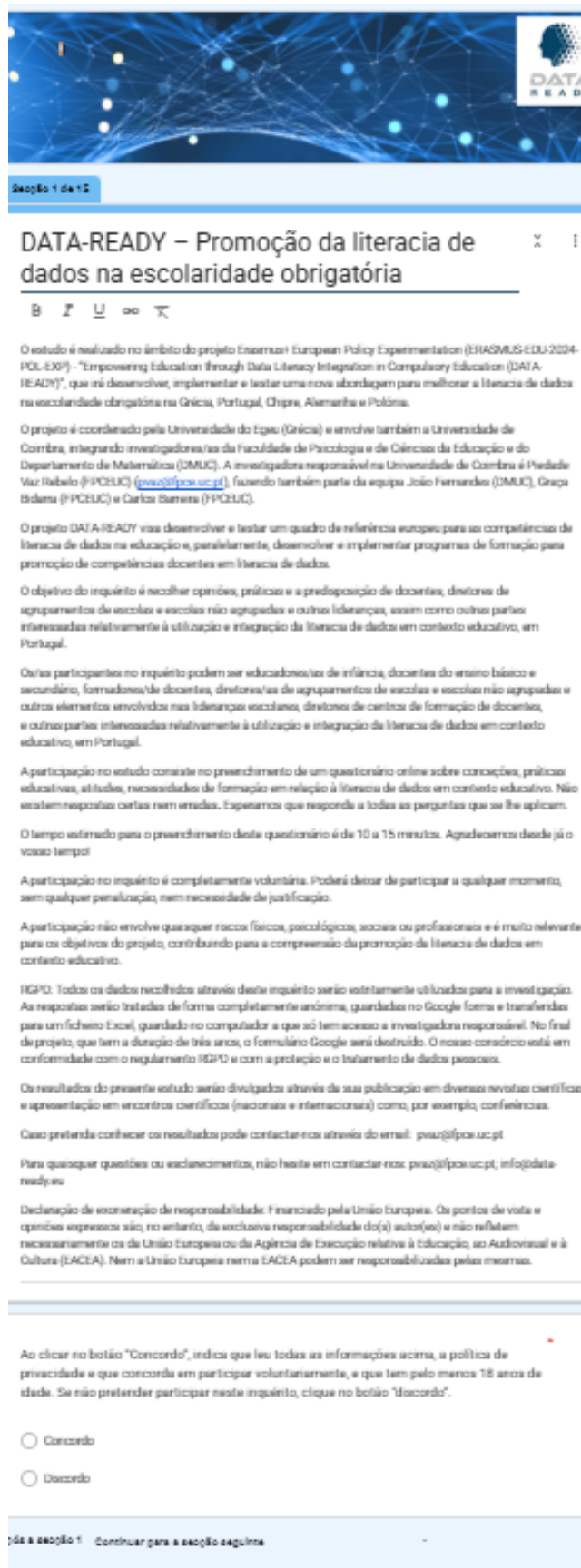
The studies converge in the finding that teachers' knowledge and attitudes are crucial to the success of organising and processing data. Teachers who are more aligned with the curriculum and more sensitive to statistical literacy tend to adopt richer and more reflective practices.

The general lack of training in statistics - both initial and ongoing - is a critical barrier to the development of students' statistical literacy, and it seems clear that there is a need to strengthen training opportunities in this area.

The studies suggest the need for curricular policies that more clearly articulate the objectives of organising and processing data with the development of statistical literacy, encouraging teacher training, the production of materials and the adoption of contextualised and challenging tasks.

9.3 Survey

The national survey in Portugal was accessible through this link: https://docs.google.com/forms/d/1CUjYcixVppOTzyxfnxWymRRKC1G5YPnex5la5kopc_Q/preview



DATA-READY – Promoção da literacia de dados na escolaridade obrigatória

O estudo é realizado no âmbito do projeto Erasmus+ European Policy Experimentation (ERASMUS+EDU-2024-POL-EXPE) – "Empowering Education through Data Literacy Integration in Compulsory Education (DATA-READY)", que irá desenvolver, implementar e testar uma nova abordagem para melhorar a literacia de dados na escolaridade obrigatória na Grécia, Portugal, Chipre, Alemanha e Polónia.

O projeto é coordenado pela Universidade do Egio (Grécia) e envolve também a Universidade de Coimbra, integrando investigadores/as da Faculdade de Psicologia e de Ciências da Educação e do Departamento de Matemática (DMUC). A investigadora responsável na Universidade de Coimbra é Práxedes Vaz Ribeiro (FPEUC) (prax@fpce.ucp.pt), fazendo também parte da equipa João Fernandes (DMUC), Graça Bédara (FPEUC) e Carlos Sarmas (FPEUC).

O projeto DATA-READY visa desenvolver e testar um quadro de referência europeu para as competências de literacia de dados na educação e, paralelamente, desenvolver e implementar programas de formação para promoção de competências docentes em literacia de dados.

O objetivo do inquérito é recolher opiniões, práticas e a predisposição de docentes, diretores de agrupamentos de escolas e escolas não agrupadas e outros líderes, assim como outros partes interessadas relativamente à utilização e integração da literacia de dados em contexto educativo, em Portugal.

Os/as participantes no inquérito podem ser educadores/as de infância, docentes do ensino básico e secundário, formadores/de docentes, diretores/as de agrupamentos de escolas e escolas não agrupadas e outros elementos envolvidos nas lideranças escolares, diretores de centros de formação de docentes, e outros partes interessadas relativamente à utilização e integração da literacia de dados em contexto educativo, em Portugal.

A participação no estudo consiste no preenchimento de um questionário online sobre conceções, práticas educativas, atitudes, necessidades de formação em relação à literacia de dados em contexto educativo. Não existem respostas certas nem erradas. Esperamos que responda a todas as perguntas que se lhe aplicarem.

O tempo estimado para o preenchimento deste questionário é de 10 a 15 minutos. Agradecemos desde já o vosso tempo!

A participação no inquérito é completamente voluntária. Podem deixar de participar a qualquer momento, sem qualquer penalização, nem necessidade de justificação.

A participação não envolve quaisquer riscos físicos, psicológicos, sociais ou profissionais e é muito relevante para os objetivos do projeto, contribuindo para a compreensão da promoção da literacia de dados em contexto educativo.

RGPD: Todos os dados recolhidos através deste inquérito serão estritamente utilizados para a investigação. As respostas serão tratadas de forma completamente anónima, guardadas no Google Forms e transferidas para um ficheiro Excel, guardado no computador a que só tem acesso a investigadora responsável. No final do projeto, que tem a duração de três anos, o formulário Google será destruído. O nosso compromisso está em conformidade com o regulamento RGPD e com a proteção e o tratamento de dados pessoais.

Os resultados do presente estudo serão divulgados através da sua publicação em diversas revistas científicas e apresentação em encontros científicos (nacionais e internacionais) como, por exemplo, conferências.

Caso pretenda conhecer os resultados pode contactar-nos através do email: prax@fpce.ucp.pt

Para quaisquer questões ou esclarecimentos, não hesite em contactar-nos: prax@fpce.ucp.pt, info@data-ready.eu

Declaração de exoneração de responsabilidade: Financiado pela União Europeia. Os pontos de vista e opiniões expressos são, no entanto, de exclusiva responsabilidade do(s) autor(es) e não refletem necessariamente os da União Europeia ou da Agência de Execução relativa à Educação, ao Audiovisual e à Cultura (EACEA). Nem a União Europeia nem a EACEA podem ser responsabilizadas pelas mesmas.

Ao clicar no botão "Concordo", indica que leu todas as informações acima, a política de privacidade e que concorda em participar voluntariamente, e que tem pelo menos 18 anos de idade. Se não pretender participar neste inquérito, clique no botão "Discordo".

☐ Concordo

☐ Discordo

[Continuar para a secção seguinte](#)

Figure 207 Portugal Survey [Screenshot]



A total of 76 individuals completed the survey; however, one respondent did not provide consent. Consequently, the final dataset comprises responses from 75 participants. Of these, one participant, in his comments, said that he didn't answer all the questions because he felt that some were not appropriate for him.

9.3.1 Demographic Data (Section A)

Among the 75 respondents, the majority identified as female (**n = 50**, 66.7%), while **n = 25** (33.3%) identified as male. No participants selected "Other" or "Prefer not to answer." This gender distribution reflects a predominantly female representation,

Género
75 respostas

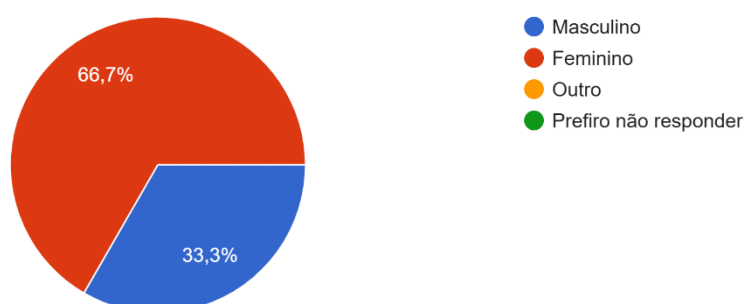


Figure 208 Portugal Survey [Gender]

The age distribution is relatively diverse. The two largest age groups were 56-60 (**n = 16**) and 61-65 (**n = 16**), each representing 21.3% of the sample. This was followed by participants aged 51-55 (**n = 12**, 16%) and 46-50 (**n = 13**, 17.3%). The younger age brackets-22-29 (**n = 7**, 9.3%), 30-35 (**n = 1**, 1.3%), and 36-40 (**n = 2**, 2.7%)-were less represented. The oldest group (66+) included **n = 5** (6.7%).

Idade (anos)
75 respostas

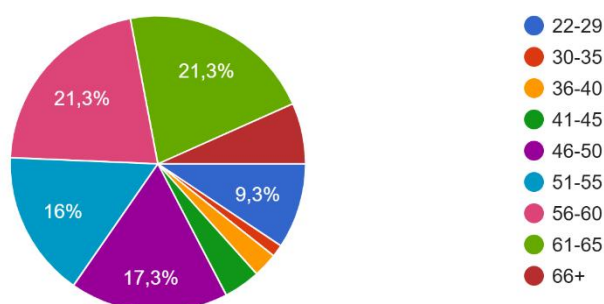


Figure 209 Portugal Survey [Age]

Among the 72 respondents who answered this question, most hold a Master's degree (**n = 34, 47.2%**). This was followed by Bachelor's or Licentiate degrees (**n = 20, 27.8%**), and Doctorates (**n = 16, 22.2%**). Only **n = 2 (2.8%)** reported holding an Aggregation degree. These results show that the sample is composed of highly qualified professionals.

Grau académico mais elevado

72 respostas

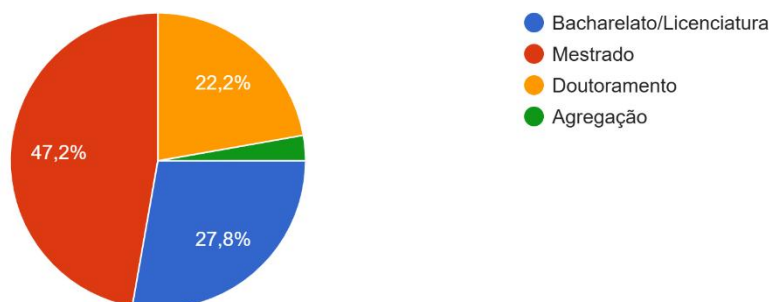


Figure 210 Portugal Survey [Educational level]

The majority of participants rated their ICT (Information and Communication Technology) skills as intermediate or advanced. Specifically, **n = 32 (42.7%)** selected level 4, and **n = 29 (38.7%)** chose level 3 on the scale. A smaller group (**n = 12, 16%**) considered themselves highly proficient (level 5), while only **n = 2 (2.7%)** reported low proficiency (level 2). No respondents selected level 1, indicating a general baseline of digital literacy across the sample. This distribution suggests that most respondents feel confident or relatively confident using digital tools.

Nível de competências em TIC

75 respostas

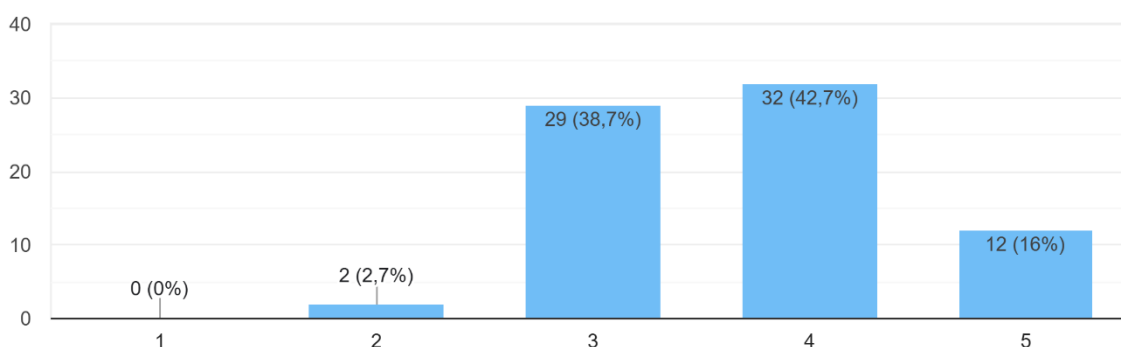


Figure 211 Portugal Survey [ICT level]

Almost half of the respondents (**n = 37, 49.3%**) stated they had not received any training related to data use or data literacy. Informal training or collaborative learning with colleagues was reported by **n = 20 (26.7%)**. Certified training provided by a Continuing Education Centre was mentioned by **n = 9 (12%)**, by a higher education institution by **n = 6 (8%)**, and certified training

promoted by the school itself by **n = 3** (4%). These figures reveal a gap in formal professional development opportunities in this area.

Recebeu/participou em formação relacionada com a utilização de dados ou com a literacia de dados?

75 respostas

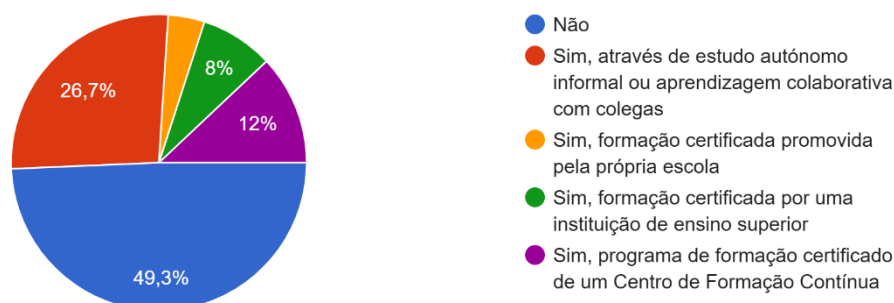


Figure 212 Portugal Survey [Have you received training related to data use or Data Literacy?]

A significant majority of respondents identified as teachers (**n = 54**, 72%). Leadership or management roles (e.g., school directors) were held by **n = 9** (12%). Educational policy officials or directors of training centres made up **n = 8** (10.7%). The remaining roles were each mentioned by only one or two participants, including university professors - teacher educators.

Selecione a sua função atual na área da educação:

75 respostas

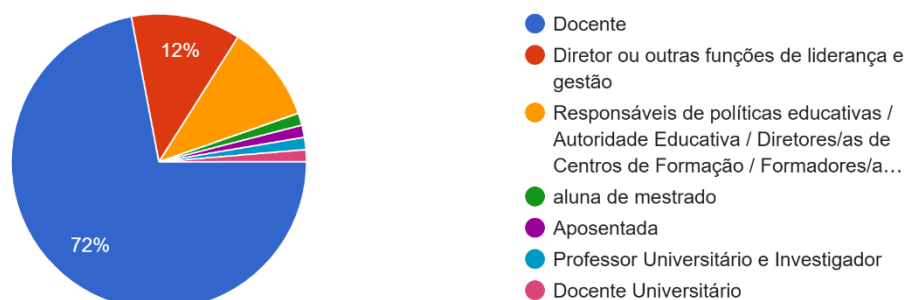


Figure 213 Portugal Survey [Select your current role in education]

The following tables and figures represent details related to each role's demographics.

Section A: Demographic Data [Teacher]

Among the respondents, the most represented recruitment group is 520 - Natural Sciences and Biology, with 14 participants (28%). This is followed by 300 - Portuguese (**n = 6**; 12%), 500 - Mathematics (**n = 5**; 10%), and 510 - Physics and Chemistry (**n = 2**; 4%). Several other groups- such as 110 (1st Cycle), 240 (Visual Arts), 400 (History), and 420 (Geography)-are represented by smaller proportions, typically with 1 or 2 participants (2-4%) each.

The most representative group comprised educators with over 31 years of service (41.4%, n = 24), followed by those with 20-30 years (24.1%, n = 14) and 12-19 years (15.5%, n = 9). Less experienced teachers (1-3 years) represented 12.1% (n = 7), and the least represented were those with 4-6 years (n = 1) and 7-11 years (n = 3).

Experiência de ensino (anos)

58 respostas

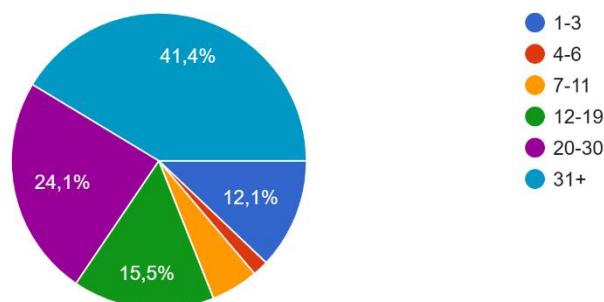


Figure 214 Portugal Survey [Teacher: Experience (years)]

The most common school type/level of teaching was secondary education (16-18 years), with 49% (n = 25), followed by lower secondary (13-15 years) at 33.3% (n = 17). Basic education (7-12 years) represented 17.6% (n = 9), while no respondents indicated work at the pre-school level.

Tipo de escola/ Nível de ensino que leciona

51 respostas

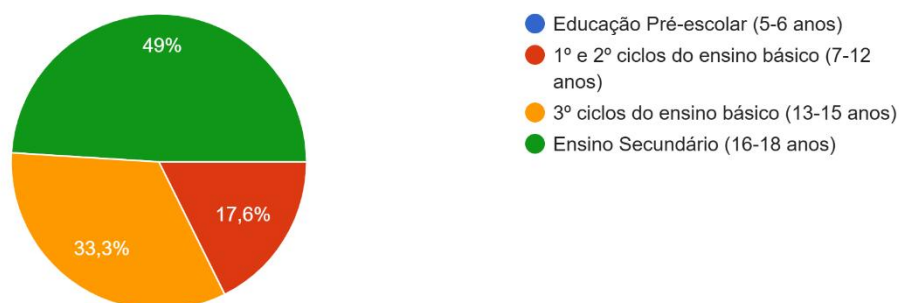


Figure 215 Portugal Survey [Teacher: School type]

Most respondents worked in urban schools (63%, n = 34), followed by those in suburban areas (27.8%, n = 15) and rural settings (9.3%, n = 5).

Área geográfica da escola

54 respostas

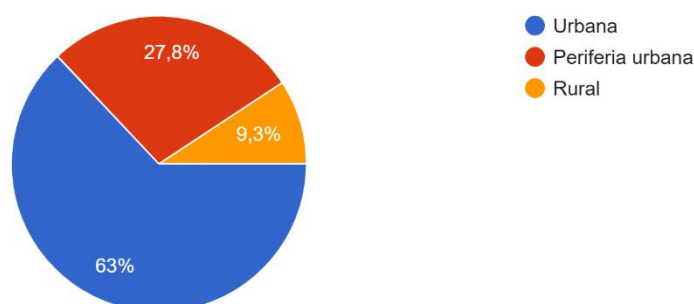


Figure 216 Portugal Survey [Teacher: School region]

Most respondents were based in very large schools with more than 181 students (78.2%, n = 43). Smaller schools were much less common: large (121-180 students) schools accounted for 16.4% (n = 9), medium-sized schools for 3.6% (n = 2), and small schools (21-60 students) for 1.8% (n = 1). No participants reported working in schools with fewer than 21 students.

Dimensão da Escola

55 respostas

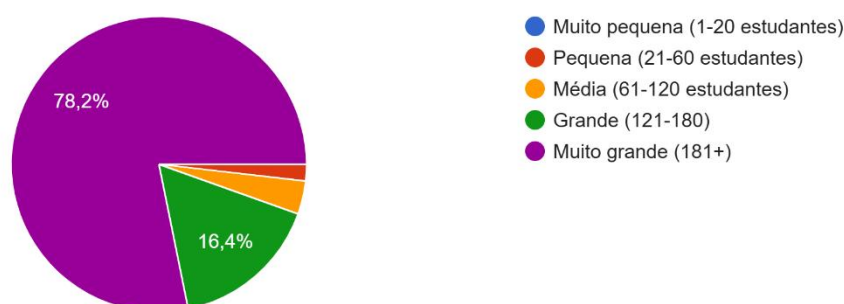


Figure 217 Portugal Survey [Teacher: School size]

Respondents reported working in schools of highly varied sizes in terms of teaching staff. The most frequently reported figure was 200 teachers (13.2%, n = 5), followed by clusters around 40, 70, and 98 teachers-each mentioned by 3 respondents (7.9%). Several other schools were reported as having between 25 and 120 teachers (with 2 to 5.3% of responses in each range). A wide distribution is visible, ranging from schools with no registered teachers up to those with 300, although the majority fall between 25 and 200.

Section A: Demographic Data [Administrator]

Among the 9 respondents with leadership roles, there was a relatively even distribution of years of experience. The largest groups (22.2% each, n = 2) reported having between 4-6 years, 12-19 years, and 20-30 years of leadership experience, respectively. Smaller proportions (11.1% each, n = 1) had 1-3 years, 7-11 years, or more than 31 years of experience.



Anos de experiência em cargos de liderança na educação

9 respostas

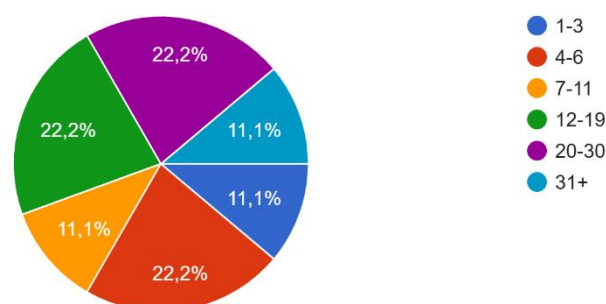


Figure 218 Portugal Survey [Administrator: Experience (years)]

Among the 9 respondents with leadership roles, the majority (77.8%, $n = 7$) reported working in upper secondary education (ages 16-18). The remaining 22.2% ($n = 2$) worked in lower secondary schools (ages 13-15).

Tipo de escola

9 respostas

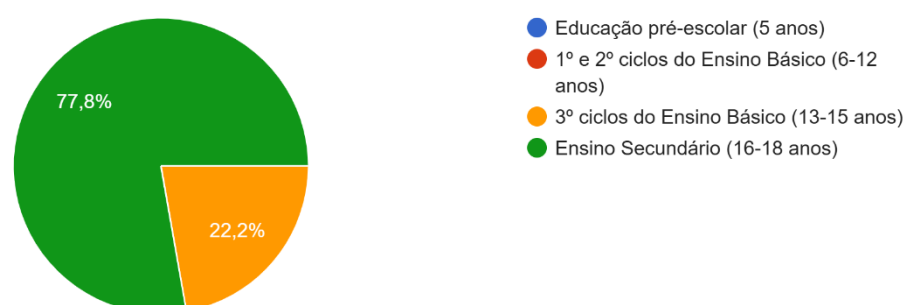


Figure 219 Portugal Survey [Administrator: School type]

Regarding school location, most respondents (55.6%, $n = 5$) indicated working in urban areas. Additionally, 22.2% ($n = 2$) reported being based in semi-urban (urban periphery) areas, and another 22.2% ($n = 2$) in rural regions.



Área geográfica da escola

9 respostas

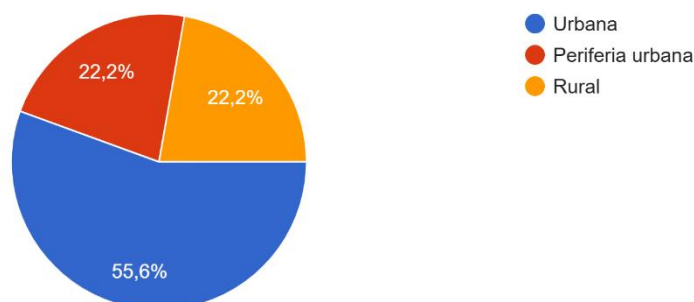


Figure 220 Portugal Survey [Administrator: School region]

All respondents in leadership positions (100%, n = 9) reported working in very large schools with more than 181 students. This is due to the fact that, in Portugal, most schools are organised into school *clusters*. These clusters can include all levels of education, from pre-school to upper secondary, and often serve a large number of students. As a result, leadership roles tend to be centralised within these larger organisational structures, which may explain why all respondents with leadership responsibilities reported working in very large schools.

Dimensão da escola

9 respostas

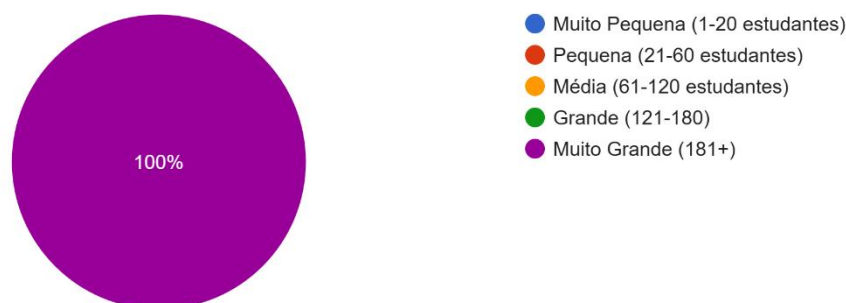


Figure 221 Portugal Survey [Administrator: School size]

Among the nine respondents holding leadership positions, school sizes varied significantly. The majority (2 participants, 28.6%) reported working in schools with 266 teachers. The remaining respondents (1 each, 14.3%) indicated school sizes ranging from 70 to 160 teachers, including institutions with 70, 80, 120, 132, and 160 staff members. This distribution reinforces the idea that school leaders in Portugal are frequently based in large institutions, a result of the country's organisational model in which schools are grouped into clusters that encompass all levels of education-from preschool to secondary-and may serve a large

Among the eight respondents, the majority (50%) have between 20 and 30 years of experience. This is followed by 37.5% who have more than 31 years of experience, indicating a highly



experienced group. Only one respondent (12.5%) reported having between 12 and 19 years of experience, while no responses were recorded for categories under 12 years.

Anos de experiência em funções de liderança educativa
8 respostas

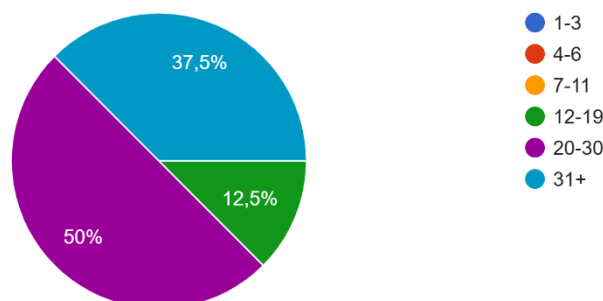


Figure 222 Portugal Survey [Administrator: Experience (years)]

Regarding the level of authority in which participants exercise their leadership, half (50%) of the respondents indicated working at the local level, which includes school-based or municipal educational leadership. Additionally, 37.5% operate at the national level, suggesting involvement in broader educational planning or governmental bodies. A smaller portion (12.5%) reported holding regional authority. This mix suggests that the group includes a combination of practitioners with both practical and policy-level engagement in data-informed educational leadership.

Nível de autoridade
8 respostas

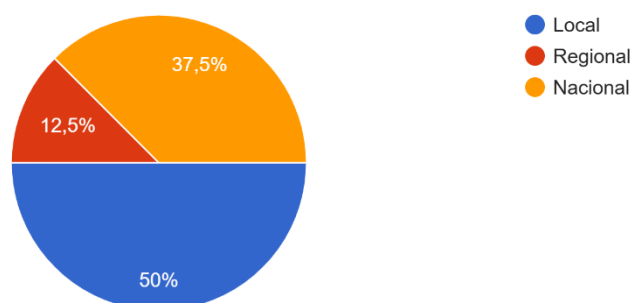


Figure 223 Portugal Survey [Authority: Level]

The participants in educational authority roles reported a diverse set of functions within the education system. Among the eight respondents, the most common role was that of a *teacher trainer*, mentioned by 25% of participants. Other roles, each represented by 12.5% of respondents, included positions such as *educational authority*, *coordinator of a master's programme*, *director of a training centre*, *inspector*, *higher education professor*, and *trainer in other contexts*.

9.3.2 Understanding and Awareness of Data Literacy (Section B)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree Nor Disagree, 4 = Agree, 5 = Strongly Agree.

The first statement was: "I understand the following concepts:"

Seven specific literacies were assessed: Data Literacy, Digital Literacy, AI Literacy (Artificial Intelligence Literacy), Information Literacy, Statistical Literacy, Learning Analytics, Scientific Literacy.

1. Compreendo os seguintes conceitos:

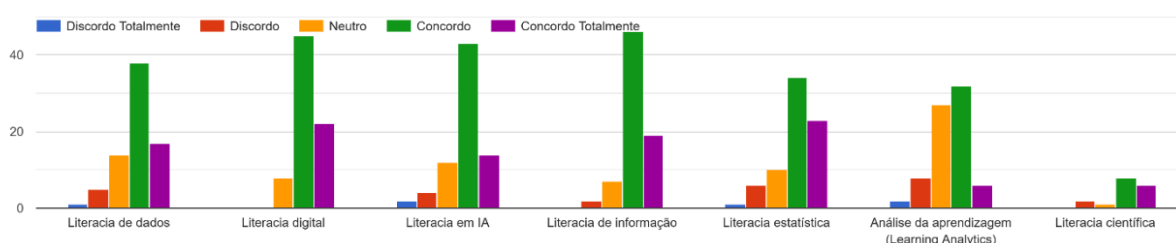


Figure 224 Portugal Survey [Understanding of concepts]

The results suggest that participants generally report a **strong understanding of most of the presented concepts**, although familiarity varies across some concepts.

Digital Literacy stands out with approximately 90% of participants selecting "Agree" or "Strongly Agree," indicating a strong sense of confidence in understanding this concept. **Information Literacy** shows similarly high levels of agreement (about 87%), reflecting a shared recognition of its relevance and presence in educational discourse.

Data Literacy also received a strong level of self-reported understanding, with around 80-85% expressing agreement. However, this item displayed a slightly higher proportion of neutral responses compared to the previous two, which may reflect variation in how the term is interpreted or applied in practice.

In the case of **AI Literacy**, about 85% of respondents indicated agreement, but a slightly higher share of neutral and disagree responses (around 12-15%) suggests that while the concept is widely recognised, some participants may feel less secure in their grasp of it-likely due to its technical complexity or evolving nature.

Statistical Literacy had somewhat lower agreement levels compared to the other core literacies. Approximately 75% selected "Agree" or "Strongly Agree," with the remaining 25% distributed between neutral and disagreement options. This may indicate that some respondents view statistical knowledge as more technical or specialised, and perhaps less accessible in day-to-day educational contexts.

Learning Analytics revealed the greatest variability in responses. While there was still a majority agreement (just over 60%), this item had the **highest proportion of neutral responses (exceeding 30%)** and notable disagreement. This suggests a gap in familiarity with the concept, or uncertainty regarding its scope and relevance, especially for educators not directly involved in data-driven instructional strategies.

Regarding **Scientific Literacy**, it is important to note that this item was introduced later in the survey and was **not answered by all participants**. Nevertheless, among those who responded, there is a **balanced but positive trend**, with approximately 60-65% indicating agreement and relatively few disagreement responses. Although the total number of responses is smaller, the results still suggest a growing recognition of the value of scientific reasoning—such as evidence-based thinking and hypothesis testing—as part of the broader framework of data literacy.

The following statement was: "Data Literacy is connected to the following concepts:"

Six specific literacies were assessed: Digital Literacy, AI Literacy (Artificial Intelligence Literacy), Information Literacy, Statistical Literacy, Learning Analytics, Scientific Literacy.

2. Literacia de dados está relacionada com os seguintes conceitos:

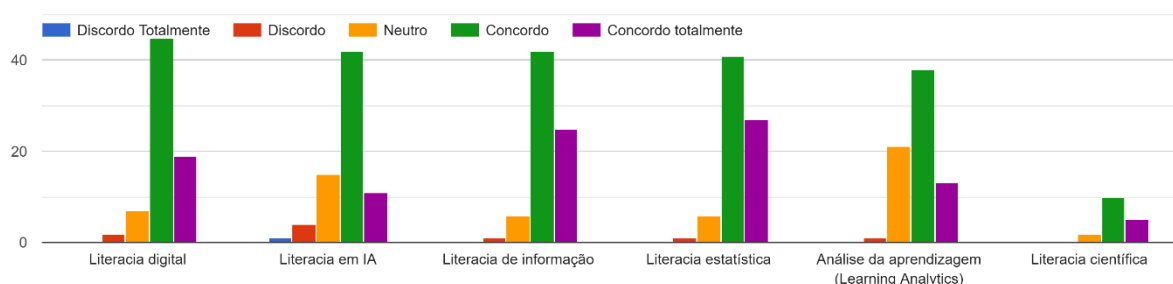


Figure 225 Portugal Survey [Connection of concepts]

The responses reveal a strong overall agreement that data literacy is closely connected to several foundational conceptual domains, particularly information literacy, statistical literacy, and digital literacy.

In the case of information literacy, approximately 93% of participants selected "Agree" or "Strongly Agree," indicating near-unanimous consensus regarding its relevance to data literacy. This suggests that participants clearly recognise the parallel between the ability to critically evaluate sources of information and the ability to understand and interpret data.

Digital literacy has an estimated 88% of respondents expressing agreement. This high level of consensus reflects the perception that digital skills are essential for accessing, manipulating, and interpreting data, especially given that digital environments are the primary context in which data is generated and used.

Statistical literacy received similarly high agreement (around 88%), although it showed a slightly higher proportion of neutral responses. This may indicate that while statistics are broadly acknowledged as relevant, some participants perceive statistical methods as more technical or specialised, potentially creating a perceived distance from general data literacy.

For artificial intelligence (AI) literacy, the overall agreement was lower, at approximately 72%. Although the majority of participants recognised its relevance, the higher rate of neutral responses (around 21%) and some disagreement suggest a certain level of uncertainty or limited familiarity with the relationship between AI and data literacy. This points to an area where professional development and clearer conceptual integration may be needed.

Learning Analytics was the concept with the most dispersed responses. While about 70% of participants agreed with its connection to data literacy, this was accompanied by a notable 28% neutral response rate. This dispersion may reflect lower familiarity with the term or a lack of clarity regarding how learning-related data practices align with broader definitions of data literacy.



Regarding scientific literacy, although this item was introduced later in the survey and thus had fewer responses, the trend was still clear: over 85% of those who responded selected "Agree" or "Strongly Agree." This indicates that, when included, scientific thinking-grounded in data, evidence, and critical reasoning-is also viewed as a key component of data literacy.

The statement "I understand the potential uses and applications of data to support learning, assessment, research, and decision-making in education." followed.

3. Compreendo os potenciais usos e aplicações dos dados no apoio à aprendizagem, avaliação, investigação e tomada de decisão em educação.

75 respostas

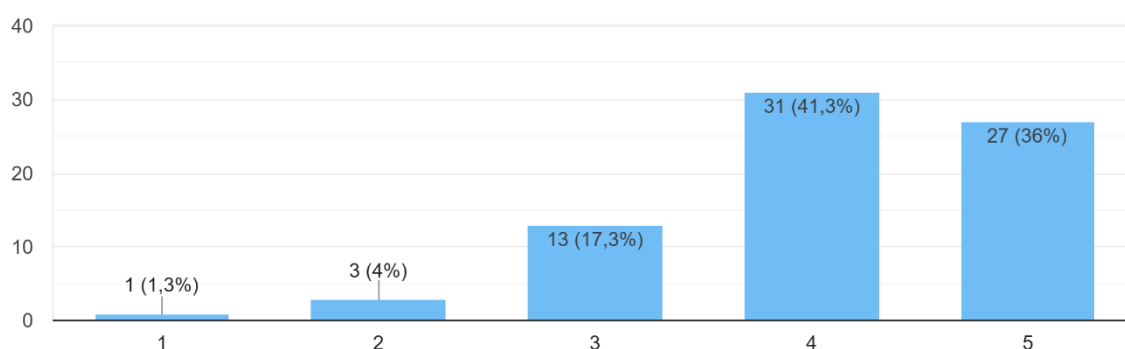


Figure 226 Portugal Survey [I understand the potential uses and applications of data to support learning, assessment, research, and decision-making in education]

The results show a high level of self-reported understanding among participants. The majority selected positive agreement options: 41.3% (n = 31) selected 4 (Agree) and 36% (n = 27) selected 5 (Strongly Agree).

This indicates that 77.3% of respondents feel confident in their understanding of how data can be used to enhance various educational domains. These findings suggest a broad recognition of the strategic role data plays in evidence-based education.

Meanwhile, 17.3% (n = 13) selected the neutral option (3), which may reflect a developing or partial understanding of the topic. This group could benefit from further professional development or clearer integration of data-related practices into their professional context.

Only 5.3% of participants (n = 4) selected disagreement options (1 - Strongly Disagree or 2 - Disagree), indicating that very few respondents feel disconnected from the topic or unaware of its relevance.

Overall, the data point to a strong general awareness of the importance and applications of data in educational contexts. However, the presence of neutral and lower responses also highlights the need to ensure that all educators and education professionals are adequately supported in developing both conceptual understanding and practical skills for using data effectively.

The statement "I recognise Data Literacy as an essential element teachers' modern role." followed.



4. Reconheço a literacia de dados como um elemento essencial no papel atual dos professores.

75 respostas

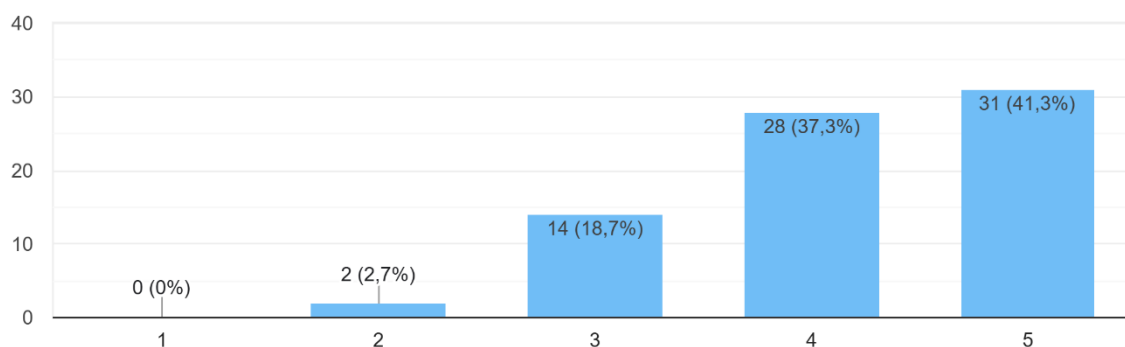


Figure 227 Portugal Survey [I recognise Data Literacy as an essential element teachers' modern role]

The results demonstrate a very high level of agreement with this statement: 41.3% (n = 31) selected 5 - Strongly Agree and 37.3% (n = 28) selected 4 - Agree.

This indicates that 78.6% of respondents clearly recognise the importance of Data Literacy in the professional profile of contemporary teachers. Such widespread agreement reflects the growing understanding that teachers are expected not only to engage with data but to do so critically and effectively as part of their teaching, assessment, and decision-making responsibilities.

An additional 18.7% (n = 14) selected the neutral option (3), which may suggest that while they do not dispute the importance of Data Literacy, they may still be forming a complete understanding of its role or may not yet fully experience it in their professional context.

Only 2.7% (n = 2) selected 2 - Disagree, and no participants selected 1 - Strongly Disagree, reinforcing the overall consensus.

In summary, these findings emphasise that the majority of participants not only understand the concept of Data Literacy but also consider it to be a key competence required for teachers to respond to the challenges of contemporary education. However, the presence of neutral responses indicates that further clarification and institutional support may still be necessary to bridge the gap between theoretical recognition and practical implementation.

The statement "I recognise the legal, ethical and privacy issues associated with data in education." followed.

5. Reconheço as questões legais, éticas e de privacidade associadas aos dados na educação

75 respostas

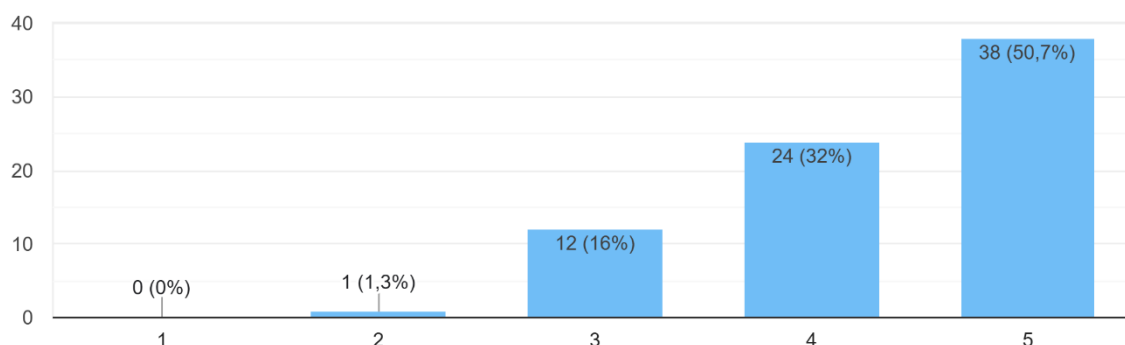


Figure 228 Portugal Survey [*I recognise the legal, ethical and privacy issues associated with data in education*]

The results demonstrate a very strong recognition of these concerns among participants: 50.7% (n = 38) selected 5 - Strongly Agree and 32% (n = 24) selected 4 - Agree. This means that 82.7% of respondents agreed or strongly agreed with the statement, indicating a strong awareness of the sensitive and regulated nature of data in educational contexts.

A smaller proportion, 16% (n = 12), selected the neutral response (3), suggesting that a minority of participants may still be developing their understanding or are uncertain about the scope of these issues.

Only 1.3% (n = 1) selected 2 - Disagree, and no respondents selected 1 - Strongly Disagree, reinforcing the consensus around the importance of legal and ethical considerations.

These results indicate that educators and professionals in the sample are highly conscious of the responsibilities and potential risks involved in the use of educational data. At the same time, the presence of some neutral responses points to the continued need for targeted training and institutional guidance on regulations, ethical data use, and safeguarding student privacy.

9.3.3 Knowledge and Skills (Readiness) in Data Literacy (Section C)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree Nor Disagree, 4 = Agree, 5 = Strongly Agree.

The first statement was: "*I know of data analysis methods, techniques and tools*".

6. Conheço métodos, técnicas e ferramentas de análise de dados

75 respostas

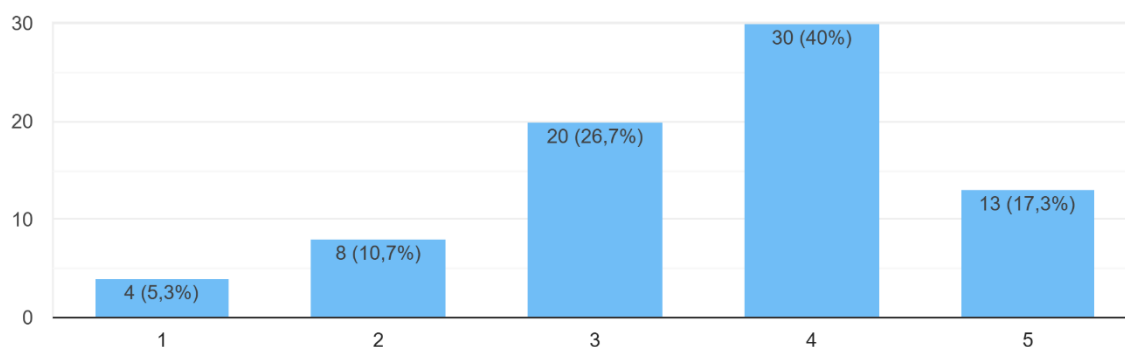


Figure 229 Portugal Survey [I know of data analysis methods, techniques and tools]

The responses show a moderately high level of perceived knowledge, although with more variation than observed in previous items: 40% (n = 30) selected 4 - Agree and 17.3% (n = 13) selected 5 - Strongly Agree. Together, these responses represent 57.3% of participants who positively affirm that they are familiar with tools and methodologies used in data analysis. This suggests a majority feel reasonably confident in this domain, reflecting either prior training or practical experience with data in their professional contexts.

However, a significant portion selected the neutral midpoint: 26.7% (n = 20) chose 3 - Neither agree nor disagree. This indicates that over a quarter of respondents may only have a basic understanding or feel uncertain about their level of proficiency with data analysis practices.

However, 16% of participants expressed disagreement: 10.7% (n = 8) chose 2 - Disagree and 5.3% (n = 4) chose 1 - Strongly Disagree. These figures point to a relevant minority who report limited or no familiarity with analytical tools, suggesting that technical aspects of data literacy may not yet be fully developed across the entire group.

In summary, while the majority of participants report some level of knowledge regarding data analysis methods and tools, the distribution of responses reflects varying levels of confidence. This reinforces the importance of **capacity-building initiatives** to ensure that all educators can engage meaningfully with data-from collection to interpretation and decision-making.

The statement "I know how to use digital tools to manage and organise data effectively." followed.

7. Sei utilizar ferramentas digitais para gerir e organizar dados de forma eficaz

75 respostas

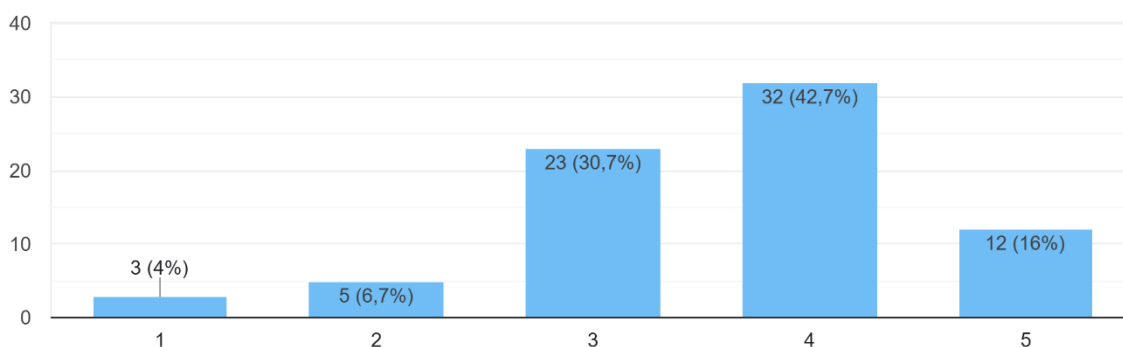


Figure 230 Portugal Survey [I know how to use digital tools to manage and organise data effectively]

The results reveal a generally high level of confidence among participants in this area: 42.7% (n = 32) selected 4 - Agree and 16% (n = 12) selected 5 - Strongly Agree. Together, 58.7% of respondents reported that they feel confident in their ability to use digital tools for effective data organisation and management. These results suggest that a majority possess practical digital skills relevant to the manipulation and structuring of data—an essential component of data literacy in professional educational contexts.

A considerable portion of participants (30.7%, n = 23) selected 3 - Neutral, indicating moderate confidence or a developing familiarity. This suggests that while these individuals may use digital tools, they may not consistently do so with ease or efficiency or may lack training in more advanced functionalities.

Only a small percentage selected disagreement options: 6.7% (n = 5) selected 2 - Disagree

And 4% (n = 3) selected 1 - Strongly Disagree. These responses suggest that roughly one in ten participants experience difficulty or lack experience with digital tools for data-related purposes, representing a group that may benefit from targeted training or technical support.

In sum, the data indicate that most participants possess basic to advanced operational skills in data management using digital tools, although a significant group remains in the intermediate range and a small number report low confidence. This points to the importance of ongoing professional development efforts to consolidate and expand educators' digital capacities.

The statement "I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information." followed.

8. Sei ler, compreender e interpretar gráficos, tabelas e quadros, e correlacioná-los com outras informações

75 respostas

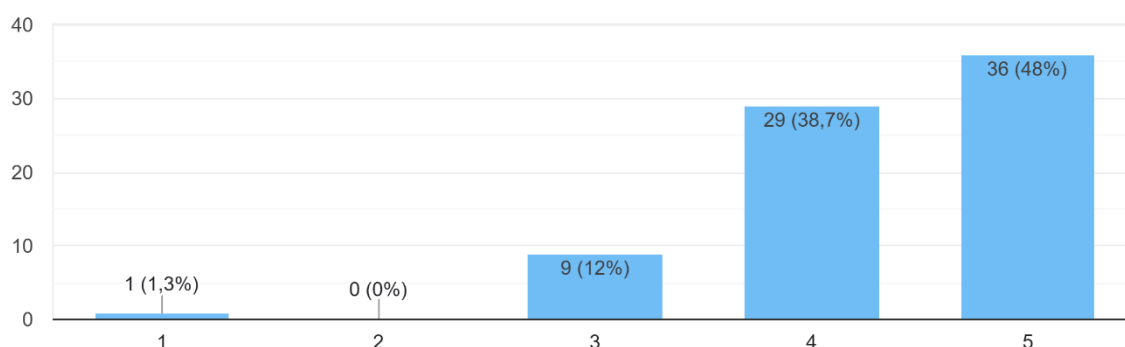


Figure 231 Portugal Survey [I know how to read, understand and interpret charts, tables, and graphs and correlate them with other information]

The responses demonstrate a very high level of confidence among participants: 48% (n = 36) selected 5 - Strongly Agree and 38.7% (n = 29) selected 4 - Agree. These results indicate that 86.7% of respondents feel confident in their ability to interpret and work with visual data formats-such as charts, tables, and graphs-and relate that information to other relevant data points.

A smaller portion (12%, n = 9) selected the neutral option (3), suggesting moderate or emerging skills in this area. Only 1.3% (n = 1) selected 1 - **Strongly Disagree**, and no participants selected 2 - **Disagree**, indicating almost unanimous basic competency.

The statement "I know how to create charts, tables, and graphs to organise and visually present data." followed.

9. Sei criar gráficos, tabelas e quadros para organizar e apresentar dados visualmente.

75 respostas

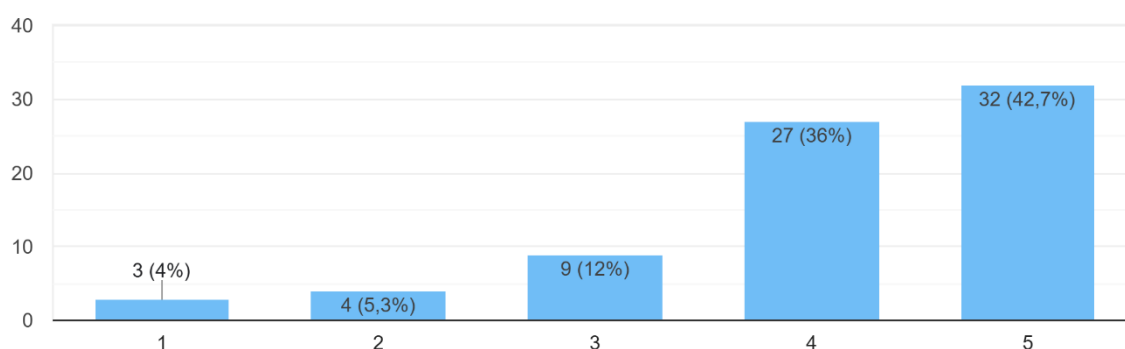


Figure 232 Portugal Survey [I know how to create charts, tables, and graphs to organise and visually present data]

The results reflect a high level of confidence in data visualisation skills: 42.7% (n = 32) selected 5 - Strongly Agree and 36% (n = 27) selected 4 - Agree. Together, 78.7% of participants reported feeling confident in their ability to create visual data formats, such as charts, tables, and graphs. This suggests that most respondents are not only able to interpret visual data but also actively engage in its production, a key competency for effectively communicating findings in educational and professional contexts.

A smaller portion of the sample (12%, n = 9) selected the neutral option (3), possibly indicating partial skill development or limited opportunities to practice these tasks.

A minor percentage reported low confidence: 5.3% (n = 4) selected 2 - Disagree and 4% (n = 3) selected 1 - Strongly Disagree. These results indicate that a small but relevant subgroup may lack technical confidence or training in designing and structuring visual data outputs.

The statement "I know how to make use of data to solve problems and make decisions related to my work." followed.

10. Sei utilizar dados para resolver problemas e tomar decisões relacionadas com o meu trabalho.

75 respostas

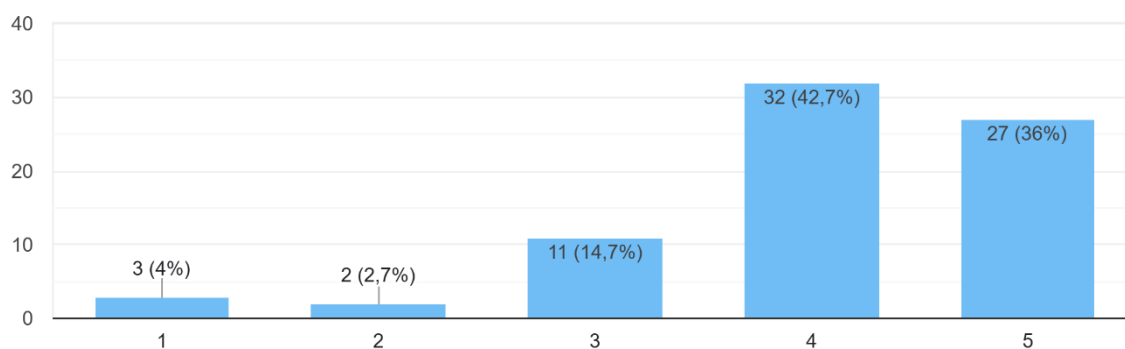


Figure 233 Portugal Survey [I know how to make use of data to solve problems and make decisions related to my work]

The responses indicate a high level of agreement with the statement: 42.7% (n = 32) selected 4 - Agree and 36% (n = 27) selected 5 - Strongly Agree. In total, 78.7% of participants affirm that they know how to use data to inform decisions and address challenges in their professional roles. This result demonstrates not only awareness but also a practical application of data literacy in real-world educational or institutional contexts.

A smaller segment of respondents (14.7%, n = 11) selected the neutral midpoint (3), possibly reflecting intermediate levels of confidence or inconsistent use of data in decision-making practices.

Only 6.7% expressed disagreement: 4% (n = 3) selected 1 - Strongly Disagree and 2.7% (n = 2) selected 2 - Disagree

These findings suggest that the vast majority of participants see data not just as information but as a tool to actively guide action and shape outcomes in their professional work. At the same time, the presence of a small group with limited confidence highlights the value of continued support and professional development focused on data-informed decision-making strategies.

9.3.4 Current Practices and Implementation (Section D)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree Nor Disagree, 4 = Agree, 5 = Strongly Agree.

The first statement was: "I explore and collect data for my work (i.e. surveys, assessment results, participation statistics, etc.)".

11. Exploro e recolho dados para o meu trabalho (por exemplo, inquéritos, resultados de avaliações, estatísticas de participação, etc.)

75 respostas

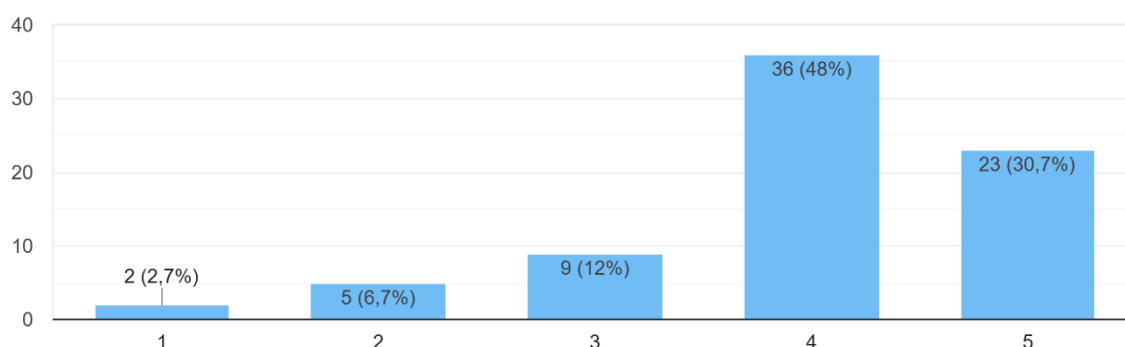


Figure 234 Portugal Survey [I explore and collect data for my work (i.e. surveys, assessment results, participation statistics, etc.)]

The results reveal a high level of engagement in data-related practices: 48% (n = 36) selected 4 - Agree and 30.7% (n = 23) selected 5 - Strongly Agree. Together, 78.7% of participants indicated that they regularly collect or explore data in their work, such as through surveys, assessment results, or participation records. This reflects a practice of integrating data into day-to-day educational or administrative routines, indicating that data literacy is not only conceptual but operational for most respondents.

A smaller portion of participants (12%, n = 9) selected the neutral option (3), which may reflect irregular engagement with data, uncertainty about methods, or contextual limitations (e.g., lack of access to data systems).

A minority of respondents reported limited data collection practices: 6.7% (n = 5) selected 2 - Disagree and 2.7% (n = 2) selected 1 - Strongly Disagree

These responses suggest that while the majority of educators or professionals in this sample actively collect and use data, a small subset may require more institutional support, training, or incentives to engage in data-informed practices.

The statement "I assess and use data in my work" followed.

12. Analiso e utilizo dados no meu trabalho.

74 respostas

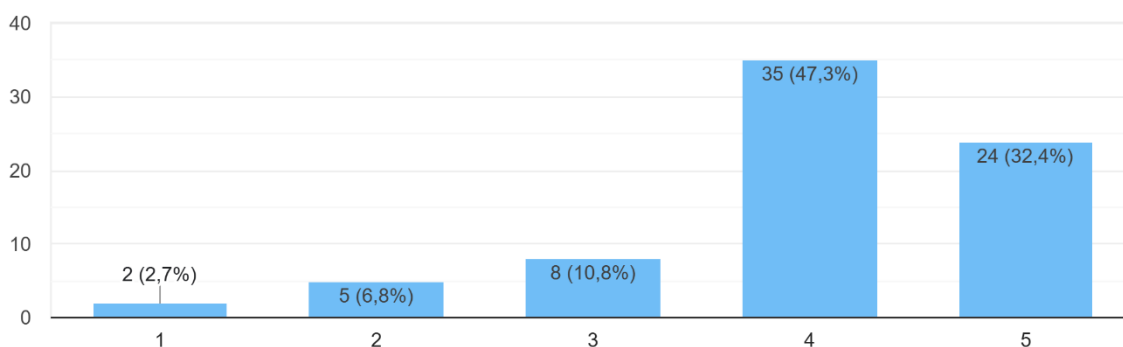


Figure 235 Portugal Survey [I assess and use data in my work]

The results reflect a high level of engagement in data-informed practice: 47.3% (n = 35) selected 4 - Agree and 32.4% (n = 24) selected 5 - Strongly Agree. In total, nearly 80% of participants (79.7%) indicated agreement with the statement, confirming that data analysis and its practical application are widespread habits in participants' work contexts.

A smaller group of respondents (10.8%, n = 8) selected 3 - Neutral, which may suggest limited confidence, variability in use, or contextual barriers to regular application of data analysis.

Only 9.5% expressed disagreement: 6.8% (n = 5) selected 2 - Disagree and 2.7% (n = 2) selected 1 - Strongly Disagree

These figures imply that a small minority still feel disconnected from data use in their practice.

Overall, the findings indicate that most participants actively integrate data into their decision-making and pedagogical processes, but also reinforce the need to strengthen capacity-building efforts for those still developing this dimension of professional competence.

The statement "I analyse and synthesize data for addressing a problem or question" followed.

13. Analiso e sintetizo dados para abordar um problema ou uma questão.

75 respostas

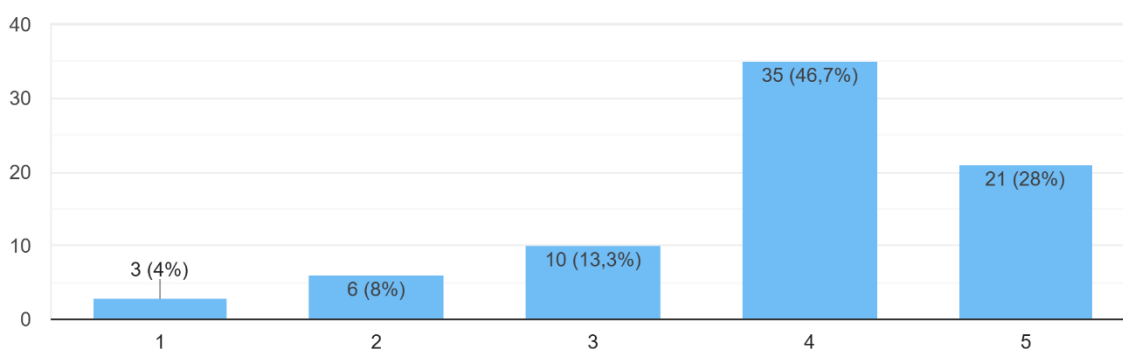




Figure 236 Portugal Survey [I analyse and synthesise data for addressing a problem or question]

The results reflect a **strong level of analytical engagement: 46.7% (n = 35)** selected **4 - Agree** and **28% (n = 21)** selected **5 - Strongly Agree**. Together, these values indicate that **nearly three-quarters of participants (74.7%)** feel capable of analysing and synthesizing data to approach challenges or questions in their professional contexts. This suggests a solid foundation in data-informed reasoning and application.

On the other hand, **13.3% (n = 10)** chose the neutral response (**3**), indicating a portion of participants may feel less confident or are still developing their capacity for data interpretation and synthesis.

A smaller proportion expressed disagreement: 8% (n = 6) selected **2 - Disagree** and 4% (n = 3) selected **1 - Strongly Disagree**. These responses show that a minority of respondents may lack the skills or confidence needed to conduct deeper analytical tasks, underscoring the need for targeted training in data analysis, especially for evidence-based problem-solving.

In summary, the majority of participants indicate they are competent in analysing and interpreting data to support professional inquiry, though a minority would benefit from further support in developing these higher-order data literacy skills.

The statement "I use data visualisations in my work" followed.

14. Utilizo visualizações de dados no meu trabalho

75 respostas

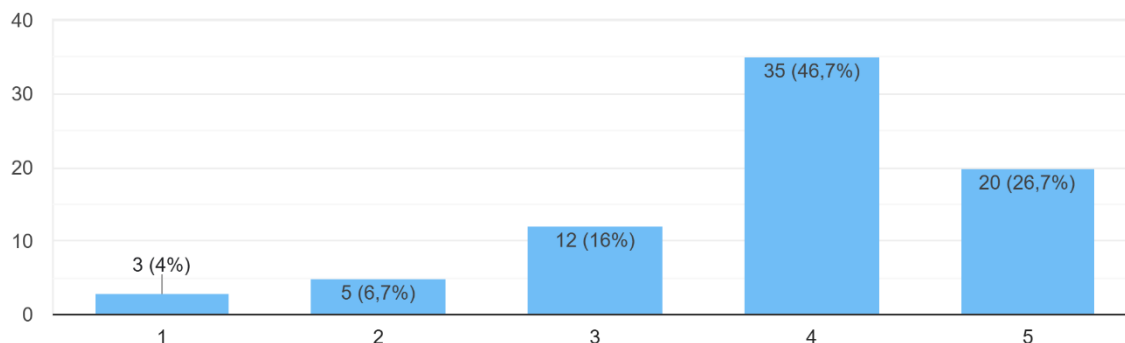


Figure 237 Portugal Survey [I use data visualisations in my work]

The results indicate a strong tendency to use visual data representations in work contexts: 46.7% (n = 35) selected **4 - Agree** and 26.7% (n = 20) selected **5 - Strongly Agree**. In total, 73.4% of participants indicated that they regularly incorporate data visualisations into their work. This reflects not only functional proficiency with digital tools but also a recognition of the communicative and analytical power of visual representations in conveying patterns, trends, and findings.

A smaller proportion of participants (16%, n = 12) selected the neutral option (**3**), suggesting limited or occasional use of data visualisation or a lack of confidence in their use.

A minority reported low levels of usage: 6.7% (n = 5) selected **2 - Disagree** and 4% (n = 3) selected **1 - Strongly Disagree**. These responses imply that while the majority demonstrate active

integration of data visualisations, there is still a group for whom training or tool access may be necessary to strengthen their visual communication practices.

The statement "I collaborate with colleagues on interpreting educational data" followed.

15. Colaboro com colegas na interpretação de dados educativos.

75 respostas

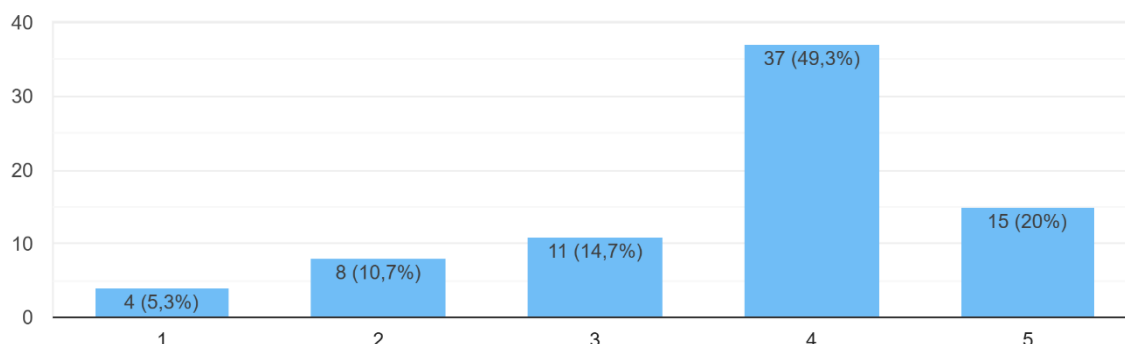


Figure 238 Portugal Survey [I collaborate with colleagues on interpreting educational data]

The results reveal a generally strong culture of collaboration: 49.3% (n = 37) selected 4 - Agree and 20% (n = 15) selected 5 - Strongly Agree. These values indicate that nearly 70% (69.3%) of participants affirmatively engage in interpreting data with colleagues. This suggests that data use is not only an individual competency but also a shared practice within professional teams, facilitating collective decision-making, reflection, and improvement.

A moderate proportion (14.7%, n = 11) chose the neutral option (3), possibly reflecting inconsistent opportunities for collaboration or uncertainty about their own role in joint data interpretation efforts.

A small portion of participants expressed disagreement: 10.7% (n = 8) selected 2 - Disagree and 5.3% (n = 4) selected 1 - Strongly Disagree. These results suggest that while most respondents report positive engagement in collaborative data interpretation, there is still a segment that experiences barriers.

The statement "I share data with students, parents, teachers, administration and others" followed.

16. Partilho dados com alunos, pais e encarregados de educação, colegas docentes, equipa de gestão e outros intervenientes.

74 respostas

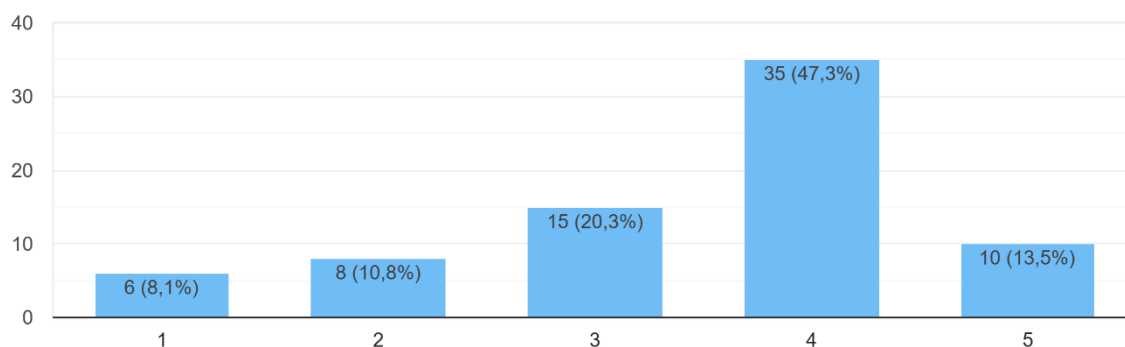


Figure 239 Portugal Survey [I share data with students, parents, teachers, administration and others]

The results show a moderate to high level of engagement in data-sharing practices: 47.3% (n = 35) selected 4 - Agree and 13.5% (n = 10) selected 5 - Strongly Agree. In total, 60.8% of respondents affirmatively report that they engage in sharing educational data with others, suggesting a recognition of the importance of transparency, communication, and collaboration in supporting educational processes through data.

However, 20.3% (n = 15) selected the neutral response (3), possibly indicating that while they may share data occasionally, it is not yet a consistent or structured practice.

A notable portion of participants expressed disagreement: 10.8% (n = 8) selected 2 - Disagree and 8.1% (n = 6) selected 1 - Strongly Disagree. These results highlight that nearly one in five participants do not engage in or feel confident about data sharing, which may stem from concerns around data privacy, lack of institutional protocols, or uncertainty about appropriate methods and audiences for communication.

In summary, while the majority of participants actively share educational data, the relatively lower percentage of "Strongly Agree" responses and the presence of disagreement suggest that this remains an area where institutional support, ethical guidance, and clear procedures could further reinforce responsible and effective data-sharing practices in education.

9.3.5 Attitudes and Dispositions Towards Data Literacy (Section E)

Participants were asked to indicate their level of agreement with several statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree Nor Disagree, 4 = Agree, 5 = Strongly Agree.

The first statement was: "In my opinion, data enhance: Learning, Teaching, Assessment".

17. Na minha opinião, os dados potenciam a/o:

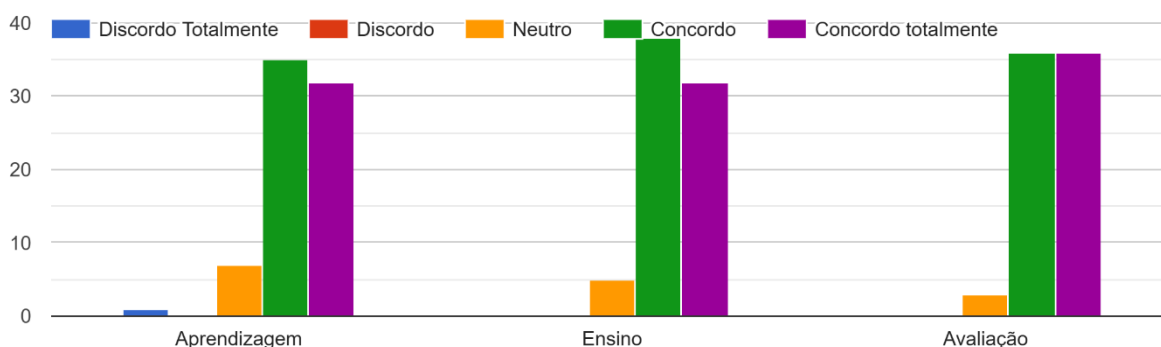


Figure 240 Portugal Survey [In my opinion, data enhance: Learning, Teaching, Assessment]

The results reveal a high level of consensus regarding the positive impact of data:

- **Learning:** A strong majority believe data enhances learning. The combined number of respondents who selected "Agree" or "Strongly Agree" is the highest among the three dimensions, while negative responses were minimal or nonexistent. A small proportion (approx. 5-6 responses) selected "Neutral", suggesting near-universal acknowledgment of data's contribution to learning processes.
- **Teaching:** Similarly, teaching is perceived to benefit significantly from data. The number of "Agree" and "Strongly Agree" responses is again substantial and nearly equal, indicating broad recognition of data's role in supporting planning, differentiation, and instructional decision-making. A small group selected "Neutral", but disagreement was negligible.
- **Assessment:** This is the area with the most pronounced agreement, with the majority of respondents selecting "Strongly Agree". Very few selected "Neutral", and no participants appear to have disagreed. This suggests that data is most widely perceived as critical for improving assessment practices, enabling more accurate, fair, and formative evaluation of students' progress.

The statement "I believe that data enhance personalisation and differentiated teaching" followed.

18. Considero que os dados potenciam a personalização e o ensino diferenciado.

74 respostas

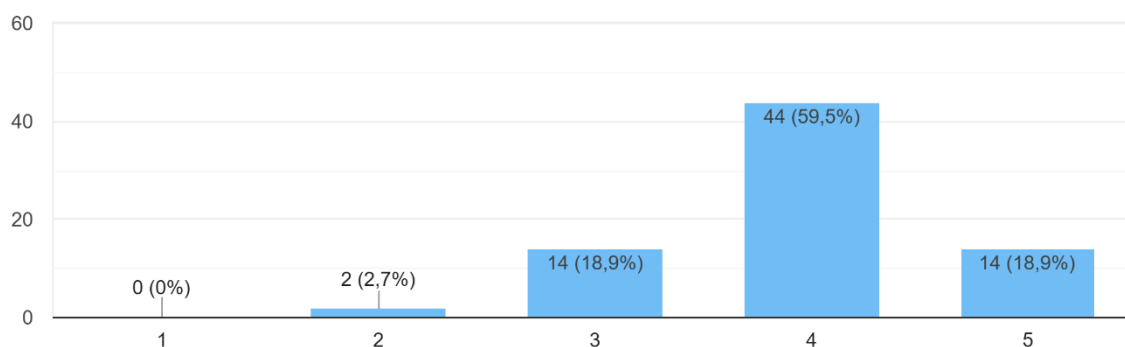


Figure 241 Portugal Survey [I believe that data enhance personalisation and differentiated teaching]

The results reveal a strongly favourable view of data's potential in this domain: 59.5% (n = 44) selected 4 - Agree and 18.9% (n = 14) selected 5 - Strongly Agree. Together, 78.4% of respondents believe that data positively contributes to tailoring teaching practices to individual student needs. This demonstrates a clear recognition of data as a key driver of pedagogical responsiveness, enabling educators to adapt pace, methods, and content to better serve diverse learners.

A smaller portion (18.9%, n = 14) chose the neutral option (3), indicating either uncertainty or lack of consistent experience with data-driven personalisation in their context.

Only 2.7% (n = 2) selected 2 - Disagree, and no respondents selected 1 - Strongly Disagree, showing that opposition to this view is virtually nonexistent within the sample.

In summary, the data suggest that most participants view educational data as a valuable resource for enhancing inclusive and adaptive teaching practices, reinforcing the relevance of data-informed differentiation in contemporary education.

The statement "I believe that data-driven methods improve educational equity" followed.

19. Considero que os métodos baseados em dados contribuem para a equidade na educação

74 respostas

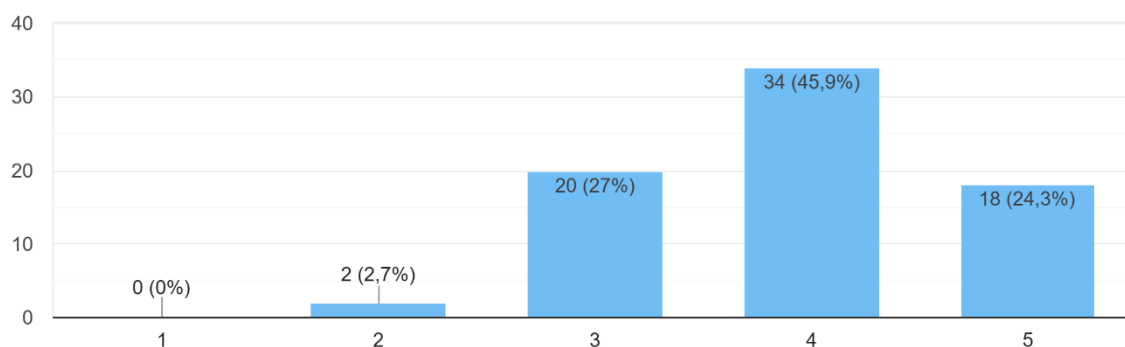




Figure 242 Portugal Survey [I believe that data-driven methods improve educational equity]

The results show a predominantly positive perception: 45.9% (n = 34) selected 4 - Agree and 24.3% (n = 18) selected 5 - Strongly Agree. Altogether, 70.2% of respondents expressed agreement that data-driven approaches support fairer and more inclusive educational practices. This suggests that most participants recognise the capacity of data to identify disparities, inform targeted interventions, and monitor progress towards more equitable outcomes.

However, 27% (n = 20) chose the neutral option (3), indicating a degree of uncertainty or ambivalence. This may reflect a lack of direct experience with equity-focused data practices or questions about how data is actually applied in real-world educational settings.

Only 2.7% (n = 2) selected 2 - Disagree, and none selected 1 - Strongly Disagree, indicating a very low level of opposition to this idea.

The statement "I believe that data-driven methods increase teachers' workload" followed.

20. Considero que os métodos orientados por dados aumentam a carga de trabalho dos/as docentes.

75 respostas

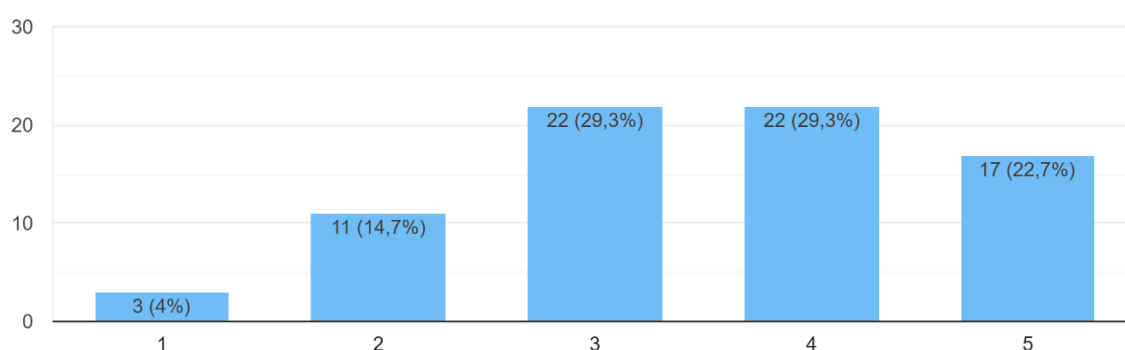


Figure 243 Portugal Survey [I believe that data-driven methods increase teachers' workload]

The results reflect a broad diversity of opinion, with a moderate tendency towards agreement: 29.3% (n = 22) selected 4 - Agree and 22.7% (n = 17) selected 5 - Strongly Agree. These figures suggest that over half of the respondents (52%) perceive data practices as increasing the workload of teachers. This view likely reflects the time and effort required to collect, process, analyse, and act upon data in meaningful ways, particularly when support structures or integrated tools are lacking.

Meanwhile, 29.3% (n = 22) chose the neutral option (3), possibly indicating that respondents recognise both the potential benefits and burdens of data-driven approaches, or that they feel the impact varies depending on context and implementation.

A smaller proportion disagreed with the statement: 14.7% (n = 11) selected 2 - Disagree

And 4% (n = 3) selected 1 - Strongly Disagree. This suggests that while some participants do not perceive a significant increase in workload, they represent a minority.

9.3.6 Policy and Curriculum Perspectives (Section F)

Participants were asked to indicate their level of agreement with a number of statements.



Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree Nor Disagree, 4 = Agree, 5 = Strongly Agree.

The first statement was: "Educational system sufficiently promotes Data Literacy in schools".

21. O sistema educativo promove adequadamente a literacia de dados nas escolas.

75 respostas

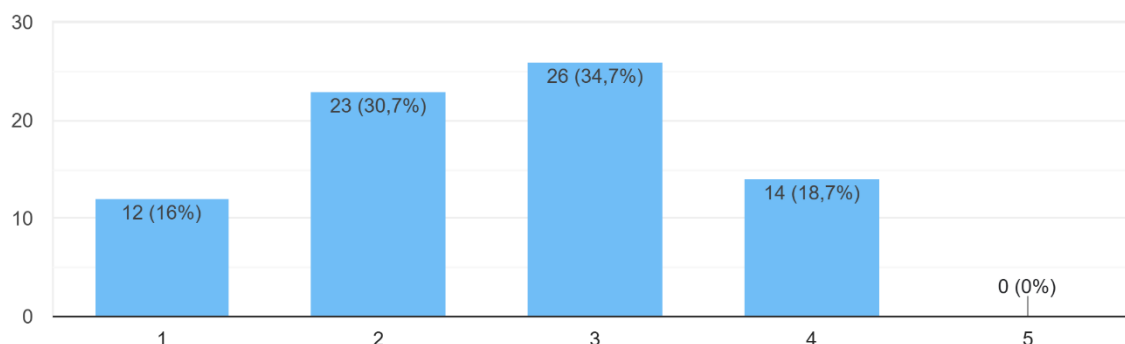


Figure 244 Portugal Survey [Educational system sufficiently promotes Data Literacy in schools]

The results clearly indicate a perception of insufficiency in institutional promotion of Data Literacy: 30.7% (n = 23) selected 2 - Disagree and 16% (n = 12) selected 1 - Strongly Disagree. Combined, 46.7% of respondents disagreed to some degree with the notion that schools are effectively supported in this domain.

Additionally, the largest proportion of respondents (34.7%, n = 26) selected 3 - Neutral, suggesting uncertainty or ambivalence regarding the role and visibility of system-level efforts. This may reflect a perceived lack of clarity, coherence, or strategic communication in policy implementation and curriculum integration.

Only 18.7% (n = 14) selected 4 - Agree, and none selected 5 - Strongly Agree, considering that data literacy is adequately prioritised by the educational system.

The statement "School curricula effectively integrate Data Literacy concepts and methods" followed.



22. Os currículos escolares integram de forma eficaz os conceitos e métodos da literacia de dados.

74 respostas

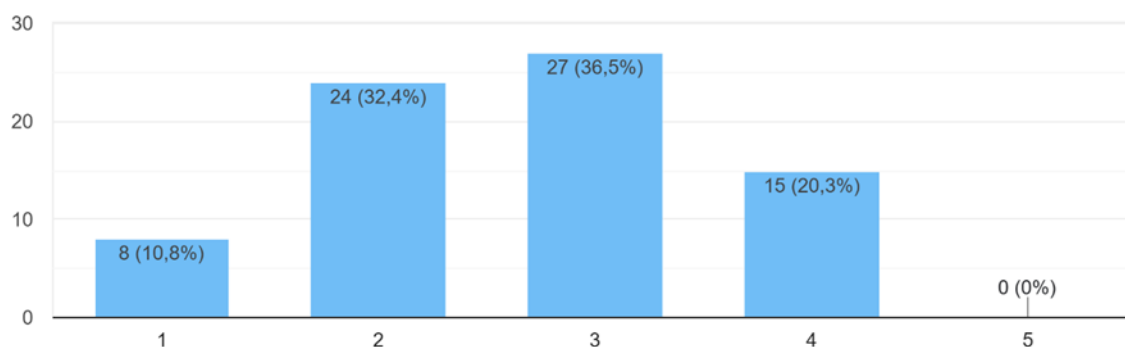


Figure 245 Portugal Survey [School curricula effectively integrate Data Literacy concepts and methods]

The results reveal a predominantly critical or ambivalent stance: 32.4% (n = 24) selected 2 - Disagree and 10.8% (n = 8) selected 1 - Strongly Disagree. Thus, a total of 43.2% of respondents expressed disagreement, indicating that many perceive current curriculum structures as falling short in integrating data literacy effectively.

A significant proportion-36.5% (n = 27)-chose the neutral response (3). This may reflect a lack of clarity about how or where data literacy is expected to be addressed in the curriculum, or it may suggest that implementation is uneven or implicit rather than explicit.

Only 20.3% (n = 15) agreed with the statement (score of 4), and no respondents (0%) selected 5 - Strongly Agree, signalling a notable absence of strong endorsement for curriculum effectiveness in this area.

The statement "School administrators play a critical role in successful Data Literacy integration" followed.

23. Os responsáveis pela gestão escolar desempenham um papel crucial na integração bem-sucedida da literacia de dados.

74 respostas

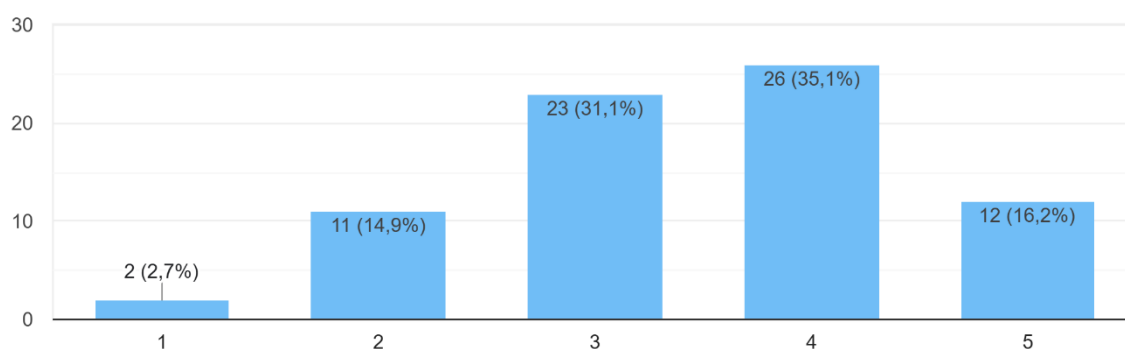




Figure 246 Portugal Survey [School administrators play a critical role in successful Data Literacy integration]

The overall results suggest a moderately strong consensus regarding the crucial role of school leadership: 35.1% (n = 26) of participants selected 4 - Agree and 16.2% (n = 12) chose 5 - Strongly Agree. Together, these account for over half (51.3%) of the total responses, highlighting that a majority of respondents see school leaders as key facilitators in the successful implementation of data literacy practices.

However, a significant minority expressed ambivalence or hesitation: 31.1% (n = 23) selected the neutral option (3). An additional 14.9% (n = 11) disagreed (score 2), and 2.7% (n = 2) strongly disagreed (score 1). This distribution suggests that while many acknowledge the importance of leadership, some respondents may have limited visibility into leadership actions, or may have experienced insufficient strategic support for data-driven initiatives in their schools.

The statement "Teachers have adequate knowledge to address ethical considerations related to educational data (privacy/security/responsible use)" followed.

24. Os/as docentes têm conhecimentos adequados para lidar com as questões éticas associadas aos dados educativos (privacidade, segurança, uso responsável).

74 respostas

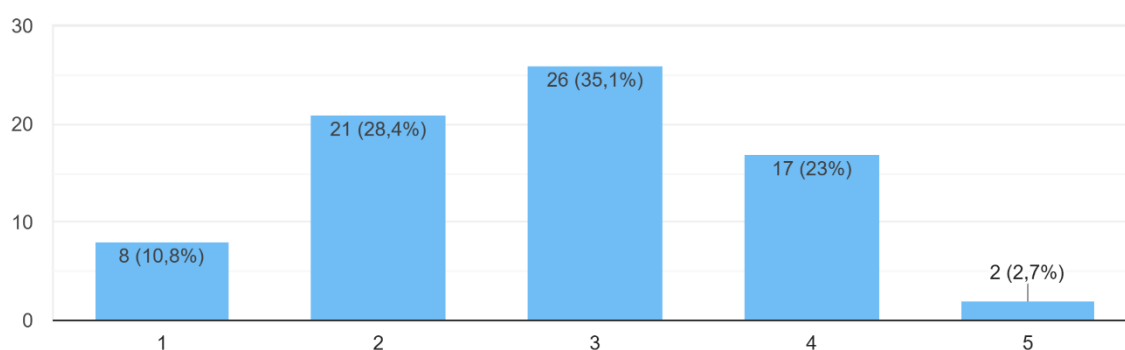


Figure 247 Portugal Survey [Teachers have adequate knowledge to address ethical considerations related to educational data (privacy/security/responsible use)]

The responses show a clear lack of strong confidence in this area.

- Only 2.7% (n = 2) of respondents selected 5 - Strongly Agree, while 23% (n = 17) selected 4 - Agree, totalling just 25.7% of participants who feel teachers are adequately knowledgeable in this regard.
- The majority of responses fell into the more cautious or critical categories:
- 35.1% (n = 26) selected 3 - Neutral, suggesting uncertainty or limited visibility into teachers' ethical data practices.
- 28.4% (n = 21) disagreed (score 2) and 10.8% (n = 8) strongly disagreed (score 1), indicating that nearly 40% of participants perceive teachers as underprepared to consider the ethical implications of data use.

This distribution highlights a significant perceived gap in teacher training or awareness around ethical data literacy.



The statement "Teachers have adequate autonomy to implement data-driven methods" followed.

25. Os/as docentes têm autonomia adequada para implementar métodos orientados por dados.

74 respostas

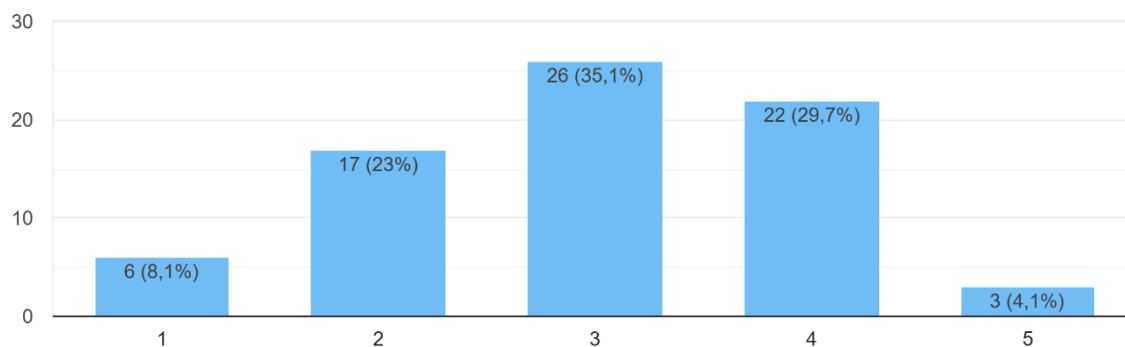


Figure 248 Portugal Survey [Teachers have adequate autonomy to implement data-driven methods]

The distribution of responses reveals a moderately positive view, though not without reservations.

- The most frequent response was "3 - Neutral" (35.1%, n = 26), suggesting a significant level of uncertainty or variability across different schools or systems.
- 29.7% (n = 22) selected "4 - Agree", indicating a relatively positive perception, while only 4.1% (n = 3) fully agreed (option 5).
- On the more critical end, 23% (n = 17) selected "2 - Disagree", and 8.1% (n = 6) selected "1 - Strongly Disagree", together accounting for 31.1% of the responses.

This spread suggests that while there is no overwhelming sense of lack of autonomy, there is also no strong consensus that teachers feel fully empowered to implement data-informed approaches.

The next statement was: "School curricula sufficiently cover:"



26. Os currículos escolares abordam de forma suficiente os conceitos de literacia de dados.

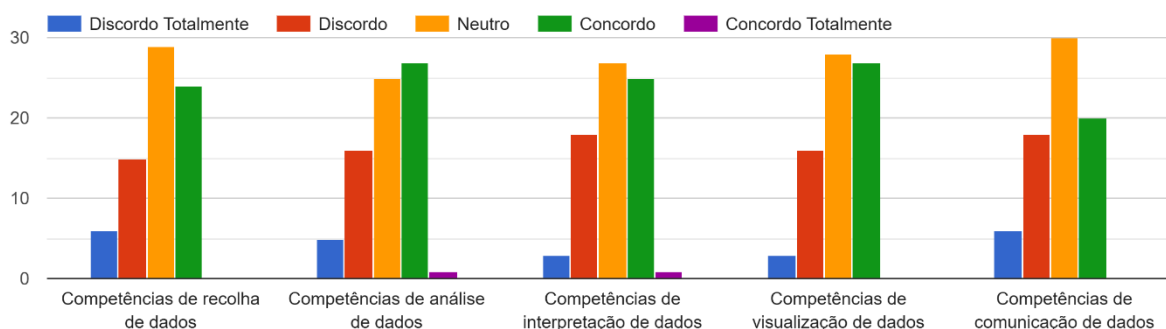


Figure 249 Portugal Survey [School curricula sufficiently cover Data collection skills, Data analysis skills, Data interpretation skills, Data visualisation skills, Data communication skills]

The analysis of the responses shows that participants generally believe that school curricula do not sufficiently cover core data literacy concepts. Across all five evaluated competencies—data collection, analysis, interpretation, visualisation, and communication—the majority of responses fell under "Neutral" or "Disagree," with very few participants selecting "Strongly Agree."

For data collection skills, only 25% of respondents agreed that this competency is sufficiently addressed in the curriculum, and none strongly agreed. 38.7% responded neutrally, while 20% disagreed and 6.7% strongly disagreed, pointing to a clear perception of inadequacy.

Regarding data analysis skills, 26.7% agreed with their inclusion, and only 1.3% strongly agreed. Meanwhile, 26.7% remained neutral, and 21.3% disagreed—again suggesting a critical stance towards its presence in current curricula.

Data interpretation skills followed a similar trend, with 25.3% agreeing and only 1.3% strongly agreeing. A considerable 33.3% responded neutrally, while 24% disagreed. This reflects widespread uncertainty or dissatisfaction with how this skill is represented in the curriculum.

For data visualisation skills, only 25% agreed, and 0% strongly agreed that the curriculum addresses this area. Neutral responses were high (36%), with 21.3% disagreeing and 4% strongly disagreeing indicating that data visualisation is often overlooked or inconsistently taught.

Lastly, data communication skills had the lowest agreement overall, with only 20% agreeing and none strongly agreeing. Neutral responses peaked at 40%, and disagreement was high (22.7% disagreed; 5.3% strongly disagreed), suggesting that this competency is especially underrepresented.

The next statement was: "School curricula approach the use of Data Literacy:"



27. Os currículos escolares abordam o uso da literacia de dados:

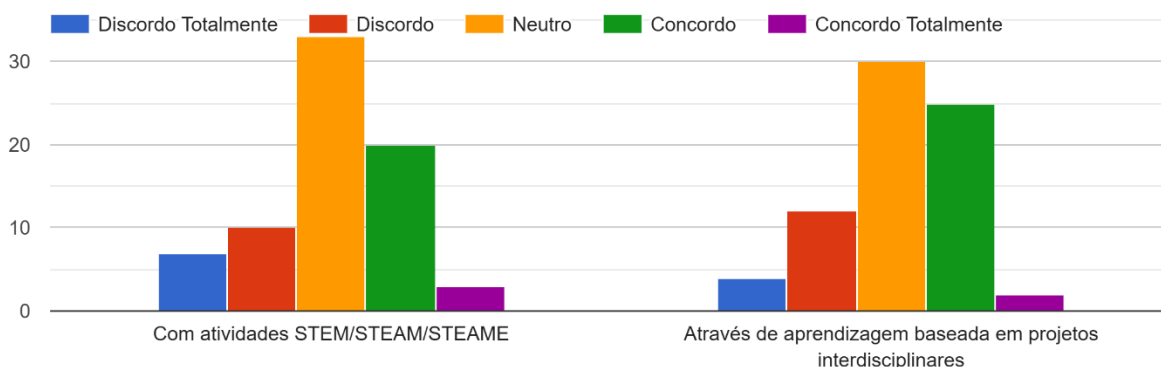


Figure 250 Portugal Survey [School curricula approach the use of Data Literacy With STEM/STEAM/STEAME activities and With project-based learning across disciplines]

Based on the responses, the perception of how school curricula address the use of data literacy—particularly through STEM/STEAM activities and interdisciplinary project-based learning (PBL)—appears to be marked by neutrality and moderate agreement, with notable room for improvement.

For STEM/STEAM/STEAME activities, only 26.7% of participants agreed or strongly agreed that data literacy is adequately integrated through these methods (20% agree, 6.7% strongly agree). However, a considerable 44% chose a neutral option, while 13.3% disagreed and 6.7% strongly disagreed. This distribution suggests that although some recognition of integration exists, many respondents are either uncertain or feel the connection is weak.

In the case of interdisciplinary project-based learning, the pattern is quite similar: 24% agreed and 2.7% strongly agreed, totalling 26.7% of positive responses. Again, a large proportion (40%) remained neutral, with 16% disagreeing and 5.3% strongly disagreeing.

The open responses to question 26 highlight several aspects regarding the integration of data literacy concepts in school curricula. Firstly, participants emphasise that the actual implementation of data literacy often depends on teachers' individual strategies and pedagogical choices. While official documents such as the *Essential Learnings* and the *Student Profile at the End of Compulsory Schooling* do include data literacy as a competency to be developed, its effective integration into classroom practices appears to vary significantly.

Secondly, there is a recognition of a lack of teacher training in this domain. One participant explicitly mentioned having "very little training in this area," which suggests that even when curricular guidelines exist; there may be insufficient professional development opportunities to support their enactment.

Finally, some respondents refer to the role of national initiatives, such as ICT activities promoted by the Ministry of Education, as a way in which data literacy is indirectly encouraged. These initiatives may provide additional support structures or tools, but they do not replace the need for sustained training and curricular alignment.

9.3.7 Training and Professional Development Needs (Section G)

Participants were asked to indicate their level of agreement with a number of statements.



Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree Nor Disagree, 4 = Agree, 5 = Strongly Agree.

The first statement was: "I believe that developing Data Literacy will significantly contribute to my professional development"

28. Considero que desenvolver a literacia de dados contribuirá significativamente para o meu desenvolvimento profissional.

75 respostas

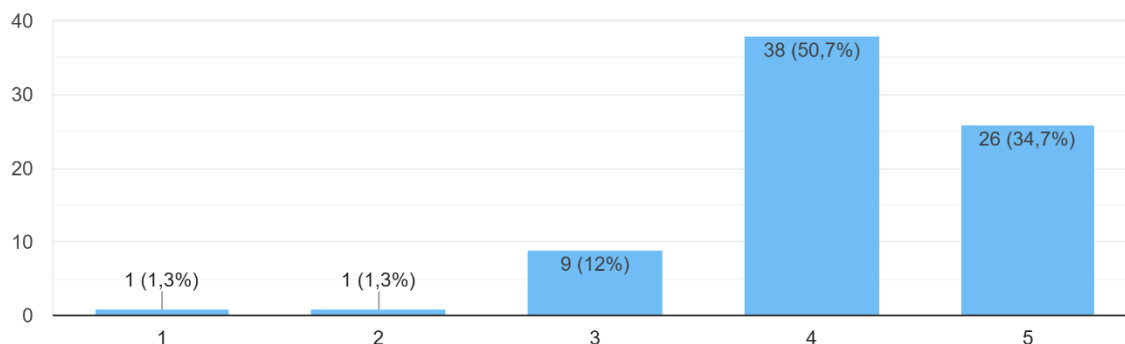


Figure 251 Portugal Survey [I believe that developing Data Literacy will significantly contribute to my professional development]

The responses to statement 28-"I believe that developing Data Literacy will significantly contribute to my professional development"-indicate a strong consensus among participants regarding the importance of data literacy for their careers.

A majority of respondents expressed agreement with this statement: 38 participants (50.7%) selected 4, 26 participants (34.7%) selected 5, totalling 85.4% who strongly or moderately agree with the contribution of data literacy to their professional growth.

Only a small portion expressed neutrality (12%) or disagreement (2.6% combined for scores 1 and 2).

The statement "I am interested in professional development related to Data Literacy" followed.



29. Estou interessado/a em formação profissional na área da literacia de dados.

75 respostas

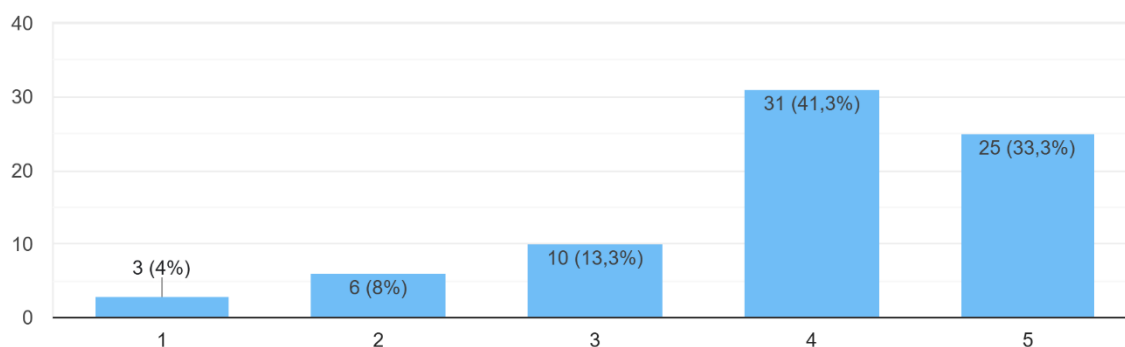


Figure 252 Portugal Survey [*I am interested in professional development related to Data Literacy*]

The results for the statement "I am interested in professional development related to Data Literacy" show a strong level of interest among participants: 31 respondents (41.3%) selected 4 and 25 respondents (33.3%) selected 5, which means nearly 75% (exactly 74.6%) of participants expressed high interest in pursuing further training in data literacy.

Only 10 respondents (13.3%) were neutral, and a small minority-9 respondents (12%)-expressed low interest (ratings 1 or 2).

This distribution confirms a clear demand for professional learning opportunities in data literacy, reinforcing the relevance of offering targeted training programmes to support educators in this domain.

The statement "The available professional development programmes address my needs regarding data use" followed.

30. Os programas de desenvolvimento profissional disponíveis respondem às minhas necessidades em matéria de utilização de dados.

75 respostas

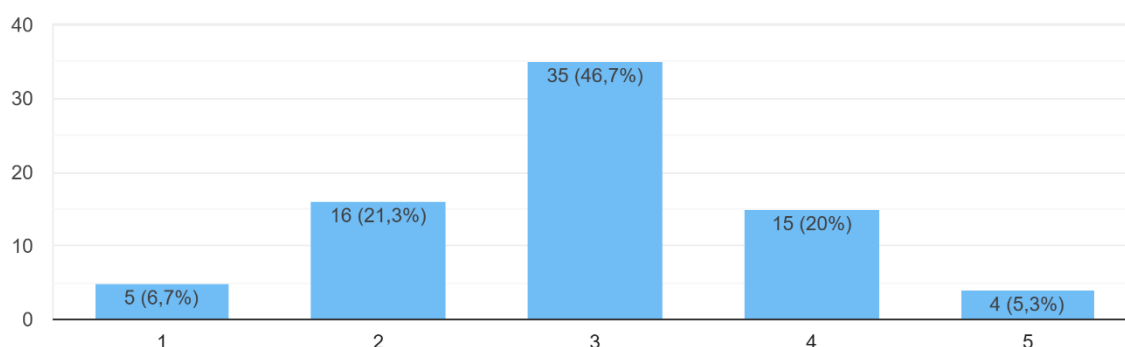


Figure 253 Portugal Survey [*The available professional development programmes address my needs regarding data use*]



The responses suggest a general perception of partial adequacy:

- The most frequent response was 3 (neutral), selected by 35 respondents (46.7%), indicating a moderate level of satisfaction or uncertainty.
- 16 respondents (21.3%) selected 2, and 5 (6.7%) selected 1, totalling nearly 28% who feel their needs are not being met.
- On the other hand, only 15 (20%) selected 4 and 4 (5.3%) selected 5, representing a minority (25.3%) who believe the programmes are meeting their needs well.

These results reflect a clear gap between interest in professional development (as seen in the previous question) and the perceived effectiveness of current offerings, highlighting the need for more targeted, relevant, and accessible training opportunities in data literacy for educators.

The next statement was: "What type of support do you need to effectively implement Data Literacy methods in your curriculum?"

31. Que tipo de apoio necessita para implementar de forma eficaz métodos de literacia de dados no seu currículo?"

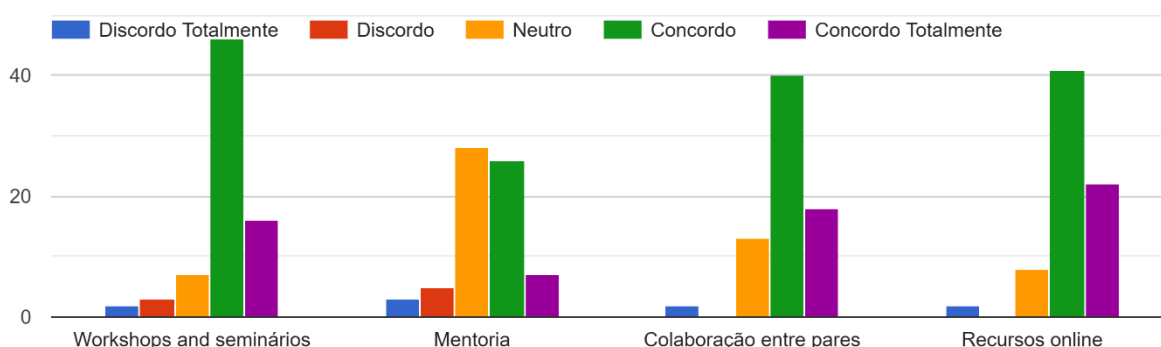


Figure 254 Portugal Survey [What type of support do you need to effectively implement Data Literacy methods in your curriculum?]

The responses reveal clear preferences and priorities among participants.

A large majority of respondents highlighted the importance of workshops and seminars, with approximately 45 participants agreeing and 17 strongly agreeing with their relevance. This indicates a clear preference for structured, hands-on training opportunities that can offer both conceptual understanding and practical applications of data literacy in educational settings.

Online resources also emerged as a highly valued form of support. About 41 respondents agreed and 22 strongly agreed that access to digital materials would help them implement data literacy more effectively. This underscores the demand for flexible and self-paced learning tools that teachers can consult according to their availability and professional needs.

Peer collaboration was another form of support seen as essential. Around 40 participants agreed and 17 strongly agreed that opportunities to work with colleagues are helpful. This suggests that collaborative environments foster mutual learning and help build collective capacity for integrating data literacy into the curriculum.

On the other hand, mentoring received a more moderate endorsement. Although 26 respondents agreed with its usefulness, 28 chose a neutral position, and 11 expressed some form of disagreement. This may reflect uncertainties about the availability of qualified mentors or the feasibility of sustained mentoring relationships in current school contexts.

In summary, participants show a strong interest in support mechanisms that are practical, collaborative, and accessible, particularly favouring workshops, online resources, and peer interaction. Mentoring is acknowledged as beneficial by some, but it does not stand out as a priority.

In addition to the predefined options, some respondents suggested alternative forms of support to effectively implement data literacy methods. Two specific suggestions emerged: the need for a certified *training* course, which would provide formal recognition and potentially contribute to career progression, and the proposal of a MOOC (Massive Open Online Course), offering flexibility and broad access to structured learning content. These responses reflect a desire for both accredited training pathways and scalable, self-paced learning solutions.

The next statement was: "*What are your current training needs?*".

32. Quais são as suas necessidades de formação atuais?

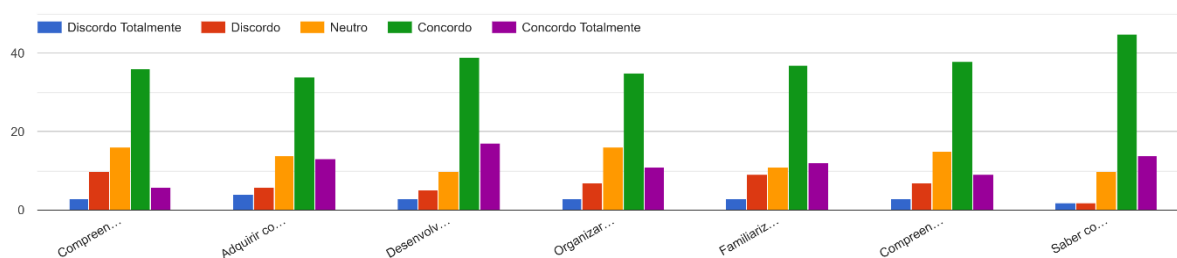


Figure 255 Portugal Survey [What are your current training needs?]

The answers to question 32 reveal a clear recognition of multiple professional development needs related to data literacy. The strongest area of need identified is "knowing how to use data ethically and responsibly", with a high number of respondents expressing agreement or strong agreement. This suggests a concern with the ethical dimensions of data use in education, including privacy, security, and responsible practices.

Similarly, many participants acknowledged the need to develop strategies to promote students' data literacy, as well as to organise and analyse educational data effectively. These areas indicate a practical demand for skills that support both pedagogical integration and data-informed decision-making.

Other training needs that stood out include understanding data literacy and its relevance in teaching and gaining theoretical knowledge in the field. There is also an interest in becoming more familiar with digital tools and resources that support data literacy education.

The open-ended responses in the "Other" category of question 32 highlight two additional and important dimensions of professional development needs.

Firstly, one respondent points to the disciplinary specificity of data literacy, acknowledging familiarity with data work in research contexts (likely in higher education or STEM-related areas), but expressing uncertainty about how data literacy applies across the broader school curriculum beyond subjects like Mathematics, Geography, and Physics. This underscores a need for cross-disciplinary integration strategies and examples that demonstrate how data literacy can be meaningfully embedded in diverse subject areas.

Secondly, another respondent emphasises the need to understand statistical, digital, and AI tools, pointing to the growing relevance of advanced technological competencies in the educational landscape.

9.3.8 Challenges and Obstacles (Section H)

Participants were asked to indicate their level of agreement with a number of statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree Nor Disagree, 4 = Agree, 5 = Strongly Agree.

Focusing on the challenges and obstacles, the relevant statement was: "Which of the following do you think constitute challenges and obstacles for Data Literacy in education?"

33. Quais dos seguintes aspectos considera que constituem desafios e obstáculos à literacia de dados na educação?"

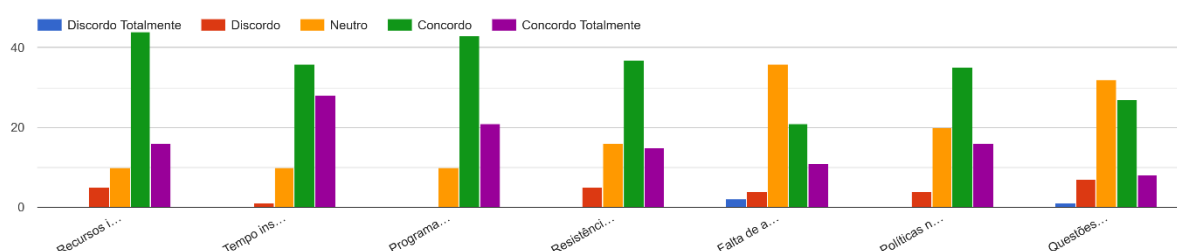


Figure 256 Portugal Survey [Which of the following do you think constitute challenges and obstacles for Data Literacy in education?]

A significant majority of respondents (59.4%) agreed or strongly agreed that insufficient digital resources are a major barrier for the implementation of Data Literacy in education. Similarly, curricular overload was highlighted by 64.9% of participants, who believe that the existing curriculum leaves little room for the integration of data-related practices.

Another critical issue is the lack of instructional time, with 62.2% agreeing this limits the implementation of Data Literacy strategies. In addition, teacher resistance or hesitation was acknowledged by 52% of the participants as an obstacle, possibly reflecting gaps in confidence or training.

Moreover, lack of administrative support was flagged by 33.8% of the respondents, showing that institutional backing is not always guaranteed. Likewise, inadequate educational policies were noted by 51.3 per cent as a limiting factor to progress.

Finally, ethical and legal concerns, such as privacy and responsible data use, while less prominent, were still acknowledged by 45.9 per cent of respondents as challenges that should not be overlooked.

9.3.9 Future Intentions (Section I)

Participants were asked to indicate their level of agreement with a number of statements.

Responses were collected on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree Nor Disagree, 4 = Agree, 5 = Strongly Agree.

The relevant statement was: "In the future, I intend to use data more frequently in my work for".

Six options were mentioned: Administrative tasks, Instructional design, Communication and collaboration, Assessment and feedback, Counseling and parent engagement, Broader management responsibilities.

34. No futuro, pretendo utilizar dados com mais frequência no meu trabalho para:

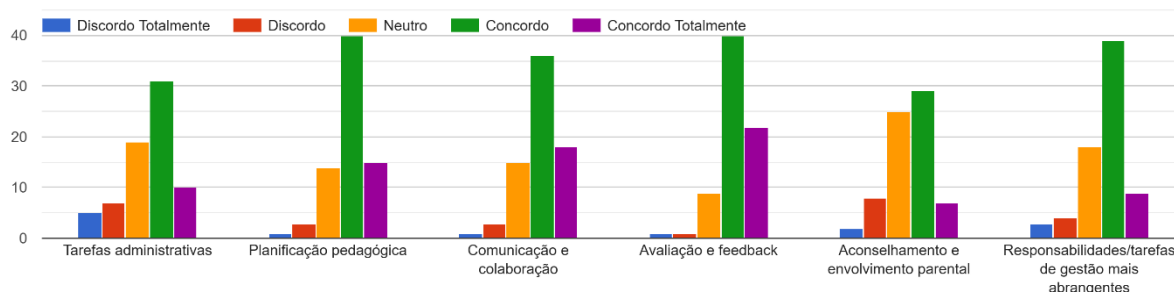


Figure 257 Portugal Survey [In the future, I intend to use data more frequently in my work for:]

Based on the results from question 34, respondents expressed a strong intention to use data more frequently across various domains of their professional practice. The most widely agreed-upon areas include pedagogical planning and assessment and feedback, with around 54% and 60%, respectively, stating that they "agree" and approximately 18% and 22% stating that they "strongly agree." This suggests a clear desire to integrate data into core teaching and learning processes.

There is also support for using data in communication and collaboration, with 53% agreeing and 20% strongly agreeing, and in administrative tasks, where about 41% agree and 14% strongly agree. These results show that data is seen as a valuable resource not only for instruction but also for operational efficiency.

Interest is somewhat lower in areas like parent engagement and broader management tasks, although still significant. For instance, 43% agree and 7% strongly agree regarding parent involvement, while 46% agree and 11% strongly agree with using data for broader school management responsibilities.

The open-ended response to question 43a ("Other - please specify") identified the **effective use of statistical tools** as an additional perceived challenge or obstacle in promoting data literacy in education. This highlights a concern with **technical competencies**, suggesting that some educators feel underprepared or insufficiently trained to use statistical tools efficiently. It reinforces the need for **targeted professional development** focused on practical, hands-on skills for working with data.

9.3.10 Open-ended Questions (Section J)

In your opinion, what are the most important factors for implementing successful data-driven methods in education in [country]?

Based on the 38 responses to question 35, several key factors were identified as crucial for the successful implementation of data-driven methods in education. These can be grouped into the following themes:

Teacher Training and Professional Development. Many respondents emphasised the importance of practical, school-based training, particularly involving collaborative workshops or "oficinas" that include teachers from various subject areas and school leadership. This kind of training



should be hands-on and context-relevant, promoting simultaneous development of knowledge and practice.

Availability of Resources and Tools. There was a recurrent concern about the lack of appropriate tools for efficient and meaningful data collection. Respondents also highlighted the need for technological resources and access to effective trainers, suggesting that successful implementation depends not only on knowledge but also on infrastructure.

Ethical and Legal Awareness. Participants stressed that working with data-especially outside the natural sciences-requires awareness of ethical considerations and compliance with regulations such as the RGPD and other national legislation. Understanding boundaries around privacy and data security is viewed as essential.

Time Allocation. A lack of time was frequently mentioned as a barrier. Respondents called for dedicated time for personal learning and collaborative work, without which meaningful data practices cannot be developed or sustained.

Broader Conception of Data and Curriculum Integration. Some participants noted that data use tends to be confined to physical and experimental sciences and stressed the importance of expanding the role of data across disciplines. They advocated for a curricular approach that values data literacy across diverse contexts, including the social sciences and humanities.

9.3.11 Summary

Participants in the survey largely agree that data literacy is strongly connected to related domains such as digital, information, and statistical literacy. While newer areas like AI literacy and learning analytics received less consensus, they were still recognised as relevant. Participants reported strong confidence in basic competencies such as interpreting and creating data visualisations. However, fewer respondents felt confident in using data analysis techniques and tools, suggesting a need for deeper methodological training.

Many participants reported actively using data in their professional practice, particularly for monitoring student progress, lesson planning, and organising information visually. However, collaborative data practices and the sharing of data with other stakeholders-such as students, families, and school administrators-were less common. This highlights an opportunity to strengthen the culture of collaboration and transparency around data use in schools.

Participants expressed overwhelmingly positive attitudes towards data use in education. Most believed that data enhances teaching, learning, assessment, and personalisation. A significant proportion also saw data as a tool to promote educational equity. Nonetheless, more than half of the respondents recognised that data-driven approaches could increase teachers' workload, indicating a potential trade-off that requires institutional support and thoughtful integration.

The results indicate a critical stance towards the role of national policies and curriculum frameworks. Fewer than 40% of respondents believe that the educational system or school curricula effectively support data literacy integration. Nonetheless, school leadership was widely acknowledged as a key facilitator in this process. While teachers were generally seen as ethically aware, their autonomy to implement data-driven practices appeared limited, suggesting a need for more empowering environments.

There is a strong interest in professional development related to data literacy. Over three-quarters of participants stated that improving their data skills would contribute to their professional growth. However, fewer than 40% felt that current training programmes meet their needs. Respondents emphasised the importance of practical, certified, interdisciplinary training formats-such as workshops and MOOCs-that are adaptable to their working contexts.



Key obstacles identified include lack of time (71.7%), insufficient training (61.7%), limited institutional support (60%), and inadequate access to digital tools (56.7%). Many respondents also pointed to low digital competence and scepticism about the relevance of data in certain pedagogical contexts. Addressing these challenges requires both capacity building and systemic reform.

Educators showed strong intentions to increase their use of data, particularly for assessment (74.6%), teaching strategies (71.2%), and enhancing student learning (70%). Other intended uses include planning and school management. These intentions demonstrate readiness and motivation to engage more fully with data, provided adequate support is available.~

To summarise, educators are conceptually aligned with the goals of data literacy and demonstrate a strong willingness to engage further. However, systemic, practical, and technical barriers remain. To enable meaningful data use in education, it is essential to invest in aligned policies, supportive institutional structures, and high-quality professional development opportunities. This will empower teachers to use data ethically, effectively, and confidently in their educational practice.

9.4 Focus group/interviews

9.4.1 Understanding (Section A)

1. How would you define data literacy? What key skills and competencies do you associate with it?

Analysing the interviews reveals that the participants share a broad and critical view of data literacy, understanding it as a fundamental skill in today's context, marked by the omnipresence of data and the need to deal with complex information in various areas of life.

Data literacy is described as the ability to access, understand, select and use data critically. For H, it consists of "the ability to read, select, understand and critically use the data we have at our disposal", emphasising that we live in times when data "is just a click away". From B. 's point of view, this competence is close to the idea of literacy: "something that we are capable of understanding, analysing and, above all, critically analysing [...] if we don't have this ability, we will be immersed in a world that we don't know".

Participants recognise a diverse set of skills necessary for data literacy, ranging from technical skills to critical analysis abilities. For I, "a person who has good data literacy [...] the first concern they should have is whether that data is reliable, what the source of the data is, whether they can believe it or not". In addition, the ability to "interpret tables and graphs, process and organise data" stands out.

Z. also adds skills linked to interpreting statistical data and graphs, emphasising that "nowadays journalists present a lot of information in the news with graphs and we have to know how to interpret that," which requires knowledge of averages, percentages and variations. S, for her part, associates these skills directly with teaching: "any teacher in any field has to know how to work with their pupils' data [...] interpret graphs, interpret the pupil's progress throughout the school year".

W. emphasizes that the lack of digital literacy goes beyond the technical inability to use devices. It is deeply connected to how digital information is interpreted and used. This perspective broadens the concept of digital literacy and highlights its interdependence with data literacy, "In my opinion, the lack of digital literacy is not just about not knowing how to use a computer or a mobile phone, it's about how I use the information provided by mobile device.". W. also warns of the potential negative social effects resulting from this gap, linking it to growing issues of indiscipline and aggression, both nationally and internationally. Thus, the lack of digital and data



literacy can have implications not only in education but also in broader social and behavioral domains.

The ethical dimension of data literacy was emphasised by several participants. H, in particular, emphasises that "the first competence associated with this literacy is really to be aware, to be conscious of the nature of the data I'm using", adding that "I need to have some ethical competences to know under what circumstances I can use [the data] and what I need to safeguard". Z. also warns of the possibility of manipulating visual data: "it's enough to make a small adjustment to the graph to enhance certain aspects [...] it's important to have a critical mind in order to understand and analyse the data".

A key underlying issue is the concept and quality of data itself. As C. puts it:

"But which data are we talking about? We agree that having data is important, but are we truly capable of analysing it critically and asking whether it supports what we are observing? That's the kind of use that many people are still lacking – the ability to distinguish and analyse data effectively". This participant stresses the importance of interrogating the quality and sources of data: "Are the sources scientific or not? Are they credible? We need to ask these questions. But we only ask them if we already know something – otherwise, we won't question it at all, and we end up accepting it uncritically."

This highlights a crucial point also touched on by other participants: **data literacy presupposes a foundation of prior knowledge** and the ability to scrutinize information, rather than just consuming it.

2. Do you believe data literacy should be an essential competence for teachers and students today? Why or why not?

All the participants agree that data literacy is now an essential skill for both teachers and students. H argues that "it's clearly a skill, but it's a skill for doing all those things - selecting data, producing data, processing data, eventually using it". E. complements this view by considering that data is used to "make decisions, but also to acquire knowledge".

The civic dimension of data literacy was also widely mentioned. For B., the COVID-19 pandemic made its importance clear: "to be even remotely up to date with what was going on, I had to have some mastery, even if it was small, of that data". Z. reinforces this point by emphasising the presence of data literacy in everyday life: "we have to know how to read a label, interpret data, make decisions [...] even to understand what's in a medicine or a news graphic."

The participants recognise that data literacy is interconnected with other literacies, namely scientific, statistical, mathematical and digital. B. says that he immediately thought of "scientific literacy, or literacy, basically [...] because it's all the same: understanding, critically analysing what comes to us from different sources". S. reinforces the role of maths as a transversal support: "maths is fundamental [...] it helps to understand reality and should be transversal to all teachers".

9.4.2 Views (Section B)

3. How would you view the generation and use of data in compulsory education overall?

The generation and use of data in compulsory education is seen by the participants as an inevitable reality, although not always fully understood or integrated into school practices. Data is recognised as central to understanding the world and to pedagogical action, but its use in schools is not always critical, systematic or ethically framed.

H is emphatic in stating that "if it's not really a matter that concerns schools and should be at the centre of attention, it should be, because at the moment we're living in, it's a key time" and also



emphasises that data is now "just a click away" and that, despite its ubiquity, "schools were not prepared" and are in the process of being forced to adapt to the emerging technological reality.

From I.'s point of view, there is a misuse of data as a way of supporting unfounded arguments, which reveals the urgency of developing critical literacy: "the way to convince people [...] is by providing data [...] and that's what I think the problem is too."

S. adds that data literacy is deeply linked to assessment: "teachers have to be aware of the data they are working with". The effective use of data is therefore considered an essential competence in teaching action

4. In your opinion, what types of data do teachers use in schools?

The data used by teachers is essentially divided into three categories: disciplinary data (linked to curriculum content), administrative and evaluative data (attendance, grades, participation), and sensitive data (health issues, behaviour, and socio-economic profile).

E. describes this multiplicity when she says that "I compile data on my students' attendance, participation in lessons [...] and then there's the data that I don't compile myself, but that is supplied externally." This diversity of sources is also emphasised by C., who uses the Edulog observatory to access "official data", cross-referencing it with data collected by the students themselves.

The data is also used to support school projects or pedagogical research. Z. and other interviewees mention, for example, the use of questionnaires in interdisciplinary work, which raises additional ethical concerns.

W. believes that the use of data in schools should not be limited to teachers alone. In her view, "some of the data brought into schools often come from what appears on social media. And social media often feeds our students, even from primary school", yet this type of information is not always analysed deeply or critically — even by teachers. She also argues that schools collect many types of data — such as satisfaction surveys and internal evaluation data — without involving the whole educational community. In her words, "it is very important that school leadership takes this into account. When satisfaction questionnaires are distributed, or internal evaluation processes are carried out, what is done with those data? Do operational assistants have access to it? Are they given the opportunity to join cooperative groups, to analyse it? Ideally, in an interdisciplinary way, bringing together assistants, teachers, coordinators, and other staff." This perspective highlights the need to democratise data analysis practices in schools, encouraging broader participation and fostering collaborative interpretations that can inform meaningful educational change.

5. In your opinion, how do teachers use that data?

Teachers' use of data is heterogeneous and not always fully conscious or critical. Data is often used for evaluation and administrative purposes, but there are also attempts to integrate it into more student-centred pedagogical practices.

H. warns of the "impulsive" and unsubstantiated use of data: "content is often shared [...] clearly in violation of the rules". I. observes that, despite their efforts to collect data, "they don't use it when they disseminate it", pointing to a dissociation between collection, analysis and pedagogical action.

On the other hand, S. emphasises the importance of a competent analysis of the data, especially in assessment: "if the teacher doesn't know how to [...] interpret it, [...] their assessments [...] may not be very reliable". Z. also points out the potential of data to personalise teaching: "it could help each student".



6. In your opinion, what are the ethical implications of using student data? How do you evaluate the credibility and accuracy of data used in compulsory education?

The ethical implications of using student data are recognised as a major concern. These include respect for privacy, informed consent, the prevention of stigmatisation and the transparent and responsible use of data.

E. shares a reflection on the danger of labelling: "this data that we sometimes receive should be, above all, to include the student and not just to put a label on them". C. recounts a specific situation in which a pupil was not authorised to be filmed, and the teacher "was very worried about whether the girl [...] would pass in front of the camera".

B.&I.&A. discuss excessive bureaucracy and rigid ethical procedures: "data protection is such that it limits our actions," which can "mischaracterise [...] the data itself". These obstacles hamper pedagogical practice and research, jeopardising the viability of certain methodologies.

7. In your opinion, what are the main barriers and challenges of data literacy in compulsory education?

The main challenges are insufficient teacher training, poor integration of data literacy into the curriculum, ethical and bureaucratic obstacles, and a lack of critical thinking.

S considers it essential to train all teachers, in all areas, saying that "it is essential that everyone is aware of this [...] data literacy". Z. adds that many teachers know how to "carry out the procedures" but don't know how to "interpret" them, which jeopardises making informed pedagogical decisions.

B.&I.&A. also identify difficulties in valuing the process of collecting and analysing data on the part of the students themselves, saying that "they don't value the data they collect at the end of the day". This lack of appreciation points to a basic gap in initial training.

Finally, H. emphasises that "the only possibility is to understand, to know the boundaries, the limits and the possibilities" of using data, highlighting the fundamental role of ongoing training. Meeting the challenges of data literacy therefore requires an articulated and transversal commitment, from the early years of schooling to the professional training of teachers.

9.4.3 Professional Development (Section C)

8. What type of support and training do you believe that teachers need to effectively implement data-driven educational practices?

The interviewees emphasise the need for ongoing, interdisciplinary, practical and transformative teacher training. It is not enough to raise awareness of the issue: it is essential to transform professional awareness and practices. There was frequent criticism of the ineffectiveness of one-off actions, such as seminars or isolated lectures. One of the participants sums it up well when says: "In this area there is only one way to introduce the effect of training: to transform practices, to transform consciences. And that can only be achieved with training programmes that last overtime."

The desired training should promote an in-depth understanding of the architecture of the data system: "You'll never be able to know all the tools, but it's essential to know the legal and ethical frameworks and the limits of what can and can't be done."

In addition to technical training, teachers need to develop analytical, critical and ethical skills to deal with data in an educational context. Training should also include the use of data in assessment and pedagogical planning: "Data is present every day in our practices, especially in assessment. But few are prepared to interpret it critically."



9. Would you prefer training sessions focused specifically on data literacy or integrated within broader pedagogical topics such as digital literacy or problem-based learning? Why?

Many participants favour integrated training, which links data literacy with other areas such as digital literacy, citizenship, critical thinking and disciplinary literacies. "There is no such thing as data out of context. Working with data implies working with discipline, it implies working with real problems, it implies crossing areas of knowledge." For this reason, many argue that training should not be isolated, but should be framed within approaches such as project or problem-based learning or inserted into transversal pedagogical practices: "The disciplinary literacies are the way forward. What can I do about data literacy within my discipline?"

Other participants emphasise the importance of integrating this training into existing structures, such as the DACs (domains of curricular autonomy) or the subject of Citizenship and Development.

Collaborative work was also emphasized as a key strategy, involving teachers from different disciplines working together, each contributing with their own disciplinary literacies while identifying common elements – in this case, data literacy – that traverse them all. W. strongly emphasizes the importance of collaboration when developing data literacy. According to this perspective, the most effective approach is to bring together heterogeneous groups of teachers from different disciplines to explore, in a collaborative and intentional way, how data literacy can be addressed explicitly within each subject. "How can I develop this? Collaboratively, right? Collaboratively, finding all this in a collaborative way. I think it would be interesting to form heterogeneous groups – disciplinary groups – and then work on this issue, that is, to see in each discipline where this can be worked more explicitly and intentionally. At the same time, we must understand that this cuts across all areas and then come together to discuss these aspects."

In this scope, W. advocates a horizontal approach to professional learning through peer collaboration and knowledge sharing, aimed at fostering greater vertical articulation within the educational system. "It's all about collaboration, working in networks, in partnerships, so that there is this knowledge transfer among peers, in a more horizontal approach, but with the larger goal of achieving stronger vertical articulation." W. provides a concrete example from a postgraduate programme in continuing teacher education. The programme piloted the implementation of a DAC-inspired approach by integrating two curricular units: one focused on curriculum, inclusion, and school organisation, and another on creativity and cooperation. These were merged into a semester-long collaborative project.

9.4.5 National Policy and Curriculum Integration (Section D)

10. In your opinion, is the educational system able to support and promote data literacy for teachers and students?

The general perception is that the system still falls short of what is needed. Progress is recognised in digital training and local initiatives, but an integrated vision is lacking. One participant clarifies: "There are actions, there is awareness, but there is still no structured national policy for data literacy. We're reacting to the impact, not planning for it."

It seems that the pandemic and the digital transition plans have acted as catalysts, but still in a fragmented way. The following testimony is enlightening: "The specifications for data literacy haven't arrived yet. But I believe it will."

11. What is your opinion on the current national education policy regarding data literacy? Are there any gaps or inconsistencies you have identified that you would like to comment on?

The main criticisms are the fragmentation, the still implicit nature and the lack of coherence between documents and practices. Although there are occasional references in the Student



Profile or the Essential Learning, these are not enough: "The term 'data literacy' doesn't appear. Similar things appear, but in a diffuse way. We need a national plan, like there was for digital literacy."

Some interviewees also emphasised that the incoherence of the curriculum hinders the continuity of content throughout compulsory schooling: "The concept of an axis in a graph is taught in different years in different subjects, without articulation."

12. Critically, how do you assess your national school curriculum in terms of integrating data literacy? What would you suggest improving it?

Although data literacy is present in subjects such as maths or ICT, the participants consider that the approach is limited and lacks depth. The recurring proposal is to strengthen its presence in real and interdisciplinary contexts: "Working with data should be a transversal practice. All teachers, from all disciplines, work with data, even if they don't know it."

They suggest cross-cutting projects, annual integrative themes (such as financial literacy) and curriculum revisions that make data literacy an explicit and central competence. "Data can't just be an implicit skill. It has to be a formal curricular objective, with indicators, proposals and evaluation."

It is also important that the educational community — especially the students themselves — is involved in the process. AsW. points out: 'When I deliver continuing professional development sessions for teachers and bring up the Profile of the Student at the End of Compulsory Education wheel, I ask: do you know this? And the teachers say: yes, of course. And your students? The students don't know it. So how can we expect students to reach a goal if only the teacher knows what the goal is? This wheel should always be present in the classroom, it should be with us all the time.'

9.4.6 Summary

Analyzing the interviews shows a broad and critical understanding of data literacy, considered by the participants to be an essential skill in today's educational and social context, marked by the abundance and accessibility of data. This competence is described as the ability to access, interpret, critically evaluate and use data in an ethical and informed manner.

Participants emphasized that data literacy goes beyond the technical and is a matter of citizenship and critical thinking: without this skill, we run the risk of being passive in a world shaped by data. It is associated with technical skills (such as reading graphs and processing data), cognitive skills (critical analysis, reliability of sources) and ethical skills (responsible use, data protection).

All the participants agreed that data literacy is indispensable for teachers and students today. It allows them to make informed decisions, develop knowledge and intervene responsibly in personal, social and professional contexts. The pandemic has reinforced this perception, showing the need to understand news and scientific data. In addition, the interviewees point to links with other literacies - scientific, mathematical, digital - and advocate their integration into the curriculum as a transversal competence.

Data is a growing reality in schools, although its use is not always critical or systematic. They are used for administrative purposes (attendance, assessment), pedagogical purposes (interpreting progress, interdisciplinary projects) and even investigative purposes, but the analysis reveals a use without systematic articulation with reflective pedagogical practices.

Different types of data are highlighted: administrative data (attendance, grades, participation); curricular data (produced in the context of teaching and learning); sensitive data (behavioural, socio-economic and health issues). The teachers point out that there are still difficulties in



transforming the data collected into real teaching tools, emphasising the need for critical training. It is also noted that data from social media frequently enters the school environment, influencing students from an early age, yet this data is rarely analysed critically — even by teachers. Moreover, schools often collect various data (e.g., internal satisfaction surveys), but these are rarely shared or discussed with the wider educational community. There is a call for more inclusive data analysis involving operational assistants, coordinators, and teachers in cooperative, interdisciplinary settings.

Ethical concerns arise across the board: privacy, consent, stigmatisation and the credibility of data are recurring themes. There are warnings about the visual manipulation of graphs, early labelling of students or bureaucratic obstacles that hinder pedagogical innovation and research.

Among the main challenges, the participants highlight aspects such as a lack of adequate teacher training; superficial integration of data literacy into the curriculum; a lack of structured critical thinking when reading data; ethical and bureaucratic barriers that limit effective pedagogical use.

Ongoing training is seen as an essential condition. It must be transformative, interdisciplinary, ethical and practical, with a real impact on teaching practices. The interviewees criticize isolated actions and suggest long-term programs to help teachers understand the legal, technical and pedagogical frameworks for using data.

They argue that training should be collaborative and based on heterogeneous disciplinary groups working together to identify how data literacy can be developed in each subject area.

One participant mentions a concrete example of integrating two curricular units into a single collaborative project during a postgraduate teacher training programme, aiming to foster creativity and cooperation.

As for the format, integrated training within broader themes such as digital literacy or problem-based learning is advocated. Working with data out of context is seen as artificial; instead, it is recommended to articulate data and disciplines, promoting transversal and interdisciplinary approaches, such as through the DAC or the Citizenship and Development discipline.

Participants believe that there is still no structured national policy for data literacy. Despite some initiatives in digital transition and documents such as the Profile of Pupils Leaving Compulsory Schooling, the approach is still fragmented. The absence of the term "data literacy" in curriculum documents is seen as a symbolic and operational gap. There are inconsistencies in the continuity of content, and the interviewees advocate the need for a clear national plan, with objectives, indicators and concrete pedagogical proposals.

Finally, as far as the curriculum is concerned, data literacy is present only implicitly, limited to a few subjects (such as Maths or ICT). The participants consider it important to make this competence explicit, transversal and assessable, through real projects, annual integrating themes and collaborative work between subjects.

In this process, students themselves must be involved. One example cited is that students are often unaware of the Student Profile wheel (PASEO), even though teachers know it well — showing the gap between curricular intentions and student awareness.

9.5 Country Summary

In Portugal, the relevance of data literacy in education is increasingly recognised against a backdrop of accelerating digital transformation and growing demands for critical, informed citizenship. While the term “data literacy” is not explicitly used across national education policies or curricula, a substantial body of practices, competencies, and learning goals relevant to data literacy are present throughout compulsory education. The education system is centrally



governed by the Ministry of Education, Science and Innovation (MECI), with growing autonomy at the school cluster level. The recent introduction of pedagogical innovation projects and cross-disciplinary subjects reflects the system's responsiveness to societal challenges, including those associated with data use.

This national report synthesises findings from a literature review, a national survey with educators, and focus groups with teachers and education stakeholders. It explores how data literacy is understood, implemented, and challenged across Portugal's compulsory education system.

The integration of data literacy in the Portuguese curriculum emerges in a cross-disciplinary fashion across all levels of education.

In early childhood education, data literacy is introduced implicitly through activities involving the collection and organisation of data from everyday experiences (e.g., counting classmates, identifying preferences). Teachers support children in formulating questions and interpreting data.

In primary education (1st cycle), data literacy is mainly situated within mathematics and environmental studies. Students engage in real data investigations (e.g., surveys), interpret graphs and develop early probabilistic thinking. English, ICT, and Physical Education also introduce data literacy-related practices, such as recording observations and using self-assessment data.

In lower secondary education (2nd and 3rd cycles), data literacy becomes more formalised. Mathematics includes topics such as frequency tables, measures of central tendency, and probability. Science and humanities subjects incorporate data interpretation and critical analysis. ICT teaches online data search, validation and organisation. Some schools offer a cross-curricular subject called "Literacies" that integrates data literacy, media and information literacy.

In upper secondary education, data literacy is deeply embedded in scientific-humanistic courses, particularly through Mathematics A, MACS (Applied Mathematics to Social Sciences), Economics, and Sciences. Students are expected to analyse and interpret real-world data, carry out statistical studies, and explore probabilistic models. Pilot pedagogical innovation projects (PPIPs) introduce the new subject "Literacies and Data," which formally incorporates data literacy into the core curriculum for all secondary students.

Educators across Portugal consistently view data literacy as a vital 21st-century skill. Focus group discussions and survey responses highlight a shared understanding of data literacy as a multifaceted competence involving technical, analytical and ethical dimensions. Participants emphasise its importance for fostering critical thinking and informed decision-making; supporting student autonomy in learning; navigating digital environments and avoiding misinformation.

Despite this awareness, significant gaps persist as lack of explicit guidance and systematization; variability in teacher preparedness; barriers to interdisciplinary collaboration; limited evaluation and support tools-

Nonetheless, teachers and school leaders shared multiple examples of best practices as co-teaching strategies between subject teachers and school librarians to support project-based data literacy; integration of data literacy into existing projects on environmental education, school citizenship or use of media content and local data for graph interpretation and statistical inquiry.

Portugal demonstrates a solid foundation for the progressive development of data literacy throughout compulsory education. While the formal use of the term remains limited in



curriculum documents, the skills and attitudes associated with data literacy are embedded in many disciplines, particularly Mathematics, ICT, Sciences, and Humanities. The emergence of new subjects like “Literacies and Data” and ongoing pilot projects signal a promising shift toward recognising data literacy as an essential cross-curricular domain.

To consolidate this trajectory, further steps are needed as develop a coherent national strategy that explicitly includes data literacy as a learning objective across all levels of education; invest in teacher training—both pre-service and in-service; support interdisciplinary and project-based learning models that position data literacy within real-world contexts; provide assessment tools and guidance frameworks to monitor data literacy development in students.

9.5.1 Conceptualization of the term ‘Data Literacy’

In Portugal, data literacy is increasingly recognised as a critical competency in contemporary education, though it remains variably defined across policy documents and curricular materials. From a theoretical standpoint, data literacy is understood as a multidimensional competence involving the ability to access, interpret, analyse, and use data effectively and ethically in a range of contexts.

It encompasses technical skills, such as reading graphs or performing statistical analysis, as well as critical thinking, ethical reasoning, and the ability to communicate data-based insights. Theoretical perspectives in Portugal align closely with international frameworks such as DigComp 2.2, which outlines core competencies in searching, evaluating, and managing data and digital content.

In practical terms, data literacy is integrated into the Portuguese education system in a cross-disciplinary and progressive manner. In pre-school, data literacy is introduced implicitly through observation, classification, and simple data collection tasks based on everyday experiences.

In primary education, data literacy becomes more formalised, especially through Mathematics, Environmental Studies, and ICT. Students learn to collect, organise, and analyse data using tools such as bar charts and tables, often in connection with real-life contexts. As students progress to lower and upper secondary levels, data literacy is expanded through subjects like Sciences, Geography, History, and Economics, where statistical reasoning and data interpretation are emphasised.

ICT curricula also support data literacy by introducing students to information retrieval, digital research, data organisation, and critical evaluation of sources. The integration of project-based learning and interdisciplinary approaches—particularly through innovative programmes like the “*Literacies*” and “*Literacies and Data*” subjects—further promote data literacy by encouraging students to apply these skills in meaningful, authentic tasks.

9.5.2 Challenges and Gaps

The research conducted in Portugal—including the national literature review, teacher survey, and focus group interviews—reveals a number of persistent challenges and structural gaps in the implementation of data literacy across the education system.

One of the most significant gaps is the absence of an explicit policy framework for data literacy. While many competencies associated with data literacy are embedded across subjects, particularly in Mathematics, Sciences, and ICT, there is no coordinated national strategy that systematically guides its integration across curricula and educational levels.

Teacher training represents another critical gap. Many educators report feeling underprepared to teach data literacy, especially in areas related to statistical reasoning, data ethics, or interdisciplinary applications. This is true for both initial teacher education and continuous professional development, where data literacy is often absent or addressed only superficially.



There is also limited support for interdisciplinary collaboration. Although data literacy naturally spans across Citizenship, Media Education, and Science, institutional and curricular rigidities hinder its practical integration. Moreover, the absence of assessment frameworks for data literacy limits its visibility and curricular relevance. 9.5.2 Best practices and recommendations.

9.5.2 Best practices and recommendations

Despite these challenges, the Portuguese education system presents promising practices that showcase the potential of effective data literacy integration.

One strong example is the “Literacies” subject. Co-taught by subject teachers and school librarians, it uses project-based methodologies to develop skills such as information evaluation, referencing, and communication, directly aligned with data literacy principles.

Another innovative initiative is the “Literacies and Data” subject, introduced through pilot pedagogical innovation projects in upper secondary education. This subject integrates data literacy with other forms of literacy (financial, digital, etc.), affirming data literacy as central to citizenship, employability, and critical thinking.

Several schools promote real-data projects, where students collect and analyse data relevant to their communities. These experiences foster both engagement and deeper statistical understanding.

Teachers also experiment with media-based resources, encouraging students to interpret real-world graphs and data critically—bridging the gap between academic learning and everyday information environments.

Recommendations involve defining a national strategy that explicitly incorporates data literacy across all educational levels and subjects, ensuring its systematic and coherent integration into curricula. It is also essential to embed data literacy into both pre-service and in-service teacher training, with a strong emphasis on statistical reasoning, ethical considerations, and interdisciplinary methodologies. Additionally, promoting project-based and collaborative pedagogies that leverage real-world data can foster meaningful student engagement and deeper understanding. Finally, the development of assessment tools is recommended to effectively monitor, support, and enhance data literacy acquisition throughout the learning process.

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10. Results

10.1 Conceptualization of Data Literacy

The conceptualization of DL synthesizes perspectives from five national contexts (Cyprus, Germany, Greece, Poland, and Portugal) alongside an extensive review of academic literature.

Together, these inputs reveal **a shared recognition of DL as a key 21st-century competence**, yet also highlight variations in emphasis, implementation, and integration within educational systems. Across the board, **DL is seen as both a multidimensional and foundational literacy**, crucial not only for future work but for democratic participation, lifelong learning, and ethical digital citizenship.

A central point of consensus among the five countries is that DL extends well beyond technical abilities or statistical knowledge. It encompasses **a broader set of competencies including the ability to access, manage, interpret, critically evaluate, and ethically use data in a range of social, educational, and professional contexts**.

Multiple sources emphasize **DL as a cross-disciplinary skill**. In both the literature and national reports (particularly Cyprus, Portugal, and Greece) DL is framed as not limited to mathematics or computer science, but relevant across subjects such as geography, social studies, environmental education, and even language arts. This holistic integration is consistent with educational recommendations that advocate for authentic, real-world contexts in which students engage meaningfully with data.

A particularly salient feature in the conceptualization of DL across all five countries is the increasing emphasis on its ethical and critical dimensions. These concerns are echoed in the national reports, especially in Greece and Germany, where stakeholders highlight the importance of equipping students not only with the ability to interpret data, but also with the capacity to question its origin, assess its validity, and understand its potential for harm or misuse.

- German perspectives further advance this critical framing by positioning DL as part of broader media and digital literacies that allow individuals to engage with data reflectively and responsibly within its social and cultural context.
- Similarly, Greek educators discuss the role of DL in preparing students to confront misinformation and algorithmic bias, challenges that are increasingly relevant in the context of artificial intelligence and digital surveillance.

Despite these conceptual alignments, **there are notable differences in how DL is implemented, or in some cases, not implemented**, within the educational systems of the participating countries.

- Portugal emerges as a leading example of structured DL integration, with a coherent, age-appropriate progression from early childhood through secondary education. Curricular innovations such as the “Literacies and Data” programme encourage interdisciplinary, project-based learning, aligning with the literature’s emphasis on active data use in authentic contexts.
- By contrast, Poland and Germany report fragmented or implicit approaches to DL.
- In Poland, for instance, DL is not treated as a distinct educational goal but is rather absorbed into broader frameworks such as digital or statistical competencies. Educators often lack a unified understanding of DL, and its development relies heavily on individual teacher initiative.
- Similarly, in Germany, DL is seldom explicitly named in curricula or teacher training standards. It is often addressed indirectly through digital, media, or IT-related content, leaving ambiguity around what specific DL skills are being cultivated.



- Cyprus and Greece present a mixed picture. Both countries recognize DL as a foundational and essential literacy, yet teachers report a gap between this conceptual understanding and their practical ability to apply DL principles in classroom settings. Educators in Cyprus note that data use is often intuitive and informal, lacking a structured pedagogical foundation. Greek teachers echo these sentiments, expressing a need for clearer frameworks, targeted training, and more resources to integrate DL meaningfully into their instructional practice. These findings reinforce the importance of professional development and institutional support in bridging the gap between policy and practice.

The national reports for the reviewed literature consistently situate DL within a wider constellation of literacies, including digital, statistical, scientific, and information literacy.

- For example, DL is seen as complementary to digital literacy, as both involve navigating digital environments, but DL places stronger emphasis on interpreting and analysing data critically.
- Similarly, its overlap with statistical literacy is evident, especially in mathematics education, where students learn to handle numerical data.
- However, as several reports emphasize, DL also involves qualitative reasoning, ethical judgment, and communication skills that go beyond statistical analysis.

In this way, DL emerges as a “literacy of literacies”, a meta-competence that synthesizes multiple domains of knowledge and practice. The German and Cypriot reports both highlight the need for DL to be understood as an educational objective, rather than a secondary outcome of other curricular areas.

Overall, the conceptualization of data literacy in the five national contexts supports a broadened and evolving understanding of what it means to be data literate in the 21st century. While all countries share **a vision of DL as a multidimensional, foundational, and ethically grounded skill**, there is considerable variation in how it is defined, valued, and embedded within education systems.

Key challenges include:

- the lack of consistent policy frameworks,
- the need for cross-curricular integration,
- gaps in teacher training and institutional support.

To advance DL effectively, education systems must move from fragmented, subject-specific approaches toward comprehensive strategies that treat DL as a core competency. This includes:

- defining clear learning outcomes,
- embedding DL across subjects and grade levels,
- investing in professional development that empowers educators to teach DL confidently and critically.

Only then can students be truly prepared to participate in a data-rich world, equipped not just to consume data, but to question, analyse, and act upon it with integrity.

10.2 Curricula

A synthesis of the findings from the analysis of national curricula across the five countries examined within the context of this project reveals some **variations** in the integration of DL in terms of scope, depth, and pedagogical coherence.

Although **none of the countries explicitly identify DL as a distinct subject within their curricula**, components of DL are nonetheless implicitly addressed through a variety of subject



areas, most notably Information and Communication Technologies (ICT), Mathematics, Science, and Statistics. This indicates a **cross-disciplinary**, but **uncoordinated** approach to DL, wherein its constituent skills and knowledge are embedded within the objectives and content of other subjects.

Moreover, the review indicates an **absence of specific, systematic, and structured national frameworks** dedicated to LD in all five countries. Instead, DL is incorporated **indirectly** through the curricular frameworks of other disciplines, lacking a unified model.

Pre-Primary Education

At the pre-primary level, DL is generally approached through **cross-curricular, project-based activities** that emphasize **real-world applications**. These activities typically involve the collection, processing, and presentation of data related to familiar, everyday experiences. This approach prioritizes practical engagement with data, often through observation and symbolic representation, to foster foundational data-related competencies.

Primary Education

In the context of **primary** education, the introduction of subject-specific disciplines—particularly Mathematics, ICT, and various branches of science, including Physics, Geography, Environmental Education, and Technology—facilitates more **structured engagement with data-related practices**. Curricular analysis reveals a progressive development of data handling competencies, ranging from basic data collection and representation to the use of digital tools and technologies for more complex processing and analysis. This progression is marked by a gradual increase in both the complexity and formality of data acquisition, analysis, and presentation techniques, though these remain largely bound to the content and objectives of individual subjects.

Furthermore, across all five countries, there is evidence of increasing emphasis on the **critical evaluation of data** and its meaningful transformation and communication. However, such practices are implemented inconsistently and lack systematic integration across the curriculum.

Germany presents a distinct case, given its federal educational structure. Curricula are developed at the regional, state, level, resulting in considerable variation both between states and among different school types. While elements of DL are embedded in various subjects, this decentralized approach has led to even greater fragmentation and disparity in implementation. The absence of binding, nationwide guidelines further limit the extent to which DL-related learning opportunities are uniformly accessible to students across the country.

It is thus important to note that, **while all five national curricula incorporate educational objectives and learning activities directly relevant to DL, these are closely tied to the disciplinary context in which they appear**. Consequently, they are generally limited to addressing data within the boundaries of subject-specific inquiry and seldom extend across disciplines.

Secondary Education

This implicit and fragmented approach to DL persists into secondary education, where the incorporation of DL remains confined to the content and objectives of individual subjects. However, the expansion of curricular offerings at this level, particularly through the introduction of new disciplines such as Technology, Physics, Chemistry, Biology, and Economics, contributes to a slightly diversified landscape in terms of DL integration.

In secondary education, disciplines such as ICT and Design and Technology (Cyprus), Computer Science and Media Education (Germany), Technology and Informatics (Greece), Computer Science and Business and Management (Poland), and ICT, Economics, and MACS (Portugal)



contain objectives and activities that support the development of data-related competencies. While DL is not explicitly addressed, these subjects incorporate processes related to data acquisition, processing, transformation, interpretation, critical evaluation, and communication. Additionally, they emphasize the development of digital competencies using technological tools and applications in data handling.

Particularly within the **Mathematics** curricula at the secondary level, specific modules dedicated to statistical methods and techniques—both descriptive and inferential—can be found in almost all the national curricula investigated.

In conclusion, the analysis of national curricula in the five participating countries indicates that Data Literacy is not yet recognized as an explicit or standalone educational objective. Nevertheless, DL-related skills and practices are implicitly incorporated into various subject areas, predominantly ICT, Science, and Mathematics. These integrations, however, occur in a non-systematic, inconsistent, and fragmented manner, lacking a coordinated strategy and approach for DL.

10.3 Policies and plans

The primary objective of the research was also to identify any educational policies or strategic plans for Data Literacy in compulsory education. From the research it can be concluded that there are not any policies or plans exclusively targeted on DL in education in any of the national contexts investigated.

Rather than that, **DL is implicitly targeted** in the context of policies on related subjects like ICT skills development, media education, information literacy or citizenship, or even, in a few cases, explicitly referenced like in the cases of the Digital Program of the State Government of Brandenburg in Germany, or the Digital Poland strategy of the Ministry of Digital Affairs in Poland.

In terms of educational policies for DL in Compulsory Education, no such policies were found to be in force in any of the countries investigated. However, in almost all the policy documents identified and analyzed in the five countries, elements of DL can be traced, although embedded in other related frameworks, mainly digital literacy and skills, ICT literacy and skills and mathematics education. Identified policy documents are related both to students' knowledge/skills/competences and to the teaching of those subjects as well as teacher training.

In the light of these findings it can be concluded that DL is only partially addressed in the educational policies of the five countries and in a fragmented way, mainly identified as an underlying set of knowledge/skills/competences that constitute a part of ICT, Mathematics or Digital Literacy disciplines that are promoted through the policy framework of those disciplines. In all cases, even though in the policy documents the importance of data is highlighted DL is not explicitly referenced or prioritized in national education policies.

In terms of strategic planning for DL in Compulsory Education, strategic planning was found to vary across the five European countries:

- In the case of Portugal, through initiatives like the National Media Literacy Plan and INCoDe.2030, which, while focused on media literacy, also promote digital and data skills, integration and promotion of DL is considered.
- Likewise, in the Polish educational landscape DL elements are embedded into broader strategies such as the Digital Competences Development Program and the Integrated Skills Strategy.
- Greece and Cyprus, by contrast, show limited strategic planning, with no formal DL policies or teacher training.



- In the case of Germany digital skills and literacy hold a primary role in the strategic planning in national and regional level but DL although thought upon constitutes a minor partial element of the planning with only select efforts, like the Stifterverband charter, addressing it explicitly.

Overall, there is a clear lack of coherence and more explicit integration of DL into national education strategies in all five countries.

10.4 Case studies

Part of the literature review in the partner countries was to discover and analyze 5 case studies per country (a total of 25). These cases reflect a growing recognition of data literacy as a foundational competency in the digital age, while revealing differences in implementation strategies and levels of systemic support among the partners countries.

A comparative synthesis of these cases explores how data literacy is understood, implemented, and supported in Cyprus, Germany, Greece, Poland, and Portugal, in a practical level. Based on a comparative reading of the five national case study summaries, various themes emerge in each context and are particularly informative for understanding national approaches to data literacy in compulsory education.

Cyprus's case study focused on the integration of environmental and citizen engagement data into municipal-level decision-making. Data was drawn from EU portals and the Cyprus Statistical Service, supplemented by citizen-provided data through workshops.

Revealed Dimensions

- Policy Relevance: Emphasis on climate change, green infrastructure, and sustainability policies at local levels.
- Data Reuse Barriers: Limited local data availability; reliance on EU-level data.
- Citizen Engagement: Low prior engagement; revealed need for inclusive consultation.
- Institutional Capacity: Low data management capacity at the local level.
- Data Quality/Granularity: Limited granularity of existing datasets.
- Usability: Need for user-friendly visualization tools.

The German case focused on Berlin and North Rhine-Westphalia (NRW), targeting SDG monitoring and public policy planning, with particular emphasis on open data reuse and municipal transparency. Data came from federal and local open data portals.

Revealed Dimensions

- Policy Relevance: Alignment with the SDGs, especially regarding environmental protection and digital transformation.
- Interoperability: Challenge in integrating diverse data formats across levels of government.
- Data Literacy: Users in municipalities often lack skills to interpret and apply open data effectively.
- Usability & Tooling: Strong emphasis on visual and interactive tools for communication.
- Governance & Access: Fragmented data governance; differing regional access policies.
- Sustainability of Initiatives: Need for continued funding and political support.

Greece's case emphasized flood risk management in the region of Thessaly. Data sources included Copernicus services and civil protection agencies. The case aimed to assess how data can support natural disaster preparedness.

Revealed Dimensions



- **Data Timeliness:** Real-time data integration was key for disaster management.
- **Public Trust & Transparency:** Citizens require transparency to trust public data usage.
- **Cross-sector Collaboration:** Revealed a need for better coordination between public agencies.
- **Technical Infrastructure:** Limitations in systems for processing satellite and sensor data.
- **Preparedness & Risk Communication:** Data was essential to raise awareness among vulnerable communities.

In Poland, case looked at air quality and health in Warsaw, particularly how open data can inform urban environmental planning and public awareness. Data was collected from air monitoring stations, local authorities, and health statistics.

Revealed Dimensions

- **Health & Environmental Nexus:** Data used connected to public health concerns.
- **Community Awareness:** Public campaigns were needed to link data to daily decisions.
- **Data Accessibility:** Citizens value mobile-friendly, localized data dashboards.
- **Cross-Platform Integration:** Needed for merging environmental, mobility, and health data.
- **Policy Integration:** Open data was not yet well-integrated into public health planning.

Portugal's case centered on the city of Lisbon, using data for mobility planning and citizen-led urban design. Data was sourced from municipal platforms, sensor networks, and crowd-sourced inputs.

Revealed Dimensions

- **Citizen Co-creation:** High potential for participatory urban planning.
- **Mobility Data:** Valuable for both real-time services and long-term strategy.
- **Data Granularity:** Users requested neighborhood-level insights.
- **Privacy Concerns:** Mobility and location data raised privacy issues.
- **Digital Inclusion:** Marginalized groups are often excluded from digital participation.

Across all five cases, several common dimensions emerged:

- **Need for Localization:** EU/national datasets often lacked relevance at the local scale.
- **Visualization & Accessibility:** Visualization tools are essential to translate data into action.
- **Capacity Gaps:** Municipalities often lacked the skills or tools to use open data effectively.
- **Policy Embedding:** Data initiatives need to be embedded in formal planning cycles to be sustainable.
- **Trust & Engagement:** Active engagement builds public trust and leads to more meaningful data use.

These findings collectively underscore the importance of tailoring open data initiatives to the local context, improving data literacy, and building inclusive, sustainable governance structures around data use.

10.5 Survey

In the framework of the DATA-READY project, a transnational survey was conducted with the aim of mapping the current state of awareness, readiness, practices, and training needs related to Data Literacy (DL) among key stakeholders in compulsory education. The survey was addressed primarily to teachers, school leaders, and educational authorities, and was implemented across the five participating countries.



A total of 658 valid responses were collected: 254 from Greece, 122 from Cyprus, 105 from Germany, 102 from Poland, and 75 from Portugal.

The diversity in sample size per country reflects the different scales of outreach and the national education system structures yet offers a solid basis for cross-country comparative analysis and synthesis of findings. The findings presented below consolidate and interpret the overall trends and insights emerging from the responses across all five countries.

Demographic Profile

- The majority were teachers from different educational levels, primarily in primary and lower secondary education.
- A significant number of respondents also held administrative roles, while a smaller proportion represented national or regional educational authorities.
- The participants came from a range of school types and geographic settings (urban, semi-urban, and rural).
- Importantly, a noteworthy portion of teachers reported more than ten years of teaching experience, indicating a seasoned sample.
- However, despite their professional experience, fewer than four in ten respondents had received any formal training on DL or data use in education, highlighting a substantial training gap at the systemic level.

Awareness of the term “data literacy”

- A large proportion of participants across all countries expressed a general awareness of the term "data literacy" and its relevance to modern education.
- Nevertheless, the depth of understanding varied. While most respondents were able to recognize DL as an important competence, fewer were able to clearly distinguish it from related concepts such as digital literacy, AI literacy, and statistical literacy.
- The notion of DL as an interdisciplinary skill that connects to decision-making, instructional planning, and evaluation was acknowledged, yet conceptual clarity remains uneven among educators.
- Despite this, there was near-universal agreement among respondents that DL should be an integral part of the competencies cultivated in compulsory education.
- Participants emphasized the growing role of data in teaching, learning, and administration, and indicated strong agreement that DL is essential for both teachers and students in navigating today's complex digital landscape.

Knowledge and skills related to DL

- Participants demonstrated moderate levels of readiness.
- Most respondents reported basic familiarity with reading and interpreting charts, graphs, and tables, and many felt capable of using digital tools to organize and manage data.
- However, fewer than half of the respondents stated that they possessed the necessary skills to perform data analysis or apply data-driven approaches in a systematic way.
- The gap was more pronounced in the use of advanced techniques or specialized tools for educational data analysis.
- Educators from urban settings and those with higher digital confidence tended to report greater readiness, suggesting disparities in access, exposure, and support.
- Overall, the data indicates a foundational awareness of DL but limited practical capacity to apply it effectively in educational settings.

Current practices on DL

- The use of data in school contexts is often fragmented and informal.



- While many educators stated that they occasionally collect or refer to data (such as student assessments, participation records, or behavior logs), this process is not yet embedded in a structured or strategic way.
- The use of data visualization, collaborative data interpretation, or systematic integration of data into instructional planning remains limited.
- Data is more frequently used for administrative or reporting purposes rather than as a pedagogical tool.
- Furthermore, inter-professional collaboration around data analysis is sporadic, with only a minority of teachers reporting joint reflection or decision-making based on data with colleagues or school leaders.
- This confirms the need for more structured and school-wide approaches to data-informed practices.

Attitudes toward DL

- Despite the challenges in practical implementation, the overall attitude toward DL among respondents is clearly positive.
- Educators across all countries expressed strong beliefs in the potential of data to enhance teaching and learning.
- They agreed that DL can support personalized learning, improve assessment strategies, and strengthen evidence-based decision-making.
- There was also recognition of the role of data in promoting educational equity and accountability.
- However, these positive perceptions were accompanied by concerns regarding workload.
- Many participants noted that integrating DL into everyday practice could add pressure to already demanding schedules, especially in the absence of clear guidance and institutional support.
- The findings reveal a professional community that is open and motivated, but also in need of structural enablers to put its positive disposition into action.

National curricula and DL

- A recurring theme across countries was the perception that DL is not sufficiently integrated into national curricula.
- While some countries have embedded aspects of DL within ICT or mathematics subjects, very few have adopted a cross-curricular or comprehensive approach.
- Respondents often described the presence of DL in curricula as fragmented, implicit, or limited to isolated mentions.

National education policies and strategic plans

- Not widely known among educators, and those who were aware of such documents often felt they lacked actionable detail or implementation guidance.
- Teachers expressed a desire for curricula that allow flexibility and interdisciplinary applications, alongside greater emphasis on project-based learning and collaboration to support DL implementation.

Professional development in DL

- A critical finding of the survey is the overwhelming demand for professional development in DL.
- Nearly all respondents expressed interest in further training opportunities, both to improve their personal understanding of DL and to learn how to effectively implement it in their teaching practice.



- Participants identified specific areas of need, such as the interpretation of complex data, integration of DL with other literacies (e.g., digital or scientific), ethical considerations (e.g., privacy and data protection), and classroom applications of data use.
- Preferences for training formats varied, but a combination of hands-on workshops, mentoring schemes, peer collaboration opportunities, and access to quality online resources was seen as the most beneficial.
- This finding underlines the need for a targeted and scalable capacity-building strategy for educators.

Challenges

- Foremost among the challenges are the constraints of an already saturated school curriculum, inadequate professional development opportunities, and restricted access to essential resources, including software tools, equipment, and instructional materials.
- In addition, many educators reported a lack of institutional support and leadership in promoting DL practices.
- Ethical concerns, particularly regarding student data privacy and the responsible use of analytics, were also raised.
- Importantly, teachers often feel isolated in their efforts to implement innovative approaches and would benefit from school-wide or national strategies to foster a culture of data-informed teaching.

Intentions to use DL

- Despite the noted challenges, educators expressed strong intentions to enhance their use of data soon.
- Many indicated plans to integrate DL more systematically into their instructional design, assessment strategies, and school-level planning.
- A substantial number of respondents also stated their commitment to participating in further training initiatives and sharing practices with colleagues.
- This readiness for change, if met with appropriate support mechanisms and policy backing, can become a strong driver for the mainstreaming of DL in compulsory education systems.

The survey results highlight a growing recognition of the importance of DL among education professionals across Europe. While awareness is high and attitudes are positive, actual implementation remains uneven and largely dependent on individual initiative. The findings reveal a clear need for systemic interventions, including comprehensive curricula integration, strategic professional development programs, institutional support, and clear policy frameworks. These insights will directly inform the development of the DATA-READY Data Literacy Framework and its associated teacher training modules, ensuring that they respond effectively to the real needs and conditions in European compulsory education.

10.6 Focus group

Qualitative data was gathered via focus groups conducted in all five partner countries. Each focus group involved a minimum of ten participants, comprising mainly educators from primary and lower secondary schools, with some participation from school leaders, policymakers, and pedagogical advisors.

The discussions were structured around a common set of guiding questions that explored definitions, perceptions, and practical challenges related to Data Literacy (DL) in compulsory education.



The goal of the focus groups was to elicit in-depth insights into how teachers understand and engage with DL in their daily practice, what support they need, and what systemic enablers or barriers influence their adoption.

Despite national differences, several common themes and cross-cutting findings emerged, revealing a consistent picture across countries.

Across all five countries, participants acknowledged that DL is an important skill for both teachers and students, yet their **definitions of the term varied significantly**. In general, educators associate DL with the ability to read, understand, and use data in school primarily for assessment and reporting purposes. While most participants recognized that DL extends beyond numerical data to include patterns, behaviors, and digital footprints, few were familiar with comprehensive or structured definitions. Many teachers perceived DL as a “new” concept, even though they already engage in some related practices such as tracking student performance or interpreting assessment results. Participants in several countries admitted they lacked a clear conceptual framework to distinguish DL from adjacent notions like digital literacy, ICT competencies, or educational statistics. This finding indicates a widespread need for greater conceptual clarity and practical orientation in training programs.

The discussions revealed that educators do engage in **data-related practices**, but often in an intuitive, fragmented, or informal manner. Teachers reported collecting data from student assessments, classroom observations, and behavioral logs, but typically relied on their own experience to interpret and act upon this information. In many cases, data were used for administrative reporting or to meet external accountability requirements rather than for improving teaching and learning. Participants emphasized that while some digital platforms (e.g. learning management systems or e-gradebooks) provide data access, the tools are rarely user-friendly or integrated into pedagogical workflows. Moreover, data use was described as inconsistent across schools, with very few examples of collaborative or school-wide data strategies. Teachers generally worked in isolation when analyzing data, and opportunities for peer discussion or institutional reflection on data were described as limited or non-existent.

Focus group participants identified a range of **challenges** that limit the integration of DL into everyday school life. A recurring issue across all countries was the lack of time within the school schedule to engage meaningfully with data. Teachers highlighted that the pressure to meet curriculum demands and manage classroom responsibilities leaves little room for structured data analysis. Another major barrier was the lack of professional development. Participants overwhelmingly stated that they had never received formal training on DL and expressed a strong desire for targeted workshops, practical examples, and ongoing support. In addition, teachers cited technical limitations, including insufficient access to data tools, platforms, or IT infrastructure, particularly in rural or under-resourced schools. Concerns were also raised about data quality and ethical implications. Participants pointed to issues such as the unreliability of some data sources, the difficulty of interpreting data without context, and the risks of over-reliance on quantitative indicators. Ethical concerns regarding student data privacy were frequently mentioned, especially in relation to learning analytics and third-party software.

Despite the above challenges, participants in all five countries expressed a **positive and proactive attitude toward DL**. Teachers emphasized their willingness to learn and acknowledged the potential of data to improve classroom practice, personalize instruction, and support more inclusive and equitable teaching. Many educators stated that, while they currently lack the tools or knowledge, they are open to adopting DL strategies if they are adequately supported. Participants also recognized that DL could play a role in developing students’ critical thinking and citizenship skills. Several teachers noted that young people are constantly exposed to data (e.g. in social media, online content, or public health messaging), and schools have a responsibility to help them navigate this environment critically and responsibly.



A clear message that emerged from all focus groups was the **need for institutional and policy-level support**. Teachers stressed that DL cannot be an individual responsibility but should be embedded in the broader educational ecosystem. Participants called for clearer national or regional guidelines, integration of DL into initial teacher education programs, and incentives for schools to develop data-informed practices. Moreover, they emphasized the importance of collaborative approaches—highlighting the value of team-based planning, peer learning communities, and co-reflection on data. Educators expressed interest in case studies and real-life scenarios that demonstrate how DL can be applied in different subject areas and school contexts. In some cases, participants from countries with existing national strategies or platforms reported a disconnect between top-down policies and bottom-up realities. These policies were often perceived as vague or detached from teachers' everyday experiences. This reinforces the importance of ensuring that DL policies and frameworks are contextualized, actionable, and co-developed with educators.

The focus group results highlight the current state of Data Literacy in European compulsory education. While DL is widely recognized as important, it is still emerging as a structured and supported practice in most schools. Teachers feel underprepared, under-supported, and under-equipped to fully leverage the power of data in their teaching, yet they remain motivated and receptive to change. To bridge this gap, systemic action is needed, combining clear frameworks, quality training, institutional leadership, and school-level cultures that value and promote reflective data use. These insights directly inform the development of the DATA-READY DL Framework and associated teacher training modules, ensuring they are grounded in the real conditions and aspirations of educators across Europe.

10.7 Challenges and Gaps

The national reports from Cyprus, Germany, Greece, Poland, and Portugal reveal a consistent pattern of underdeveloped and fragmented efforts to integrate DL into compulsory education. Although there is a growing recognition of the value of DL as a core 21st-century competence, its implementation remains inconsistent and largely unsupported at the systemic level. Several key challenges and gaps are shared across these national contexts.

Absence of a clear policy framework or conceptual definition of data literacy within national education strategies.

In all five countries, data literacy is either not addressed at all or treated as a minor component of broader digital or mathematical competencies. This lack of clarity leads to confusion among educators and policymakers about what data literacy should include, whether it emphasizes technical skills, critical thinking, ethical awareness, or all the above. The absence of a coherent policy direction has also resulted in weak alignment between curricula, teacher training, and assessment, making it difficult for schools to adopt a unified approach.

Curricular integration of data literacy is weak and inconsistent.

In most countries, data-related learning objectives are found only in a few subjects such as mathematics, science, or ICT. Even within these subjects, data use is often limited to basic statistics or reading simple graphs. Very few national curricula embed data literacy as a cross-disciplinary skill that can be applied in diverse contexts such as social studies, environmental education, or civic engagement. As a result, students are rarely exposed to data as a tool for inquiry, argumentation, or real-world problem-solving, especially in primary education.

Lack of teacher preparation.

Across all five countries, educators report that they have not received formal training in how to teach or apply data literacy. While many have general digital skills, they often lack confidence in using data tools, creating data-based lesson plans, or addressing the ethical aspects of working

with student data. Initial teacher education programs tend to overlook data literacy altogether, and in-service training opportunities are limited or too theoretical. Without sustained professional development that addresses both pedagogy and practice, teachers remain unprepared to bring data literacy meaningfully into the classroom.

Inequalities in digital infrastructure and access to resources.

Many schools, particularly in rural or underfunded regions, face difficulties accessing devices, internet connectivity, or data-handling software. Where digital tools do exist, teachers often lack time, training, or support to use them effectively. The lack of ready-to-use teaching materials, examples, or templates adapted to local contexts also discourages teachers from experimenting with data-based approaches.

Lack of national or school-level assessment frameworks for data literacy.

Without clear goals or monitoring systems, data literacy is not evaluated in student learning outcomes. This makes the skill invisible within the broader education system and offers little motivation for teachers or schools to prioritize it. The absence of assessment also limits the ability of policymakers to track progress or identify areas for improvement.

Ethical concerns and cultural perceptions.

Finally, ethical concerns and cultural perceptions present further barriers. In all five countries, teachers expressed uncertainty and concern over how to manage student data responsibly. Privacy risks, unclear data governance, and the fear of misusing data create hesitancy. In some education cultures, data is also perceived as an administrative or bureaucratic tool rather than a pedagogical resource. This perception can prevent teachers from seeing the value of data in supporting inquiry, communication, and critical thinking in their teaching.

To conclude, the country-level research reveals a clear trend: although interest in data literacy is increasing, its integration into compulsory education systems across Europe remains weak due to policy gaps, insufficient teacher support, poor infrastructure, and cultural barriers.

A successful transition **from isolated practices to systemic implementation** will require coordinated action at multiple levels, such as:

- Defining data literacy clearly within national curricula, embedding it across subjects and grade levels, and ensuring teachers receive practical and sustained professional development.
- Governments and education institutions must also invest in infrastructure and provide user-friendly digital tools and teaching resources.
- Moreover, assessment strategies must be developed to give data literacy a visible role in student outcomes, and ethical guidelines should be established to address concerns around privacy and responsible data use.
- Above all, a cultural shift is needed that treats data not as a technical or administrative matter, but as a vital tool for learning, decision-making, and democratic engagement.

Only through such a comprehensive approach can data literacy become an essential and equitable part of modern education.

10.8 Best practices and recommendations

Best practices

cross the national reports of Cyprus, Germany, Greece, Poland, and Portugal, a number of school-level and institutional practices demonstrate promising approaches to fostering data literacy within compulsory education.



In Cyprus, schools have successfully integrated data literacy across diverse subjects such as geography, civic education, and science. This interdisciplinary embedding enables students to apply data skills in real-life contexts. The use of teacher-friendly resources, including sample datasets and classroom-ready materials, has supported educators in delivering lessons that engage students with authentic data. Collaborative environments, such as peer mentoring and in-school learning communities, further promote the exchange of knowledge and classroom innovation. On a policy level, Cyprus also illustrates how national data systems can inform equitable educational planning and decision-making.

In Germany, although a national data literacy framework is still emerging, multiple educational programs have adopted modular, interdisciplinary models that focus on applied learning. Initiatives like KI-Campus and Digital Sparks show how early and narrative-based approaches can engage students across subjects and age groups. These projects blend technical and ethical elements, using data for storytelling, inquiry, and civic exploration, thereby making data literacy more accessible and relevant.

Greek schools offer additional examples of best practice through project-based learning. Students engage with real-world data by collecting and analyzing information related to environmental or community issues. The use of visual tools, such as digital maps and infographics, enhances student understanding while promoting critical thinking. Teachers who participate in such projects often emphasize the importance of training that combines tool use with pedagogical strategies and ethical guidance. These initiatives are often strengthened by partnerships with external institutions or supported through European programs.

In Poland, creative models such as gamification and location-based learning have been employed to develop data literacy. For example, using Minecraft Education for environmental mapping helps students learn statistical and spatial analysis in an engaging and accessible format. Teachers frequently adopt data-related instructional methods independently and create informal peer networks to share practices. Many also incorporate digital safety and ethical awareness into their lessons, linking data literacy with broader concepts of digital citizenship.

Portugal stands out for its formal integration of data literacy into new school subjects such as “Literacies” and “Literacies and Data.” These courses are often co-taught by classroom teachers and school librarians and combine data skills with media, digital, and information literacy. Community-based student projects, in which learners collect and interpret real-world data, are common and help foster active citizenship. Teachers also make effective use of media and news content to help students evaluate data representations in public discourse, strengthening their critical engagement with societal issues.

Recommendations

To scale and systematize the best practices identified across these five countries, several core recommendations emerge that can guide both national education systems and school-level strategies.

First, it is essential to develop clear and coherent definitions of data literacy within national education policies.

Without shared understanding and direction, implementation will remain fragmented and inconsistent. Policymakers should define data literacy as a cross-curricular, multidisciplinary competence and embed it into primary and secondary education frameworks.

Second, data literacy should be integrated across school subjects, not limited to mathematics or ICT.

By embedding data collection, interpretation, and communication into subjects such as social studies, science, language, and civic education, students can develop the ability to work with



data in meaningful, context-rich ways. This integration should follow a progression model, starting with simple tasks in early education and advancing to more complex analysis in later years.

Third, professional development for teachers must be prioritized.

Training should go beyond basic technical skills to include pedagogical approaches, ethical awareness, and strategies for designing data-rich classroom activities. Programs should be practical, ongoing, and supported by mentoring or communities of practice. Teacher education institutions should also incorporate data literacy into both initial and continuing training curricula.

Fourth, investment in infrastructure and teaching materials is necessary.

Schools need access to appropriate devices, platforms, and user-friendly tools that allow for safe and effective data use. Ready-made lesson plans, adaptable teaching resources, and open-access datasets tailored to different age groups can make implementation more feasible for teachers.

Fifth, educational systems should develop assessment tools and indicators to monitor the development of data literacy in students.

Making data literacy visible in assessment frameworks gives it value within the curriculum and helps schools track progress. Assessments should focus not only on technical skills but also on the ability to use data ethically and communicate findings clearly.

Finally, data literacy education must be grounded on ethical principles.

Teachers and students should learn about privacy, consent, data security, and bias. Schools should adopt policies that support the ethical use of data and promote a culture of transparency and accountability. Cultivating this ethical dimension is essential for preparing students to navigate an increasingly data-driven world.

11. Conclusions

The analysis of how data literacy is conceptualized across the five partner countries revealed both a shared understanding about its importance and at the same time variation in how it is defined and implemented.

All national contexts recognized data literacy as a multidimensional and foundational competence essential for navigating the modern digital landscape. While countries like Portugal are leading in structured curricular integration, others, such as Germany and Poland, approach the concept more indirectly. Ethical considerations, critical thinking, and cross-disciplinary relevance emerged as crucial elements, though practical implementation remains limited by fragmented policy frameworks and inconsistent teacher support.

The curriculum review further underscored the fragmented nature of data literacy integration.

While competencies related to data are included across subjects such as ICT, mathematics, and science, there is a lack of coherence and dedicated focus on data literacy as a standalone or cross-curricular skill. Differences in education structures, particularly Germany's federal system, lead to varying degrees of integration. Generally, data-related learning occurs within disciplinary silos and does not extend into broader applications or interdisciplinary projects, especially in earlier stages of education.

In terms of educational policy, none of the five countries have implemented a dedicated strategy for data literacy in compulsory education.

References to data literacy typically appear within broader frameworks on digital skills, ICT, or citizenship education. Where strategies do exist, such as Portugal's INCoDe.2030 or Poland's Digital Competences Development Programme, they are not explicitly focused on data literacy in school settings. Consequently, a lack of policy coherence and prioritization limits the ability of national education systems to guide structured and scalable development in this area.

The national case studies illustrated promising but isolated examples of data literacy in action, often in local or municipal contexts.

These examples highlighted how data can be used to address issues like environmental planning, public health, and disaster preparedness. Despite their diversity, all cases shared common challenges, such as limited data access at the local level, low institutional capacity, and the need for user-friendly visualization tools. The studies emphasized the importance of localized and accessible data, capacity-building, and sustained engagement between institutions and communities to foster meaningful use of data.

Survey findings revealed that while educators widely recognize the value of data literacy, there is a significant gap in formal training, institutional support, and practical capacity to apply data-related methods in the classroom.

Most respondents reported moderate readiness but limited opportunities to use data meaningfully in instruction. Teachers expressed strong intentions to adopt more data-informed practices and demonstrated clear interest in receiving targeted training. However, challenges such as curricular overload, inadequate resources, and unclear guidance remain significant obstacles.

Focus group discussions confirmed and expanded upon survey results, offering deeper insights into the lived experiences of teachers.

While educators often engage in data-related practices intuitively, there is little formal structure or support. Teachers called for greater conceptual clarity, improved digital infrastructure, and



collaborative approaches within schools. Ethical concerns, especially around student data use and privacy, also surfaced as barriers to widespread adoption. Despite this, educators showed a strong willingness to embrace data literacy if appropriately supported through training, resources, and policy alignment.

The synthesis of challenges and gaps across all five national contexts paints a picture of growing awareness but systemic underdevelopment.

The lack of clear definitions, fragmented curricula, limited teacher preparation, unequal access to resources, and absence of evaluation frameworks collectively hinder the effective integration of data literacy into compulsory education. Furthermore, cultural perceptions of data as a bureaucratic rather than pedagogical tool continue to limit its use in meaningful classroom applications.

Finally, the identification of best practices and corresponding recommendations offers a path forward.

Successful examples of interdisciplinary teaching, project-based learning, and ethical data use demonstrate that data literacy can be implemented effectively when supported by clear frameworks, teacher training, and institutional commitment. Recommendations include embedding data literacy across subjects, developing national strategies, investing in infrastructure, and aligning assessment systems to make data literacy visible and valued. Above all, building a culture that views data as a tool for learning, equity, and democratic engagement is essential for lasting and inclusive impact.

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