

Small data and playful learning

EXECUTIVE SUMMARY

30 June 2025

Context

The Danish school system has experienced significant transformations over the last decade, characterised by increasing digitisation, heightened demands for individual student performance, and a concerning decline in wellbeing among schoolchildren. This digital shift includes the mandatory implementation of learning management systems (LMSs) in municipalities since 2013, a development tied to the 2012 Danish school reform's focus on visible learning, explicit learning goals and the individualisation of learning. Mandatory annual national surveys measuring student wellbeing were also introduced as part of this reform. The digital landscape in classrooms is further defined by government-supported digital learning materials integrated with LMSs, a variety of hardware and software, including students' own devices, and the use of data from national tests.

The observed decrease in student wellbeing is linked to societal trends of acceleration, performativity and individualisation, alongside aspects of students' digital social lives, including digital assessment. Practices of evaluation and self-evaluation, especially in digital forms, can be detrimental to the self-esteem of some pupils, particularly when they feel unable to perform appropriately. Prevalent wellbeing evaluation methods, ranging from physical mood barometers to digital apps like *Bloomsights* and *Woof*, exist, with some generating individual data and others class-level data. There is a suggested need for common evaluation methods where teachers and students cooperate, and concerns exist regarding digital wellbeing and the lack of ethics education. Performance pressure, strongly supported by platforms, tests and policies, contributes to individualised evaluations that can negatively affect students' wellbeing and self-esteem, sometimes leading students who don't meet goals to feel inadequate.

This case study investigates how playful approaches to learning and the production of small data related to students' shared learning environment can positively impact wellbeing and foster computational empowerment. Small data, in contrast to big data, is defined as being 'finely tailored to answer specific research questions' and exploring the detailed, contextual ways people understand their world. It is characterised as 'narrow mining'. Engaging pupils in producing small data about their immediate environment is seen as a way to contribute to common knowledge and foster engagement. Computational empowerment, in this context, aims to change the power dynamics between children, digital technologies and their environments. It is understood as developing students' capacity to understand digital technology and its effects, and their ability to engage critically and curiously with its construction and deconstruction. The goal in this case is to empower children through data literacy – the ability to understand and interpret data – in a productive, constructive and critical manner. The study employs classroom interventions focused on computational empowerment through learning practices and data production about the common learning environment, with the explicit aims of promoting participation, wellbeing and inclusion.

Regulation and rights privacy

The Danish school system's extensive digitisation includes the mandatory use of learning management systems (LMSs) and national communication platforms like Aula. The User Portal initiative, established from 2013, aimed to enhance digital solutions while also protecting student data and preparing for GDPR regulations. Parents can access various data about their child and communicate with the school through platforms like Aula.

Within this environment, teachers in the Agile Edu project are increasingly discussing methods to foster student awareness of privacy and data usage. Some teachers incorporate statistics and encourage students' own data production, which can lead to discussions about the ethical dilemmas, regulations and laws surrounding data. A real-world example demonstrated how attempting to collect data from the public firsthand led to an unexpected, practical lesson on legal obstacles, rights and privacy regulations. This highlighted how the act of producing data can directly create opportunities to learn about data, its implications and related regulations. Teachers also noted a distinction between data collected by humans versus machines, and the potential for students to be more passive when machines process data for them, which might limit their understanding of data complexity.

The case study's interventions facilitated complex discussions on computational thinking concepts and raised awareness of privacy, rights and data-related regulations. Empowering students to engage critically and curiously with digital technology and its effects, including data, is a key component of computational empowerment.

Data in use for teaching and learning

This case study explores the use of small data, which is specifically tailored and used to explore detailed, contextual aspects of a student's world, and contrasts with large-scale data collection. Through playful learning strategies, teachers and students collaborated on experiments to produce small datasets about their shared learning environment.

These experiments involved a number of activities.

- Students evaluated the quality of a learning environment using smiley buttons and discussed the processed data with teachers. This fostered common knowledge about activities and led students to feel more recognised and empowered by participating in decision-making.
- Students collaborated to design and build a robot or machine using digital data to measure the quality of breaks. This aimed to investigate how collective digital evaluation could support wellbeing and empower students and teachers by giving them control over data and discussions about its importance in their school lives. Students found the creative process meaningful and felt more influence over the teaching. They also recognised that personal factors like tiredness could affect data validity.

- Students designed studies using small digital data to investigate what constitutes a joyful school day. This experiment focused on helping students define what they wanted to investigate through playful activities like building LEGO models of joyful memories. The process highlighted challenges in structuring open-ended creative tasks but also showed students using peer feedback naturally.
- Students and a teacher cooperated to conduct a survey on wellbeing and mobile phone use, interpreted the results, and developed recommendations to inform class policy. This experiment successfully implemented a genuine student perspective, engaging all students in data production and interpretation and demonstrating that playful learning can create an inclusive environment.

Overall, these interventions demonstrated that engaging students in producing and interpreting data about their immediate environment can foster engagement, participation and a better understanding of the significance of data in their everyday lives. Compared to traditional methods often seen as static, these approaches were perceived as more varied, meaningful and stimulating due to collaboration and increased student influence. Working with small data about the learning environment, with a focus on computational empowerment and wellbeing, enhances the quality of the everyday learning environment. By involving students in data measurement, the case study explored how digital measurements can actively engage students and contribute to a more conducive learning environment.

| Data governance

A core purpose of the Danish User Portal was to protect student data and prepare for GDPR regulations, as well as to ensure data portability between municipalities and educational stages. The national login solution, Unilogin, facilitates access to various online services for students, parents, teachers and educators.

Within this ecosystem, a wide array of data generated by students and teachers is accessed by various stakeholders, including municipalities, researchers, teachers, school leaders, IT staff and parents/caretakers. This data includes results from national tests and exams, annual grades, wellbeing measurements, standardised tests, student productions, assignment results, observations (including behavioural data) and registration logs. Much of this data is centrally accessible through the Ministry's website, www.uddannelsesstatistik.dk. Parents can access various data about their child and communicate with the school via platforms like Aula.

Reflections from stakeholders suggest a need to rethink the school system's approach to data collection and use. Current large-scale, externally imposed data collection often feels meaningless and demotivating to both teachers and students, as it rarely provides actionable insights relevant to their needs. There is a suggestion that municipalities should conduct data collection in collaboration with teachers, just as teachers should collaborate with students.

Recommendations

To leverage the potential of smaller digital datasets and cultivate more engaging, playful and meaningful learning experiences, it is essential to develop future competencies for students, teachers and the school system.

For students, this involves cultivating strong communication skills and the capacity to meaningfully collect, understand and interpret data. They should develop a circular understanding of data, engaging in iterative processes through authentic projects relevant to their daily school lives. Practical experience is crucial for students to learn to identify data limitations and use data constructively. Engaging tasks, such as a 'treasure hunt' for data, can make data collection more meaningful.

Teachers are key to empowering students to creatively and collaboratively collect, analyse and utilise data to enhance their learning environments. This requires teachers to facilitate students in posing meaningful questions and designing data collection processes. Teachers should guide students in the critical analysis and interpretation of data, addressing potential biases and considering context. Integrating creativity helps students take ownership and use insights for action. Professional Competence Development (CPD) for teachers should focus on enhancing their own data literacy, their ability to facilitate student data literacy and computational empowerment, and pedagogical approaches for playful, open-ended learning. Teachers need to embrace dynamic roles and allow sufficient time for student investigations.

The school system and its leaders must fundamentally rethink the approach to data collection and use, moving away from often externally imposed, large-scale data that can feel meaningless. It is recommended that municipalities collaborate with teachers on data collection. Schools should prioritise meaningful, small-scale data projects generated by students about their learning and wellbeing. Crucially, the system must value and integrate student-generated data and the knowledge derived from it. School culture and leadership must support teachers exploring new roles and seriously consider student-produced knowledge, potentially requiring flexible scheduling. Furthermore, teacher education must incorporate data literacy, covering both the use of learning data and exploratory practices.

Ultimately, these recommendations aim to enhance computational empowerment and wellbeing by fostering a more engaging, relevant and collaborative approach to data within schools, driven by the authentic needs and perspectives of students and teachers.



**Co-funded by
the European Union**

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.