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Exploring the Futures of Datafied Welfare State Education: Thematic Analysis of Sociotechnical Imaginaries

Lauri Palsa, Janne Fagerlund, and Pekka Mertala

Department of Teacher Education, University of Jyväskylä, Finland

Correspondence: Lauri Palsa (lauri.p.palsa@jyu.fi)

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Abstract

Technological developments have inspired many scholars and other professionals to envision the possibilities that digital data technologies bring to the future of education. However, some aspects of this so-called datafication may conflict with the local characteristics of education systems. In this study, we investigate the future imaginaries of datafied education in the context of a welfare state education system. By interviewing Finnish experts ($N = 25$) from various sectors, we looked beyond official policies to explore the multi-perspective views of national-level stakeholders. Through a thematic analysis, we constructed four 1st order sociotechnical imaginaries that illustrate the anticipated impacts of datafication on education, specifically that it makes education (a) easier and (b) more coherent, (c) maximises learning, and (d) enhances visibility. However, some future visions involve recognising and assessing the consequences of the 1st order imaginaries. These 2nd order imaginaries broaden the spectrum of perspectives and highlight the pluralism of educational futures. Thus, the results did not give rise to a single coherent or holistic "imaginary" of datafied education but, instead, highlighted different aspects of datafied education. Through these imaginaries, we were able to identify the key characteristics of the Finnish welfare state education system, such as trust and the strong role of the public sector, that may be subject to negotiation in the datafication process. Through the development of sociotechnical imaginaries, our goal is to create a space for an inclusive debate on the future of education and thereby contribute to the promotion of sustainable development in education.

Keywords

datafication; education; experts; imaginary; sociotechnical

1. Introduction

In 1910, French artist Villemard envisioned what education might look like in the year 2000, resulting in one of the most famous historical images of the future of education. In this "paleofuturistic" picture, a teacher feeds textbooks into a machine, from which information is transmitted directly via wires to the pupils' headsets. While this imaginary might appear somewhat clumsy today, there remain similar aspirations in current "imaginaries" about the future of education, such as the desire to make education easier, automated, and more efficient. Accordingly, current imaginaries often revolve around the possibilities of digital data, rather than the prospect of feeding physical books to a machine. As the OECD (2025) conveyed, "data and digital technologies are among the most powerful drivers of innovation in education."

Datafication has inspired stakeholders, such as policymakers and researchers, to imagine its desirable and undesirable future potentials (Marcetic & Nolin, 2023). Utopian imaginaries of datafication often concern the ways in which data technologies, such as learning analytics and digital platforms, can improve education by personalising learning or automating administrative processes. For instance, combining learning analytics with facial recognition technology can enable the "continuous analysis of instructional dynamics and evaluating student effort," in turn making "instantaneous" feedback and "reporting [of] student progress and warnings of misbehaviour" possible (OECD, 2020, p. 43). However, continuous analysis requires large-scale data generation, which can threaten children's privacy and personal data protection (Silvennoinen et al., 2024). Similarly, for some, the imagined benefits of data carry the risk of "negative impacts on learning relationships, exploitative commercial uses of collected student data, discriminatory practices" (Ross & Wilson, 2023, p. 19).

Future imaginaries are not limited to the use of (data) technologies and their technical properties; rather, they depict changes in social processes. According to the OECD (2023, p. 3), digital transformation implies a "fundamental change in some educational processes…as a way to reshape teaching methodologies, learning processes, and the educational ecosystem at large, to make it more effective." The dynamic relationship between the technological (datafication) and the social (education) illustrates the sociotechnical nature of future imaginaries (Jasanoff, 2015).

Imagining the future is thus not only about the properties of technologies themselves but also about the impact they are imagined to have on different social practices, such as the way education is organised. As Burbules et al. (2020, p. 96) put it, the datafication of education "can help remedy certain disabilities; or it can create *new* disabilities. It can be liberating or coercive, and it raises new questions about surveillance and privacy." In other words, datafication can appear either as a treasure chest or as Pandora's box, depending on the imagineer.

As various stakeholders (e.g., policymakers, companies, researchers, civil society actors) can have different viewpoints regarding education, their visions about the desired and undesired futures of datafication would also differ. Several imaginaries, including utopian hopes and dystopian risks, can be present simultaneously. Moreover, what may seem utopian from a technical perspective (e.g., data-based feedback improving the efficiency of education) may seem dystopian from a social perspective (e.g., increased risk of data privacy), suggesting that differing visions can overlap and connect in intricate, tense ways.

Imagining the future is about the present—how the future is imagined can influence the decisions and actions taken today. Future visions create "a strong foundation to calls for action in the name of the future" (Mertanen & Brunila, 2024, p. 950). For example, the European Commission (2020, p. 10) has envisioned "a high-performing digital education ecosystem" that "must be a common endeavour across society" as a call to action to implement what they see as essential changes in national educational systems. International policy documents, such as the European Commission's action plan referred to above, are commonly used research materials on (future) imaginaries (e.g., Williamson, 2015). While we acknowledge the significance of future-visioning policies as instruments for guiding educational practice, our approach is more nuanced. Rather than focusing on the explicit (and often rigid) "formal" imaginaries presented in official education policy documents, we are interested in making visible the implicit nonformal future visions present in society. Accordingly, our study involved interviewing Finnish experts in different sectors (further detailed in Section 3). Experts often have the networks, capacity, and resources to make their own and their organisation's voices heard; they understand the factors and elements that are relevant for impacting the future, and they are often in positions where their decisions impact other stakeholders. Thus, because of their status within social structures, they have the "authority to construct reality" (Meuser & Nagel, 2009, p. 19).

Through our study, we addressed the following research question: How do experts at the national level imagine the future of datafied education in Finland? Analytically, we used the concept of "sociotechnical imaginary" (Jasanoff, 2015) as a heuristic device to consider the technological and social nature of datafication and education as well as the interconnections between them. This concept enabled us to analyse collectively held visions of futures that are "animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology" (Jasanoff, 2015, p. 3). Constructing such imaginaries also allowed us to identify the features that characterise the education system in the Finnish welfare state, which datafication might impose on the negotiation, thus influencing the sustainability of the education system.

Finland provides an excellent context for exploring the research topic. First, there is a strong belief in the potential of datafied education among Finnish policymakers, and their approaches resonate with international policies. In fact, the aforementioned European Commission action plan is one of the guiding documents behind the *Desired Outcomes for Digitalisation of Early Childhood Education and Care, Pre-Primary, Primary and Lower Secondary Education* proposed by the Finnish Ministry of Education and Culture (2023). Second, education policies in Finland are commonly prepared in a participatory manner, with cooperation among various relevant stakeholders through surveys, workshops, and commenting (Halinen, 2018), which means that there are opportunities for experts, such as civil society organisations, researchers, and companies, to have their voices heard.

2. Sustainable Education in the Digital Age

The Finnish education system has been argued to "focu[s] on sustainable development" (Messina, 2023, p. 1). However, future aspirations of datafication may place this central feature under negotiation. What makes Finland an interesting context for research in terms of sustainability is the paradoxical situation between future aspirations and existing characteristics. The use of digital data is highly prioritised in educational policy, even though features of datafication, such as accountability (Grek et al., 2020) and commercialisation (Cone &

Lai, 2024), are at odds with the sustainable development of the education system in a welfare society based on trust (Välimaa, 2021) and the strong role of the public sector (Dovemark et al., 2018).

Sustainability relates both to the aims of education as part of society and to the way education is organised. The public sector plays an important role in both cases. First, educational equality and equity, in line with the SDGs presented by the UN (2015), are said to be "at the heart of educational policy in Finland" (Välijärvi & Sulkunen, 2016, p. 17). In structural terms, equity is rooted in the educational reforms of the 1970s, following which the previously parallel school system was transformed into a comprehensive system (Kortekangas et al., 2019). In practice, this means that schools are for all pupils, regardless of their backgrounds (Toom & Husu, 2016). Allowing pupils to participate in attaining the same education regardless of their socioeconomic situation, among other things, is thought to enable social mobility in society (Välimaa, 2021). Second, trust has been identified as playing an important role in the Finnish school system; it is evident in the way education is governed as well as in the opportunities for teachers to use their own agency (Välimaa, 2021). Trust helps in building a culture of cooperation and common good, which in turn supports the achievement of the SDGs (UN, 2015). Concerning education policymaking, trust is reflected in the democratic ideals of openness and participation. In addition to public actors, many other stakeholders are involved in the development of education policy. At the national level, the national core curriculum (EDUFI, 2014), which provides a basis for participatory planning of local curricula, is prepared in a participatory manner based on cooperation among key stakeholders (Halinen, 2018). In addition to policymakers, educational authorities, and professionals, these include teacher education departments of universities, civil society organisations, trade unions, and private companies. Lavonen (2017, p. 7) explained that "participation of several parties in education…made the process and product [of the curriculum] more equal." It is expected that involving a wide range of actors in the preparation of education policies would lead to sustainable outcomes without radical changes, which may contribute to increasing trust. As explained by Välimaa (2021, p. 173), "it can be assumed that the stability of educational policies helps to strengthen trust in education because the policies are predictable. Citizens, schools, and teachers know what to expect today and in the future."

Rather than dictating how education should be organised (top-down), decentralised education governance (Lavonen, 2017) ensures that "schools are given almost full autonomy in developing their daily delivery of education services" (Toom & Husu, 2016, p. 49). As educational authorities and policymakers trust teachers, there is no need to pre-evaluate learning materials, inspect or supervise schools, conduct national-level testing, or systematically evaluate teachers (Lavonen, 2017). As explained by Toom and Husu (2016, p. 44), the pedagogical situations that teachers come across are so varied and pervasive that "all the criteria for teachers' pedagogical action cannot be stated explicitly." Teachers can choose their teaching methods, materials, and assessments according to what they consider most appropriate (Lavonen, 2017; see also Toom & Husu, 2016). Trust offers conditions that support teachers' pedagogical autonomy and, in turn, their professional agency. Despite their autonomy, teachers may be expected to use digital technologies in their work (see Mertala, 2020).

Over the past decades, Finnish education policymakers have made a significant push towards digitalisation through several policy documents, developmental programmes, and funding allocations. Kaarakainen and Kaarakainen (2018) have identified three phases of this endeavour: Between 1998 and 2004, education policies focused on equipping schools with information technology. Between 2005 and 2010, the policies

were aimed at evaluating the benefits of technological tools. Finally, between 2010 and 2018, the policies were focused on diversifying the use of digital tools. Despite the broad visions presented in educational policies, digitalisation has not reached educational practice to an equivalent extent. The results of national evaluations of digitalisation in education, which include classroom observations conducted in 2022 (Oinas & Hotulainen, 2024) as well as recent large-scale assessment studies such as the *International Computer and Information Literacy Study* (Fagerlund et al., 2024), have shown that learning in schools is still primarily teacher-led and that digitalisation has not brought about a significant change in pedagogy. Thus, despite decades of effort, digitalisation does not play as significant a role in everyday schooling as educational policies and visions might suggest.

3. Conducting the Study

3.1. Data Collection

Data were collected through semi-structured interviews with 25 experts working on issues related to datafied education on a national scale. Although the Finnish education system is decentralised, actors at the national level play a key role in the overall system, such as in creating structures that enable trust, participation, and decentralised organisation. The experts were selected through purposive sampling (Gill, 2020) based on their relevant but differing approaches to the datafication of education. They represented education policy, educational technology, and so-called data justice, including researchers and professionals working in civil society organisations (Dencik et al., 2019). The interviews were conducted remotely via Zoom (n = 21) or face-to-face (n = 4) between November 2023 and February 2024. The length of these audio-recorded interviews varied between 47 minutes and 122 minutes, and the total length of the data was 31 hours and 18 minutes (227,427 words). The transcriptions were pseudonymised by removing or changing identifying information, including the names of the individuals, services, and organisations.

The interview protocol (see the Supplementary File) covered a wide range of topics related to the role of data in education, with a specific focus on the future of datafied education. The interviewees were asked about their views on (a) what they would like the future of datafied education to be (utopia), (b) what their most undesirable future would be (dystopia), and (c) what they saw as the most likely future (realistic imaginary). To facilitate potentially realistic imaginaries, we instructed the interviewees to imagine the future within a concrete timeframe of five years. The micro utopias (Cooper, 2013) that result from such a process are arguably more concrete and contextualised than those that address a distant future (Selwyn et al., 2020).

3.2. Thematic Analysis

We conducted a thematic analysis (Braun & Clarke, 2006) to construct sociotechnical imaginaries of datafied education from the interviews. The analysis process is detailed in Table 1.

Table 1. Thematic analysis of the process employed in the present study.

Phase	Performed analysis	Outcome
1. Familiarisation with the data	The transcribed interviews were read thoroughly. The sections concerning utopian, dystopian, and realistic futures were identified and marked using Atlas.ti software. The sections on how the future can be influenced (i.e., the relevant actors and effective means) were also identified and marked.	The data sections identified for further analysis comprised 18,743 transcribed words.
2. Initial coding	We identified specific future-addressing citations and open-coded them to form "data simplifications," which we then categorised as focusing primarily on either education (socio) or datafication (technical).	The simplifications helped us "translate" the data into a more consistent form, supporting further analysis. Among the data simplifications, 142 concerned education, and 59 concerned datafication.
3. Constructing themes	We identified coherent and meaningful patterns (Clarke & Braun, 2013) by interpreting and comparing the data simplifications to find connecting similarities and distinctive differences. We reviewed the potential themes by reflecting their meanings on the original transcribed data to ensure that the interpreted meanings corresponded with the data.	Twelve themes were constructed.
4. Defining and naming themes	The themes were compared to identify the relationships between them. This step revealed that some of the themes directly concerned imagined educational change, while others were related to the estimated consequences of these imagined changes. Based on this notion, we differentiated between 1st and 2nd order themes. Themes referring to the imagined future of datafied education were defined as sociotechnical imaginaries.	Four main 1st order and eight related 2nd order sociotechnical imaginaries of datafied education were identified.

The following data extract exemplifies the analysis process. Here, interviewee Policy 7 imagines a future from the perspective of national-level education development:

> In an ideal world, education providers produce a certain kind of data that we can use without, for example, bothering education providers with these continuous surveys on different topics, which sometimes really overload the field….In the future, I see…that we will have a certain type of database. In their normal activities, education providers produce data for the national data bank, from which we can look at certain things and act accordingly. Without us burdening schools to death by asking once a week or once a month for all sorts of odd things.

Since the expert explicitly describes an "ideal world," this section was identified as describing a utopia (Phase 1), which relates to both education and datafication (Phase 2). In terms of datafication (technical), the expert describes the automated generation of data that occurs in normal, everyday school life as well as the data bank that integrates these data at the national level. New data infrastructure would allow education administrators to look at the different school issues for the whole country. The areas to look at come across as being comprehensive, as data production would cover "all sorts of odd things"—thematised as visibility

(Phase 3). In terms of education (socio), this would make the work of school professionals easier, as they would not have to be "burdened to death" by surveys. The mention of burdening indicates that the interviewee recognises the workload involved in data generation; this was thematised as data work.

Although an imagined future may seem straightforward in the context of a single interview, imaginaries become more diverse and relational when multiple interviews are considered as a whole. Therefore, in Phase 3, we defined four 1st order sociotechnical imaginaries that describe how datafication will make education easy, coherent, maximised, and visible, as (partly) exemplified by the previous excerpt.

Some interviewees expressed doubts about the direct changes that datafication was imagined to have in education. The following was considered by Data Justice 13:

> As I have now followed different kinds of data things, I have formed this vision that the terribly broad datafication dreams…might not really produce terribly good results.

Here, the term "datafication dreams" refers to the 1st order imaginaries that are desired, while the consideration that they "might not really produce terribly good results" illustrates the interviewee's doubt regarding these imaginaries. During the analysis, we noted that each of the 1st order imaginaries was considered to have various societal consequences. For instance, making education more visible was imagined as leading to increased surveillance and control. Therefore, in Phase 4, we constructed 2nd order imaginaries derived from the consequences of 1st order imaginaries. All the constructed imaginaries are summarised in Figure 1, illustrating how the expert interviews did not result in a single coherent or holistic

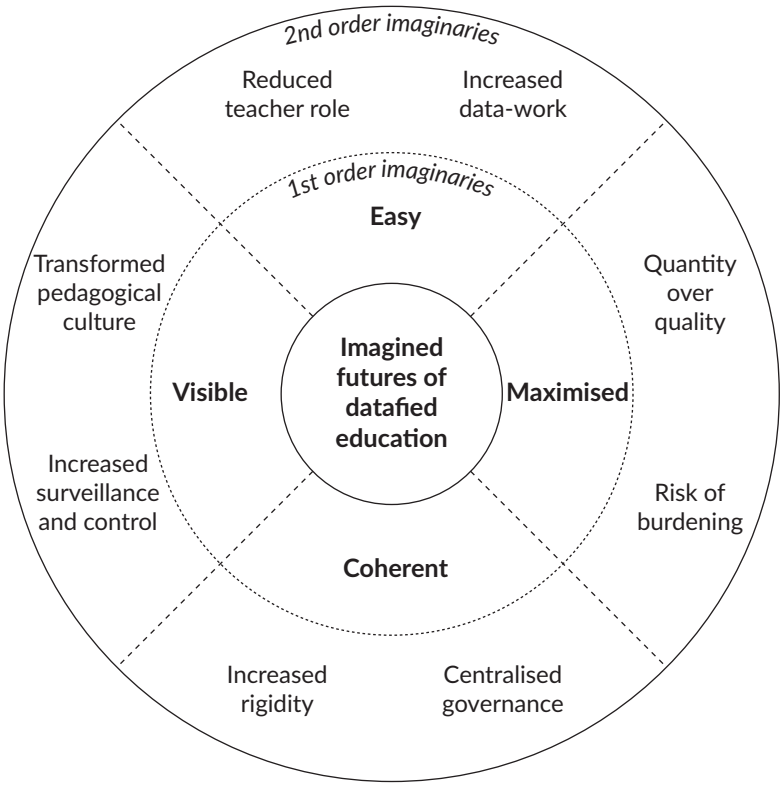

Figure 1. Sociotechnical imaginaries of datafied education.

imaginary of datafied education but, instead, highlighted different aspects of it. For example, the imaginary of "education made visible" had imagined consequences that the 1st order imaginaries did not include (e.g., increased surveillance of transformed pedagogical culture). This set of imaginaries was then diversified by determining 2nd order imaginaries, which emphasised the pluralism of educational futures. In the following section, the 1st order imaginaries are introduced, followed by a discussion of the related 2nd order imaginaries.

4. Findings

4.1. Imaginary 1: Education Made Easy (With Data)

The experts imagined different ways in which data technologies could make teachers' work easier (1st order imaginary), such as a personalised learning platform doing the teaching for them. By allowing pupils to study the content on their own using a platform, teachers can save time for other activities, such as interacting with pupils. However, this imaginary involves tension because when a teacher shares the teaching responsibility with the data technology, their *role* (2nd order imaginary) in the classroom reduces from an agentic and autonomous subject to an assistant for data technology (see Selwyn, 2019). Moreover, data technologies may require additional *work* (2nd order imaginary), in which case the teacher's time is not saved.

The following excerpt exemplifies the theme of ease. Here, the expert imagines a situation where, instead of learning from a teacher, pupils learn a subject independently using data technology that identifies their competence levels and adjusts their tasks accordingly:

> The lesson begins. Each pupil takes their own learning [platform], welcoming [them] with: "Hello, welcome [pupil's name]. Last time, we studied photosynthesis. Do you have any questions about it? Do you want me to help you with that? Do you feel you understand what photosynthesis means?" And I say: "I don't really understand it yet. Can you tell me a little bit more about it and what I need photosynthesis for?" Whereas another pupil in the class might ask: "This is quite simple for me; tell me more." And a third will ask: "What does photosynthesis mean in Finnish? I don't understand the word flower. What is a flower in Finnish?" (Technology 5)

The time "free[d] up" (Policy 14) by automated teaching was imagined as providing teachers with more opportunities to hold discussions with their pupils and get to know them better. As Technology 5 stated: "Then you [as a teacher] get to walk up to those pupils, you get to talk to them: 'Hey, how are you doing?' "

If data technologies are given a major role in education, even these dialogical interactions would serve the purpose of "fine-tuning" the algorithm in the end, as elaborated by Technology 25:

> [We] learn to read those children, to recognise, and that more teachers would have time to give it—let's call it empirical information. That the teacher would be present, they would have time to be more present to those children, to get to know them, to help the machine rather to develop so that we learn faster to understand that child, so that the programmes can support that child faster and easier, in a more straightforward manner.

The interviewee described how sharing teaching responsibilities with a "machine" would (appear to) increase the teacher's agency by enabling them to "be there" for the pupils. The latter part of the extract reveals how the teacher would not use the new information they obtain to inform their own teaching but, instead, would have to help develop the machine so that the software can support children more effectively. Thus, the teacher becomes an assistant to the machine, providing it with empirical information. In contrast to technologies "empowering and supporting teachers and educators to have confidence in what they are doing" (Policy 9), this transformation would limit teachers' pedagogical agency, highlighting their deprofessionalisation (Selwyn, 2016). This reduction in the role of a teacher illustrates the first 2nd order imaginary related to Imaginary 1: Education made easy (with data).

The next 2nd order imaginary is related to the amount of work that data technologies require. While it was imagined that technology would "free up people's time for more essential things" (Policy 8), many experts recognised that technology could also lead to more "data work" (see Hoeyer, 2023) for teachers. Policy 16 stated that they value educational data technologies based on the amount of work they require from teachers at a concrete level. When they had commonly asked technology providers about the sources of data, "quite often the answer is that, well, the teacher makes records" (Policy 16), and they continued to illustrate the problematic situation with a practical example:

> There is a system used in class, so you can observe that when [a pupil] is there, you click here, click there, and then make a record here. Thus, this accumulates certain types of data that can be used. For example, a certain kind of picture is formed about this pupil. (Policy 16)

Here lies the risk of increased data work: According to the technology provider, entering a single pupil's data would just be "a small thing. It's five minutes when you click on this page and put it like this" (Policy 16). However, the amount of work will quickly accumulate. As explained by Policy 16, "if a teacher has 25 pupils, and you have this one task that you do, so it took five times 25…it's a huge 125 minutes, more than two hours. That's a huge amount of work." If a teacher spends more than two hours manually entering data, they presumably would not have any more freed-up time left to get to know their pupils better, which is what data technologies are often proposed to offer. The problem is not the data but the way in which the data are generated. The expert conveyed their preference for the data to:

> By default…be of the kind that is generated automatically. I understand that if you are working in a digital learning environment, the data generated in it, if it can use it automatically, without you having to enter the data into it, then it is already a thing that you can get something from. (Policy 16)

It should also be noted that the use of digital environments enabled by automated data collection may require data work. Data work is not only related to whether a teacher has to manually enter data but is also a matter of the meta-level work required, such as developing the necessary skills and competencies. The integration of data technologies raises new demands not only for data competencies among learners but also for those teaching the competencies, such as for educational institutions. Accordingly, Data Justice 11 imagined a desirable future in which "teacher education should be really prepared for this and ready to teach these things to future teachers."

4.2. Imaginary 2: Data-Maximised Learning

Data technologies were imagined to increase the amount of learning among pupils by challenging them and ensuring that all curricular contents are addressed. These are aspects of data-maximised learning—an imaginary that concerns the objectives of education. A closer exploration revealed two 2nd order imaginaries that created tension with data-maximised learning. With the desire to increase learning comes the risk of *burdening* the pupils. In addition, maximisation can emphasise the *quantitative* aspects of learning at the expense of the qualitative aspects.

The experts conveyed that data technologies, such as personalised learning platforms, have the potential to maximise the amount of learning. Technology 4 envisioned the following:

> If [data-based artificial intelligence] can be harnessed, for example, in learning environments in such a way that it learns from what the user is doing and offers the right kind of questions, asks the pupils certain types of questions, and in a way challenges them to learn more and more, then I think that's desirable.

A similar "expansionist mind-set" (Selwyn et al., 2020, p. 101) was also evident when data technologies were imagined as ensuring that curricular content would be addressed in its entirety. In this regard, Data Justice 2 imagined that "the pupil would see a heatmap, that 'hey, now in history we have covered things like this. There are still these unaddressed issues.' So that this issue can be brought to the fore." In this scenario, with the help of a "heatmap," pupils would be able to follow the progress of their curriculum-based learning and check whether any aspects are missing.

Some experts highlighted the importance of emphasising the quality of learning, rather than simply maximising learning, which led to tension in the imaginary of data-maximised learning. The 2nd order imaginary in question is evident in the following scenario, where Technology 21 envisioned a national policy that would aim to improve the overall quality of the learning experience rather than purely quantity:

> [The policy] doesn't have to define what data will be used, but it would be a kind of national data programme to improve the overall quality of learning. That's probably the right term. It doesn't mean that the numbers should go up, but that we should have [the] well-being [of] pupils and graduates who leave school believing that [they] can make it in this world.

This interviewee clearly opposed the "the logic of output maximisation" (Zomer, 2024, p. 7), according to which numbers are expected to grow. The interviewee recognised the difference between the actual phenomena and the data that represent them. As data technologies tend to operate with quantitative measures, which are often technically easier to process, they are unable to account for the complexity of multifaceted issues such as learning. If the focus is on measurable data, some vital aspects may be overshadowed (Zomer, 2024). The expert noted that simply increasing numbers is not enough; the actual well-being of pupils is more than just a quantitative measure. The viewpoint was also reinforced by Data Justice 12, who argued that by limiting (instead of maximising) the curricula, education providers would be "able to focus on the right things":

> Because somehow it seems that we always say that pupils should be taught this, that and the other, [and] we say that it's important to teach them data protection, but in the end it can be quite a heavy burden what they should learn. So that [learning] would remain in moderation, however.

The interviewee seemed to note a common mindset: That various societal challenges, such as data security, can be addressed through education. As new challenges, concerns, and issues appear, schools end up covering a wide range of topics: "this, that, and the other." The challenge is that individual phenomena can be vast, making even a single topic "quite a heavy burden." This notion represents another 2nd order imaginary: the risk of burdening. To address the imbalance between the numerous teachable topics and the limited resources available without compromising pupils' well-being, the expert suggested limiting the learning content rather than maximising it.

The question about burdening goes beyond the current era. Since the end of the 19th century, the amount of content taught in schools has increased, "piling up more work for the teacher and the pupil to do" (Lamb, 1903, p. 67). A glance at the three latest Finnish national core curricula for basic education indicate that this trend has stayed the same in the 20th and 21st centuries: The length of the core curriculum was 111 pages in 1994 and 320 pages in 2004, and the efficient 2014 core curriculum is 472 pages long. Additionally, recent large-scale studies have evidenced a steady growth in the number of students experiencing school burnout (Read et al., 2022; THL, 2023), indicating the intensification of educational content. However, it should be noted that as digitalisation increases access to different types of content, the number of topics covered may also increase.

4.3. Imaginary 3: Coherent Education

Many of the interviewed experts stated that data technologies have the potential to increase coherence in education. Datafication was imagined as facilitating alignment between the amount and quality of education received by pupils across the country. However, the requirement of coherence can lead to *centralised* educational governance and create perceived *rigidity* and associated social consequences, leading to a tensioned imaginary.

Policy 6 imagined educational coherence based on equality, one of the core values of the Finnish educational system:

> Well, at least my thinking is very strongly guided by this kind of equality perspective. I think it would be equal, for example, that pupils receive the same amount of math instruction. So then, if it seems that there are big differences in the number of hours of teaching…we would be able to observe, a little bit to think about what is going on.

In other words, data technologies can enable national-level monitoring of the amount of teaching that pupils receive, which would then allow for identifying and addressing possible disparities. Data Justice 2 provided an example of what this could mean in practice. They referred to the vision paper of the DigiOne platform (under development in Finland at the time of writing), which is aimed at connecting several educational elements, from lesson planning to assessment, on the same digital platform. DigiOne (2025) is a "national digital platform for education" built by Finnish municipalities (2019–2025), around which an "education ecosystem" will be

created. The development project is funded by the municipalities involved and by Business Finland, a public organisation (funds for innovation). With the help of this system:

> [A] teacher [would be] able to plan the lesson so that when I start to build an exercise and the learning session [based on the curricular criteria integrated in the system] and the pupils go to the system, [they] do the tasks [which are then] stored there. So it all connects everything all the way from the curriculum to what happened there. So it, in that way, of course, makes it also more visible in the information system that now these curriculum things had been dealt with today in this way and what kind of results came from there. (Data Justice 2)

According to the expert, the system "makes the teacher's work a little more goal-oriented" and also enables "the principal to see whether our teachers have gone through the whole curriculum and what has been left" (Data Justice 2). Therefore, the datafication of education could help align the amount of teaching and teaching methods. The interviewees also imagined that dissimilar integrations of data technologies across the country would lead to differing educational realities for pupils. Thus, in the name of educational coherence, a push for technological coherence was identified. To achieve the expected impact of data technology on educational practice similarly at the national level, technologies should be integrated to the same extent across all contexts. For Data Justice 11, in an undesirable future, "some teachers and some municipalities prioritise these things [i.e., datafication] really high or do a lot of things and pupils get a completely different education than what pupils in other schools or classrooms get. It's just that inequality…so that it doesn't become such a deepening…data gap."

The quest for coherence creates tension in a decentralised education system where local autonomy is expected to lead to relevant but possibly different educational practices (Lavonen, 2017). As explained by Technology 17, the national education administration could support schools by guiding them towards common solutions with "a recommendation on how to create interoperable learning analytics." In relation to the 2nd order imaginary of centralised governance, local education providers and schools in Finland have the autonomy to choose the services they use. Thus, the ministry "does not want to choose for [municipalities] what is the way [to use learning analytics]" or "does not want to dictate from above, because that is not how our education system works" (Technology 17).

Some experts highlighted the importance of pedagogical freedom instead of a centrally administered and coherent education system, even though it would lead to variance in educational practices and decrease coherence:

> I'm somewhat confident that I believe that we have this pedagogical freedom and that teachers have had the space to experiment and take action and work, so I do believe that good things are happening in Finnish schools, certainly a lot of things that I haven't heard of, but that enable us to find new paths and do new things. (Policy 14)

In addition to the tension between centralised and decentralised educational administration, the experts feared that the coherence brought about by technology (e.g., in teaching, curriculum, and assessment) would increase rigidity and thereby have undesirable consequences. Regarding educational practice, Data Justice 19 stated that "the concern is that now that there is not yet such strict legislation, Google and the

like will get the marketplace. And then it's really slow and difficult to move away from that to other tools." In this imaginary, schools would have difficulties changing the platforms they use if the role of a certain technology provider became highly essential. This would increase rigidity in the way education is organised, representing "infrastructural dependency in the datafied welfare state" (Cone & Lai, 2024, p. 1). On a generic level, a "horror scenario" for Data Justice 23 would be the "really strong social control and classification of people into different tracks based on what their results look like, which would then of course very much maintain the social class." This could happen by using data "in such a way that different gates are closed, and people are somehow classified and categorised in such a way that it becomes more difficult to make a social class jump or something."

4.4. Imaginary 4: Data-Visible School

The fourth 1st order imaginary involves making education visible through data. This refers to the multiple ways in which data technologies may help different stakeholders monitor different educational aspects. Two tensions were uncovered in relation to this imaginary. First, increased visibility was seen as a threat to current pedagogical *culture* based on autonomy and agency. Second, increased visibility was seen as increasing the risk of *surveillance and control*.

Data technologies were imagined as making aspects of education more visible, as they could enable data collection, aggregation, and discoverability. Data thus serve as visible representations of schools and the education system at large. The potential of data technologies to increase visibility was not only related to things already visible but also to other aspects that could be monitored. Imagining new potentials for visibility creates the logic of an ever-expanding "data gaze" (Beer, 2019). This was evident when Technology 21 envisioned the possibility of broadening monitoring from the perspective of educational governance:

> If we forget about the limitations and think about [the desirable future], then [the Ministry of Education] could bring in a clear, data-based map of more than just skills. Competence data is easier to deal with, but then what is the well-being or social exclusion, or where are the most positive pupils-type system, so it could be seen there.

Further, Technology 21 imagined that data technologies would have the potential to open a window into the future. With data, "you could sort of see if we should put a little bit more money into potential drop-outs, because then it will come back many times over if you get them on the right side of the fence, as it were." The data were imagined as ways to predict the future trajectories of pupils, thus facilitating decisions that could influence these speculative futures.

Increased visibility creates tension when the possible consequences for the current pedagogical culture are considered. According to the experts, trust strengthens agency and individual responsibility on many levels. This idea is often used to explain how trust encourages the development of pedagogical practices (e.g., Toom & Husu, 2016; Välimaa, 2021), whereas monitoring has the opposite effect:

> I have learned that Finnish primary school pedagogy produces good results for some strange reason when you trust children and adults and don't measure them too closely. It is the psychological phenomenon that when you start to measure how many lessons you have missed and whether the

> homework is done and so on, so in a way many times people have a bit of a childish reaction, a kind of rebellion that "this kind of thing, so what is this, now it is forced," that in a way it loses its own agency in the process and its own sense of responsibility and do now this way when it is forced. (Data Justice 2)

Shifting to data-based measurements could take the education system to a new stage. Data Justice 2 saw a risk associated with this: "If we transit to this type of measurement culture in education and the autonomy and agency and experimentation disappear…many things can fall apart."

The previous data extracts illustrate that it is important not only to consider data-based visibility in general but also to determine which issues are made visible, for whom, and for what purposes. Increased visibility was perceived as a form of control that diminishes individual agency, leading to things "falling apart" (Data Justice 2). Similarly, Technology 25 imagined a dystopia in which data would be used to control pupils by monitoring them.

> What I certainly don't want to see is that it's a control tool—the data. I mean, really. One time at a [large corporate event], a representative came to explain to me, in a fit of enthusiasm, what a great system they have, that they can monitor all the time that the pupils are on the computer, don't cheat and do this and that.

The expert's mention of "all the time" directs attention to the amount of visibility. Some experts noted that an increased amount of data can lead to the risk of surveillance. For Technology 4, in a dystopian situation, data would be collected "as a precautionary measure just in case something is discovered." Data Justice 12 stated that in a dystopia, "you collect a lot of data, and then there is a lot of surveillance. That's what the General Data Protection Regulation is trying to prevent, the formation of this kind of surveillance society." This expert noted and contradicted the logic of surveillance capitalism (Zuboff, 2015)—that is, of using accumulated data to predict and control human behaviour—by highlighting the role and purpose of the EU regulation to strengthen data protection rights.

5. Concluding Remarks: Negotiating the Future of the Welfare State Education System

The next data extract succinctly summarises the main findings of our study:

> Data collection [has] insane potential that can be used for very bad, or it can be used for very good. (Data Justice 3)

It reinforces the notion that data will play a strong role in the future of education while simultaneously addressing the potentials and pitfalls of datafication. While the interviewed experts imagined datafication as making education easier, maximising learning, and making education coherent and visible, they also imagined several consequences. The tensions between 1st and 2nd order imaginaries direct attention to the relationship between datafication and the key features of sustainability of the education system in the Finnish welfare state, such as the culture of trust and the strong role of the public sector.

5.1. From Trust to Accountability?

In light of our findings, trust—one of the key features of the Finnish education system (Välimaa, 2021)—becomes subject to negotiation in various ways. On one hand, trust relates to both the imagined visibility of datafication and to making education easier. On the other hand, education is trusted to enable social mobility. In these contexts, datafication may also have unexpected consequences.

Data technologies were imagined as ensuring that pupils across the country receive the same amount of instruction. This highlights the imagined visibility and coherence of education. In Finland, the minimum number of lessons for different subjects has already been defined by law. Pupils starting their nine-year basic education in autumn 2025 will undergo 1254 hours of mathematics lessons (Finnish Government, 2012). Thus, it appears that the imaginary is prompted by the perceived affordances of data technologies that enable more nuanced monitoring. Lesson time monitoring is also in contrast to the fact that there are no extensive accountability measures, such as the systematic school supervision system in Finland—a system that is datafied in other contexts (e.g., Dabisch, 2023). Gulson et al. (2022, p. 16) pointed out that data "transformations are closely tied to the reconfiguring of relations between trust, discretionary judgment, and personal and systemic accountability in education," and some experts have recognised that increased monitoring, which is experienced as mistrust, may reduce teachers' agency. Data-based monitoring can also influence power relations, creating asymmetry within a decentralised educational system. Although teachers may still have autonomy in local education decisions, increased data generation would lead to intensified monitoring, which may have the unintended consequence of reducing teachers' actual educational leeway. Thus, some aspects of the Finnish pedagogical culture might even fall apart, necessitating negotiations in the future to find balance.

Imaginaries that involve the use of technologies to solve problems on behalf of teachers (i.e., making things easier) give rise to questions about trust in teachers' agency in their own work. For instance, the imagined possibility of technology making education easier by reducing teachers' teaching workloads conflicted with the 2nd order imaginary of data work (see Hoeyer, 2023), which concerns the need for data technologies for maintenance and manual data generation, along with meta-level work for learning how to use these technologies. Instead of increasing the time available to teachers, data technologies may change where time is spent. Furthermore, some "technosolutions" (Bass, 2018, p. 37) can limit teachers' agency and pedagogical potentialities. Selwyn (2022), for instance, has discussed the consequences of monitorining pupils' attendance. The use of facial recognition system was stated to add 2.5 hours of weekly learning time for each pupil and free teachers from the burden of roll calls, thus making their job easier (1st order imaginary). Regarding the consequences, teachers identified that the system actually takes away many pedagogically meaningful opportunities in addition to routine manual work (2nd order imaginaries). Teachers described how the traditional roll-call routine enables them to interact with pupils and provides them with valuable information about pupils' readiness for a lesson. As one teacher in the study stated: "It's a pretty perfunctory process, but as a teacher you can use it in a whole range of ways that are actually about ensuring that the pupils are in the best place to learn" (Selwyn, 2022, p. 81). This practical example illustrates that if technology and its purpose are viewed too narrowly, it is easy to miss the complexity of the pedagogical realm. Moreover, to do the things that teachers have been doing during the traditional roll call, they need to create other new activities.

The question of trust also relates to making the future visible and controllable, which can increase rigidity in social mobility. Data technologies were imagined as enabling educational professionals to predict pupils' potential futures and make decisions to prevent school dropouts. Smithers (2023) addressed the mismatch of the imagined potentials of data-based identification and the consequences by arguing that "the promise and the function of predictive analytics is to freeze students' futures through a freezing of the past that takes as its object the permanent optimization of the present" (p. 110). This freezing was reflected in the 2nd order imaginaries, where datafication was feared to prevent people's mobility among social classes, regardless of their socioeconomic background, which went against the equity principle of welfare states. Predictions made exclusively based on existing data (indicating possibly unfavourable results) carry the risk of excluding futures that might otherwise be possible. Thus, to avoid unnecessarily closing off potential futures to people in advance, trust in the possibility of futures other than those predicted by data is needed.

5.2. From Public Goods to Private Benefits?

In Finland, formal education is provided by the public sector, which is in contrast to the more privatised systems even in other Nordic welfare states (Dovemark et al., 2018). The future imaginaries of datafication leave the current role of the public sector in education open to negotiation. This could mean integrating private services into the education system, which would expose pupils to the commercial digital ecosystem, or redefining the tasks, responsibilities, and role of the public sector.

On one hand, the tension between the public and private sectors is related to the division of labour between sectors. Although Finnish education is largely the responsibility of public actors, schools and education providers have the autonomy to choose the materials and services they use. As many data technologies used in schools are provided by private companies, their use represents the growing role of private influence within the public education system. Some interviewees suspected that these services may reflect a corporate perspective in addition to a pedagogical perspective. Others were concerned that the platformisation and concentration of services would make it difficult to break away from individual service providers, leading to "infrastructural dependency" (Cone & Lai, 2024). Some experts were hopeful that the public sector would get more involved in the development of technology, which represents a new avenue for the division of labour. In practice, this hopefulness is evident in the DigiOne development project mentioned earlier, which involves the municipalities, as public education providers, preparing a digital ecosystem for schools to use.

A renegotiated relationship between private and public interests is also related to pupils. Traditionally, welfare states have sought to protect pupils from commercial influences. The Finnish core curriculum states that "school and education must not be used as a channel for commercial influence" (EDUFI, 2014, p. 15). However, the intensifying integration of (privately produced) data technologies into everyday school practices may make it difficult to limit possible commercial influences. The digital tools and services used by teachers can collect a wide variety of data about their users, which companies can then use for purposes such as advertising, profiling, and optimising their own services (Lai et al., 2023). Given the diversity of actors and the changing roles, as mentioned in the previous paragraph, it is important that the backgrounds of the producers of data technologies are made transparent so that teachers and educational authorities have sufficient opportunities to assess the implications of the technologies they use and for the commercialisation of education. Technological development can be so rapid that all its consequences are not

sufficiently considered. As explained by Lai et al. (2023, p. 14), through "datafication, students' (school) life is commodified to an extent that has not yet been fully uncovered or debated within the context of the Danish welfare state." This indicates that more research and discussion on the future(s) of datafied education in welfare states is needed.

5.3. Sustainable Imagination Needs Inclusive Language

Future imagination is needed because educational systems face new and complex challenges. We agree with Nexø (2023, p. 1458) that, currently, "the dominant mood is not this [state of things] can never change, but, rather, this cannot go on." Concerning datafied education within a welfare state, this emphasises the need to imagine the direction and ways in which change occurs. Overall, the results illustrate that datafied education does not have a single imagined future but multiple. This diversity does not mean that the imaginaries presented here cover the whole range of possible futures. One limitation of our study was the scope of the interviews. The imaginaries we constructed from the data may have been different if we'd interviewed experts from additional relevant fields. After all, the future of datafied education is not only created by those who are involved particularly in datafication but by a broader constellation of stakeholders in education. In terms of sustainability, it would be beneficial to broaden our understanding of how local educational leaders, teachers, other professionals, and pupils themselves view the role and nature of datafication in the future. Would future imaginaries be shaped by themes similar to those in this study or by different ones?

One way to lower the threshold for participation in a discussion is to pay attention to the language and terminology used. So far, education policy as well as technology companies have maintained strong footholds in influencing how the future of education is discussed. This is reflected in strong and normative visions in education policy and technical features and affordances in educational technology. It is important to note that focusing on particular perspectives may emphasise them at the expense of others. For example, the Finnish education authority's prediction that data will be produced "everywhere" (EDUFI, 2019, p. 15) illustrates that central role that datafication is expected to play in the future. This imaginary has such powerful gravitation that it might be difficult to imagine education without various data technologies. On the flip side, if attention is focused on micro-level issues, such as the technological features and affordances of a single digital service or tool, complex structural issues of education may be neglected, or the language used may be so specialised that it excludes those who are actually affected. The question surrounding the future of datafied education is not just about technology but also about the potential and consequences of technology in the organisation and practice of education. Through our construction of sociotechnical imaginaries related to education (ease, coherence, maximised, and visible), we aim to create a space for an inclusive debate on the future of education, which could, in turn, contribute to strengthening sustainable development in education.

The value of imagining the future cannot necessarily be assessed based on accuracy. The complexity of the social world deems imaginaries to always be incomplete and contradictory to a certain extent. According to Jameson's (2005, p. xvi) idea of the "anti-anti-utopia," the strength of future imaginings may lie in their inconsistencies and limitations. Discussions about the future may be more relevant than trying to imagine a perfect picture. Imperfections can inspire new and unexpected ways of thinking, which can lead to sustainable decisions and actions that ultimately influence the way the future shapes up.

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The authors declare no conflict of interests.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Supplementary Material

Supplementary material for this article is available online in the format provided by the author (unedited).

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About the Authors

Lauri Palsa is a postdoctoral researcher at the Department of Teacher Education, University of Jyväskylä, Finland. His research interests focus on datafication and emerging and contextualised literacies, such as data literacy, media literacy, and multiliteracies, both within and outside formal education.

Janne Fagerlund is a postdoctoral researcher at the Department of Teacher Education, University of Jyväskylä, Finland. His research interests are in education related to digital topics such as programming, computational thinking, artificial intelligence, and datafication. He is also actively involved in developing pedagogical approaches through teacher training and school activities.

Pekka Mertala is an associate professor in the Department of Teacher Education at the University of Jyväskylä, Finland. His main research interests focus on critical studies of the role of digital technologies in both formal (i.e., school) and non-formal (i.e., hobby-related) learning contexts.