UNIVERSITY OF GOTHENBURG

DEPARTMENT OF EDUCATION, COMMUNICATION & LEARNING

THE IMPACT OF PLATFORM-BASED DATAFICATION ON PEDAGOGY

A qualitative meta-synthesis of how digital datafication shapes teacher and student practices

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Thesis:	30 higher education credits
Program and course:	International Master's Programme in IT & Learning
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Supervisor:	Thomas Hillman
Examiner:	Annika Lantz Andersson
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Abstract

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Purpose: This qualitative meta-synthesis examined how the impact of digital datafication on pedagogical practices in European schools is addressed in existing research. It explored the interplay between school governance, datafication and digitization of teacher and student practices.

Theory: To conceptualize the assumption that school governance is generally the reason for the datafication of schools, I adopted Foucault's conceptual construct of governmentality.

Method: Twenty-four studies, published between 2004 and 2021 were obtained from five electronic databases (Web of Science, SCOPUS, ERIC, Education Complete (via EBSCOhost platform and Google Scholar), citation chasing, and manual searching. Studies that focused on data practices, the use of learning technologies, and performance-based accountability were scrutinized, and relevant data extracted, coded, analyzed to identify recurrent themes which were synthesized to generate the findings of the study.

Results: A synthesis of the outcomes from most of the studies indicated that data practices, integration of learning platforms/technologies and performance-based accountability had both positive and negative effects on pedagogy in European schools, although result of one longitudinal study pointed out that cases examined could not establish how learning analytics specifically led to positive impacts in schools. One striking relevance of the findings from this study is the indication that the interplay of datafication enablers/elements appeared to expose teachers to precipitators of mental and psychosomatic health issues, and it also revealed the absence of students voices in studies exploring datafication in schools..

Foreword

This research initially stemmed from my interest in developing an academic career that focuses on digitalization in schools and professional learning, including the intersection between big data, technology, and education. Fortunately, serving out my internship with the PADDLE research group within the University of Gothenburg provided me with the opportunity and platform to work on a policy analysis task on digital education policies in different countries. I am grateful to Thomas Hillman, who supervised my internship as well as my thesis. He was very considerate, understanding and ever willing to respond to my concerns. I also wish to commend and thank all the lecturers that participated in our programme.

I could not have succeeded in this programme without my incredible team's extraordinary support and understanding on the home front; my precious wife, Omoyemwen and my young children, David, Daniel, and Deborah. The programme's demands meant I did not have time for them as I should and as promised before we left my country for Sweden. I owe you all! Thank you all for your unwavering support.

Collaborating with peers from different continents is an experience I cherish, and I appreciate the opportunity to have been elected the students representative at the ITLGU Master's programme board for the 2020/2021 session.

Table of content

List of tables

1. Introduction

1.1. **Background**

The development of evidence-based practices, virtual learning environments, and other technologies built into the school system has created an ever-growing appetite for data. Triggered by the influence of the ”big data” revolution in all essential facets of existence, it helps drive digital transformation in the education sector worldwide (Jarke and Breiter, 2019).

The collection, generation and use of school data has always been part of the education system, initially including attendance lists, absence and sickness reports, internal tests and examination results, sports competition results, school inspection reports and external examination results. However, changes required by the transition to evidence-based school practices, among other initiatives, have led to the adoption of various educational technologies, including virtual learning environments and data infrastructure, to govern education more effectively (Ozga, 2009, 2016; Williamson, 2016). Educational technology has fueled this development, promising better assessment processes and student outcomes conveyed through digital platforms that have become commonplace in schools.

Since the industrial revolution, the measurement, evaluation and use of data have played an essential role in how organizations and governments make decisions and improve the efficiency of their institutions. However, the use of digital technologies and the need for data verification, coupled with the need to demonstrate the positive impact of teachers' classroom practice on student data, has resulted in a massive increase in the volume, scope, diversity, value, relevance, and use of digital data that are continuously produced in schools, and new ways of collecting, processing and using this data to present outcomes of situated interactions (Eynon, 2013). The availability of these platforms, in turn, catalyzed more ambitious data-driven education policies (Williamson, 2017).

Datafication can be dated back to the Industrial Revolution era practice of nation-states conducting censuses, through which result they planned for the establishment of services and amenities to the populace (Ambrose, 2015), with it becoming entrenched in the education systems of nations since the 19th century (Williamson, 2017). However, the phenomenon has undergone transformation at different times, leading to digital datafication that is characterized by "big data", so-called because of its peculiarities.

'Datafication of Education' is about converting several aspects of education into measurable data, subjected to different technological methods for processing and analysis, so schools, teachers and students could be governed (Williamson, 2017; Jarke & Breiter, 2019, Fawns, Aitken & Jones, 2021). The digitization of teacher and student practices results in different data types, including test scores, student satisfaction ratings,

workload surveys, attendance and absence records, sickness reports, marking turnaround times, learning analytics, and far more (Fawns, Aitken, & Jones, 2021).

1.1.1. Datafication and school governance

Given the global trend of school governance relying heavily on performance data, teachers worldwide are increasingly under intense pressure to have their schools and students rated highly in international assessments and standardized test scores (Neumann, 2021). Some schools that adopt international large-scale assessments now tie teachers career advancement to the test scores. Consequently, they are constrained to focus on teaching the standardized tests more than on the students and how to help them based on individual differences. Like other endeavours in a digitalized society, schooling outcomes now must be datafied and converted into data formats that lend themselves to manipulation by algorithms (Jarke & Breiter, 2019). Through learning analytics platforms, data is scrapped and mined from learners and teachers' digital practices and traces (Williamson, 2020; Lupton & Williamson, 2017), holding out a promise of improving teachers and students practices, through manipulation of the data generated and harvested as they interact with the school digital platforms.

For the data produced to be standardized and meet various requirements, educational data need to be subjected to complex and incredibly detailed analysis and, for the most part, done in real-time. Meeting the above requirement is made possible by applying computer algorithms embedded in specific digital technologies (Jarke & Breiter, 2019).

1.1.2. Digital platforms in schools

The use of platforms in schools can bring teachers and students into contact with standardized learning environments, provide the basis and infrastructure for collecting data from and about teachers and students' practices and analysing them to obtain valuable insights into the practices. However, the logic of participation in platforms such as Google classroom and others provided by big technology companies (big tech) poses some problems, including the teacher's loss of control over the dynamics of educational practices with students, hidden cross-selling techniques, surveillance, automation and division of labour. These digital technologies differ from ordinary learning management systems (Perrotta et al., 2020) in that manufacturers designed them to subtly shift the determination and control of the teacher and student practices from schools to technology companies. As a result, schools and governments worldwide are inadvertently relinquishing power over their educational systems to corporations in return for initially providing seemingly free platforms that tech companies and advocates consider appropriate to enable teaching, learning and make school administration more efficient, objective and standardized.

With platforms from the big tech companies like Google, Apple and Microsoft used by schools, the teaching and learning dynamics in these schools are no longer solely determined by them but by the tech companies that set the rules, distribute work and decide to a certain extent how teachers and students should act. The software running Google classroom algorithms embed some preset choices and motions that users cannot navigate away from if the platform is purposed to place such a constraint. With application programming interfaces (APIs) embedded in the platform, Google can execute commands that users may not know or have access to data that they have not directly consented to.

Platformization, therefore, presents a risk on different fronts to the philosophy of education's utilitarian purpose of being a public good. The big tech companies have power in setting the rules for the relationship between them and end-users, be they corporations or governments. (Kerssens & Dijck, 2021).

1.2. **Rationale/purpose of the study**

This qualitative meta-synthesis aims to examine how the impact of digital datafication on pedagogical practices in European schools is addressed in existing research. It explores the interplay between school governance, datafication and digitization of teacher and student practices.

1.3. **Delimitation of the study**

This study focused on the impact of digital datafication on teacher and student practices in European schools. This delimitation of the study was predicated on the commonality of regulatory and educational culture within the countries in Europe. Since the 1970s, some European nations started implementing education policies with the same focus and similar governance mechanisms (Duan, 2004). Within the last two decades, the European Union has sought to amplify uniformity in the education systems of member countries with a European Education cooperation frameworks; the Strategic framework for European cooperation in education and training ('ET 2020'), a forum launched in 2009 which allows member states to exchange best practices and to learn from each other[1] and a new agreement entered in February 2021 (European educational cooperation 2021-2030), aimed at creation of European Education Area by 2025

A key example of such policy work is the General Data Protection Regulation (GDPR)[2] that governs the access to and processing of the personal data of everyone living in any of the countries within the European Union. The GDPR, though a European Union regulation, applies to any organization that collects data from any subject in the European Union is considered the strictest data protection law in the world. This kind of

[1] https://ec.europa.eu/education/policies/european-policy-cooperation/et2020-framework_en
[2] https://gdpr.eu/what-is-gdpr/

initiative makes Europe a particularly interesting context in which to study issues of datafication.

1.4. **Research Questions**

This study examines the following questions:

- How does digital datafication of teacher and student practices affect pedagogy in European schools?
- What is the relationship between datafication and governmental control of schools in Europe?
- What are the pedagogical implications of using digital platforms for teacher and student practices?

1.5. **Objective**

The findings from this study complement knowledge in the growing field of datafication and pedagogy, especially from the perspective of using digital platforms for school practices. It synthesizes existing results and conceptualizes the critical relationship between digital datafication and pedagogy.

1.6. **Structure of the research report**

This work consists of seven chapters. In Chapter 2, I discuss governmentality as the conceptual framework for this research. Chapter 3 focuses on some of the previous systematic reviews related to datafication, along with a consideration of the methodology chosen to conduct this research. Chapter 4 describes the research methods, including the search strategy, the specification of the selection criteria, sources of information, the search strategy, data collection and analysis processes, and the selection of the included studies using a flowchart. Chapter 5 discusses the findings and conceptualizes the relationship between data practices, learning technologies, performance-based accountability, and pedagogic practices in European schools. I present the results by interpreting them in terms of governmentality and conceptualizing the vital relationship between digital datafication and pedagogy in chapter 6. Chapter 7 contains a summary that provides a take-away point related to the overall aim of the study.

2. Conceptual framework

Given the focus of this study on datafication, and since the design is a systematic review with methodical search and collection of primary data, based on adherence to a pre-defined protocol, I argue that there is no need to adopt an explicit learning theory. However, other assumptions are made that require conceptualization. In particular, based on the literature dealt with in the following chapters, I argue that school governance is generally the reason for the datafication of schools. I use the conceptual construct of governmentality advocated by Michel Foucault to conceptualise such governance.

2.1. **Premises**

The concept of governmentality has its roots in the College de France lecture Michel Foucault gave in 1978, in which he advanced his conceptualization of government (Graham and Neu, 2004) and how it works to achieve its goals. This term he developed is derived from two words, government and mentality, which suggests that good governance results from state agents acting rationally, knowing what to do and leading citizens to activities and processes in order to achieve them. Foucault dealt with the question of the balance of power in modern governments. His primary interest was analysing the exercise of power by focusing on developing state rationalities and associated technologies (Simons & Masschelein, 2006).

Foucault stressed the necessity for self-government and the government of others working in alignment to achieve peace and prosperity for all within a state. He postulated that, in contrast with the exercise of power using the brute force of coercion as evidenced during early civilizations, modern-day, liberal democratic governments use of power is more subtle, with the actual driving force invisible to the population and concealed in the notion of citizens freedom due to democratic governance.

An essential premise of Foucault's approach to governance is that modern governments operate through a network of indirect power, relying on heterogeneous agents and locations (Miller and Rose, 1990: 8). Instead of using brute force through direct control, they try to push through their goals using techniques that create collaborative and self-disciplined citizens. It is believed that economies in modern democracies benefit not only from the laws and policies of the three government arms (legislative, judicial and executive), but also from a network of routines and technologies of interconnected actors and relationships, both in the private and public sectors that are regulated by the state, but also restrict and behave in a self-governing manner. (Graham and Neu, 2004).

Governmentality focuses on strategies, techniques, methods, and technologies that the state has deliberately employed or incorporated to achieve its goals through maximizing its resources, key among them being the populace. According to Peters (2001), as cited

in Dorherty (2007), "... government in this sense only becomes possible at the point at which policing, and administration stops; at the point where government and self-government coincide and coalesce".

The state operates based on the assumption that the population includes a collection of citizens with a personality and social responsibility mindset, committed to seeking and supporting the aims of government (Doherty, 2007), as a mutual response to the freedom they enjoy as citizens. States interventions are usually directed at what it perceives as its interests. To achieve this, agents of the state create conditions aligned with the usual routines of the governed. This way, people do not see compliance as coerced or demanded by government agents. Rather, it operates as a cycle of willing submission to useful courses of government.(Li, 2007; Miller & Rose, 1990).

Authoritarian rulership, exemplified in part by use and display of raw power and pressure, is ditched for approaches that use different tactics to steer people's conduct with an ingrained belief and understanding that by acting the way they do towards matters of state and governance, they are following their interests. At the same time, underneath these actions are the invisible hands of the state that has conditioned the conduct of concerned citizens, such that in pursuing what they consider to be in their interests, they accomplish the aims of the government, without feeling coerced into doing that (Scott 1995:202). The population internalizes the idea that governments serve the common good of the governed and, in a certain way, this becomes a central motivator for their behaviour towards and reactions to state interference in their activities as individuals, groups, organizations and communities.

Another premise advocated by Foucault was that governments manipulate statistics or numbers to create and get populations to accept new interventions readily, thereby reducing, if not eliminating, resistance. Well-structured statistics on a particular government project become a tool to convince various interest groups. Miller and Rose (1990) describe how such datafication of society has been taking place since the advent of the census, in which government officials conduct a census, cleanse the data obtained, and apply different treatment modalities. From this perspective, datafication can primarily be understood as achieving the goals of governance expressed in socio-economic and political discourse. This concept of governmentality encompasses the power relationship between the state and the people / governed, which manifests itself through governance, technologies (means/methods, strategies, institutions and instruments of state) used by the government to achieve the desired goal.

2.2. **School governance by numbers**

Looking at school governance worldwide, Foucault's concept of governmentality helps clarify the performative and accountability oriented efforts of governments in different regions of the world, each taking steps to bring their countries to the top of the schools

ranking league tables. The Organization for Economic Cooperation and Development (OECD) drives the global rush to govern schools by numbers. Governments of nations have committed to using the results of the OECD's program for international student assessment (PISA) ranking to measure the effectiveness of schools and teachers.

To not contradict government expectations for which they might be sanctioned, schools are increasingly being shaped in the image of data and numerical requirements hence schools device ways to navigate this, for example, by teaching to the test. They also have to deal with a second agency of governance by numbers, namely the big tech companies and the platforms they make available to schools. These platforms provide application programming interfaces, clickstreams, and other embedded components that extract student data with and without their express consent. In times of big data, the hunger for data is insatiable. This has implications for how teaching and learning occur, and the practices of teachers and students are influenced.

3. Previous research

For centuries, state actors have recognized the overarching relationship between the availability of statistical information and governing people (Williamson, 2017: 213). Although metrics have been used since the dawn of modern civilization to inform government policies, plans and interventions, particularly on socio-economic issues, and thereby exercise state power (Shore & Wright, 2015; Merry, 2018; Bhuta, Malito and Umbach, 2018), it has now achieved worldwide relevance as a government technology (Öjehag-Pettersson, 2020)

Since the ninety-eighties, we have seen the emergence and evolution of a new form of governance through the use of performance indicators and rankings, where schools, staff and students are data-driven and subject to international rankings, a phenomenon that has created new dynamism, governance and subjectivity (Shore & Wright, 2015). The normalization of the quantification and indicators supports the stated goal of having the population conduct themselves willingly, based on externally determined and remotely operationalized metrics or standards, a major premise of Foucault's governmentality concept.

Historically, data practices in school are as old as modern-day schooling and can be traced to the industrial revolution in the 18th century (Williamson, 2017). They were used primarily for internal decision making within individual school units. However, the permeation of the "big data" concept and its application globally has also precipitated the need for schools to have and integrate technologies into their processes, so they can capture, process and visualize data at speed, volume and with the characteristics that make them machine-readable and amenable to algorithmic operations.

There is a growing interest in learning analytics, algorithms and artificial intelligence in education and technology integration in educational settings. These issues are all interlinked with the datafication of education. The questions addressed are diverse and include the handling of ethical concerns about learning analytics, its implementation as a tool for better student-centred institutional leadership, theoretical and pedagogical foundations of technology-based teaching and learning.

While the learning analytics literature has highlighted its contribution to improving academic performance, student engagement, reducing dropout risk, and improving the process and outcomes of feedback (Banihashem et al., 2018; Ifenthaler and Yau, 2020; Alfy, Gomez and Dani, 2019; Na and Tasir, 2017), there are concerns that the theoretical principles, scope and quality of the data are not considered (Alfy, Gomez and Dani, 2019). Equally, there are ethical and technical problems when using learning analytics in education (Banihashem et al., 2018; Ifenthaler 2020).

While advocates of technology for teaching and learning promote the unique benefits of these platforms, others express concern about automating school practices. Contradictory research results, privacy issues in data collection and use, the loss of

autonomy and control of teachers and schools' day-to-day operations, and decision-making about curriculum, administration, teaching and learning are other focus areas. These concerns in no way negate the fact that appropriate application of technology could add significant value to the system. However, it can be argued that the contribution of technology to education transformation appears in most cases overrated and that technology cannot inherently create the utopian experience projected by educational technology companies and enthusiasts (Selwyn, 2017).

Several researchers claim that digital technology in learning activities improves students' cognitive and affective skills (Lai, J.W.M. and Bower, M., 2019; Stancin et al., 2020). In addition, numerous studies have examined the value of implementing learning analytics and educational data mining for schools (Papamitsiou & Economides, 2014; Schwendimann et al., 2017). Others have explored human use of digital technologies to generate and use data about themselves and the impact of such practices on understanding governmentality (Catlaw & Sandberg, 2018). In their study that examined the relationship between teachers' self-efficacy and technology integration, Bakar., Maat and Rosli (2018) found a positive correlation.

Artificial intelligence has led to technological advances in various areas of life and in education, it has been employed in developing adaptive learning systems that enhance learning through personalizing learning design and delivery (Pappas & Giannakos, 2021), and creating personalized learning environments. However, reviews evaluating the use of technology in education suggest that researchers in their studies did not adequately account for the impact of artificial intelligence technology on the practice of teachers and students at college levels. (Zawacki-Richter et al., 2019). Furthermore, Cavanagh et al. (2020), Imhof et al. (2020) and Somyürek (2015) noted that many of the adaptive learning systems used are not deployed in the school system. Also, pedagogical models were also not designed in studies carried out, and the application of the principles in the learning activities was not explained (Gonzalez-Calatayud, Prendes-Espinosa and Roig-Vila, 2021)

3.1. **The identified gaps in the literature**

Much of the work discussed above highlight the benefits technology integration could bring to educational institutions, including personalization of learning, the objectivity of measurement, easier monitoring of student practices, better reporting, and sometimes mention the ability of technology to facilitate more creative pedagogic practices. However, such research often fails to explain how the datafication needs and processes (inseparable from digitization in and digitalization of schools) work to shape pedagogic practices.

This study examines the interplay between datafication, learning technologies/platforms, performance-based accountability and pedagogy. I address this from the conceptual

perspective of governmentality, using a systematic review of existing research findings related to the study's topic

3.2. **Different ways of doing systematic reviews**

Depending on the research purpose and question, different approaches can be used to conduct a literature study. The central issue of this study is how data practices, digital platforms, and performance-based accountability in schools shape pedagogy.

While it is possible to research a topic through literature studies/reviews with both narrative or systematic review, a systematic review is particularly suited for contributing to knowledge in areas where research is conducted across disciplines and approaches. By focusing on peer-reviewed articles, the systematic review ensures that the materials considered in preparing the reviews have already been rated among the best in the field under study by their scientific journals through rankings from those in the field of study (Thomas, 2017). This provides a reasonable basis for a new researcher to delve into current discussions in this area.

3.3. **Qualitative meta-synthesis**

This systematic literature review was conducted using the qualitative meta-synthesis method. Qualitative research studies how people interact with the world, which cannot be discovered from punching numbers and making inferences or correlations with them, as quantitative research does heavily depend on numbers, processed using statistical tools to deduce and make conclusions (Jensen and Allen, 1996). Metasynthesis is recognized as a useful method when a study's aim is generating meaning about a topic of interest by pooling qualitative data from many studies and re-interpreting them (Atkins et al., 2008).

I used a qualitative meta-synthesis method for synthesizing the data obtained and then worked with document interrogation, appraisals and interpretative synthesis (Biesta, 2007). The goal of using this method was to eventually, from an in-depth study of existing intellectual viewpoints on the subject and interpretative synthesis, identify patterns, similarities, differences and contradictions, regarding how datafication influences pedagogy. In this study, findings from several studies were examined, and a thematic analysis approach was used to identify common themes and clarify observed trends, patterns, issues, concepts, et cetra. The result envisaged with this method is producing new viewpoints from synthesizing the findings in the reviewed reports.

4. Method

4.1. **Data collection**

The topical, population, temporal and methodological parameters associated with the purpose and research questions form the basis of the inclusion criteria. I excluded articles that did not meet the inclusion criteria (as indicated) in the exclusion criteria below were not considered for inclusion.

4.1.1. Inclusion criteria

The literature must contain at least one of the keyword's variants and a linkage between the keyword and another associated with the study's central concepts, the outcome of qualitative research published from 2001 to 2021 and written in English. Literature that must be peer-reviewed could be individual articles, meta-synthesis, or systematic reviews. Also, the records must be publicly available in full text, with open access.

4.1.2. Exclusion criteria

Records that did not meet the inclusion criteria above were not considered. Specifically, studies with the following attributes were excluded from the corpus:

- *Did not use qualitative methods*
- *Not published in an international journal or conference proceeding* (for example, articles that were not peer-reviewed, books, trade reports, dissertations, theses)
- *Not empirical or evidence-based* (for example, conceptual or position papers that address the research aim and questions)
- *Not related to this study, despite a focus on datafication* (for example, studies on datafication in health, transportation, or urban development)
- *Abstract does not indicate relevance for this study* (for example, abstracts that do not mention in any way, any of the key concepts in this study, such as datafication, platformization, pedagogy, standardized tests, accountability, and school governance)
- *Empirical focus outside of Europe*
- *Unpublished work*
- *Language other than English*
- *Published before 2001*.

4.2. **Information search**

I searched for documents from the following databases:

a. Web of Science
b. SCOPUS
c. Education Research Complete and ERIC (Education Research Information Centre) accessed via EBSCO Host platform
d. Google Scholar

Additional documents were obtained through citation chasing and a manual search of key journals in the research field.

4.3. **Search strategy**

4.3.1. Search terms and strings

The following search terms, phrases, and their synonyms or alternatives/variants derived from the research questions formed the literature search strings.

School datafication (school data practices, educational data management, school information system management, education information management, data-driven school practices/data-driven practices)
Platformization (platform technologies, school clouds, platformization, platformisation)

Pedagogy (teaching and learning, instruction, training, teaching methods, teaching strategies, classroom practices, platform pedagogy)

Evolution of datafication (pre-digital datafication): To capture datafication practices that preceded digital datafication, I searched for articles on large scale learning assessments/standardized testing.

Due to the differences in the interfaces of the databases searched, the rendering or use of the keywords/phrases varied as indicated in tables 1 and 2

The search was carried out in steps and several iterations. I used the keywords and variants with the truncation symbol (*) to get more documents in the first step. Most of the search terms used were in the form of phrases as shown below:

- Datafication, schools datafication, datafication of education, schools data, educational data management, school information system management, education information management system, data-driven education
- Digital platforms, Platformization, platform technologies, school clouds.
- Pedagogy, teaching, learning, teaching methods, teaching strategies, platform pedagogy

The Boolean operators "OR" and "AND" were applied to expand and constrain the searches as appropriate, aiming to ensure that the search was as comprehensive as possible while also focusing them rightly. The initial search yielded many records, running into hundreds of thousands, before the platform-embedded filters were used across the databases, based on the study's inclusion criteria. Tables 1 below show the use of the search terms on the different platforms, and table 2 indicate the filters used in limiting the search results suitably

Table 1: Search strategy (databases, key concepts, search terms and strings)

Interfaces/ Databases	**Web of Science** *Web of Science core collection*	**SCOPUS** *SCOPUS*	**EBSCO host** *(ERIC/Education)Complete)*	**Google Scholar** *Google Scholar*
Key Concepts				
Datafication	TOPIC (datafication OR digitization) OR (school dataf*) OR (digitally mediated school*) OR (school data practices) OR (digital data management)	TITLE-ABS-KEY("school datafication") OR ("datafication") OR ("data driven education") OR ("school dataf*") OR ("digitally mediated school*") OR ("school data analytics") OR ("school data practices") OR ("digital data management") OR("education datafication")	TI "datafication" OR "school dataf*" OR "data driven education" OR "digitally mediated school*" OR "school data analytics" OR "school data practice*" OR "digital data management"	datafication, pedagogy, teacher practices, student practices, school practices
Platformization	TOPIC (platformis?ation) OR (digital platform*) OR (platform critical studies) OR (learning technology*) OR (cloud*) OR (data dashboard*) OR (platform pedagogy) OR (learning management system) AND (TOPIC) datafication	TITLE-ABS-KEY ("digital platform*") OR ("platform technology*") OR ("school platform*") OR (platformization) OR ("learning technolog*") OR ("school cloud*") OR ("school data dashboard*") OR ("platform pedagogy") AND ("learning analytics")	TI (platformization) OR ("digital platform*") OR (digital education platform) OR ("platform pedagogy") OR (learning management system) OR ("platform technology*") OR ("learning technology*") OR ("school data dashboard*")	digital educational platforms, datafication and pedagogy, platform pedagogy, virtual teaching *Due to the framing of the search string for platforms above, to include terms for pedagogy, there is no separate search string for pedagogy*
Pedagogy	TOPIC ("platform pedagogy") OR ("technology enabled teaching*") OR ("adaptive learning") OR ("digital learning") OR	TITLE-ABS-KEY ("pedagogy") OR ("platform pedagogy") OR ("technology enhanced pedagogy") OR ("technology mediated class*") OR ("teaching	(pedagogy) OR (platform pedagogy) OR (technology enhanced pedagogy) OR (technology mediated class*) OR (teaching method) OR ("digital teaching")	

	("platform linked pedagogy ") OR ("learning platform participation") OR ("participation logic") OR ("platform based pedagogy") OR ("e-learning ") OR ("virtual learning") AND (TOPIC) student learning experience	method") OR ("virtual learning*") AND ("technology pedagogy")	) (AND) TX "technology pedagogy"	
Large Scale Learning Assessment	TOPIC (large scale learning assessment*) OR (standardized test*) OR (large scale assessment*) OR (school* ranking) OR (school* measurement) (AND) TOPIC datafication	TITLE-ABS-KEY ("large scale learning assessment*") OR ("standardized test*") OR ("large scale assessment*") OR ("school* ranking") OR ("school* measurement") (AND) TITLE-ABS-KEY (school AND accountability) AND (teaching, AND pedagogy)	TI ("large scale learning assessment*" OR "International Large Scale Assessment*" OR "standardized test*" OR "teaching to the test") AND TX pedagogy OR TX school datafication	standardized testing, large scale learning assessment*, teaching to the test, teachers work, pedagogy, school accountability, governance

Table 2: Database search results

Interface/Databases	**Limiters applied/Refining of search**	**Results** *A-Datafication, B-Platformization, C-Pedagogy, D- Large Scale Learning Assessments*			
		A	**B**	**C**	**D**
Web of Science	Publication year: 2001 -2021 Language: English Web of Science Categories/Research Areas: Educational Research Region: undefined (global) Search within all fields:	12	81	140	8
SCOPUS	Publication year: 2001-2021 Subject area: Social science Document Type: Article; Review Publication stage: final Affiliated country: within continental Europe Source type: Journal Language: English Keywords	52	37	42	41
EBSCO host	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase; Smart text searching	8	12	121	44
Google Scholar	Publication Date: 2001-2021 ***Note:*** *Google Scholar does not have extensive limiter options besides selecting the period that the search focuses on and whether to rank the search result by relevance or by date. Since the results were ranked based on relevance, the first three pages of results were scanned, and articles with titles that suggested relevance to the study, based on the inclusion criteria, were chosen for initial consideration.*	27	22	-	10
		115	152	303	103
					673

4.4. **Selection of studies**

It is not unusual for a researcher not to find enough materials from database searches, despite the search criteria being considered appropriate. For this reason, it is advised that database search could be supplemented by extending the search strategy to include manual search and snowballing (Sandelowski and Barroso, 2007; Wong et al., 2013; Zawacki-Richter et al., 2020). Citation chasing and manual search of relevant journals in the field of study were used for this research, in addition to database searches.

As the search process is not guaranteed to be 100%, there is a need to sift through all the materials collected during the search, from which a selection should be made (Zawacki-Richter et al., 2020). Sandelowski and Barroso (2007) recommend doing an individual appraisal to determine if any report satisfies your inclusion criteria. This helps the researcher eventually include only materials closely related to the research aim and answer the research questions.

After completing the search process, the records were screened, using the inclusion criteria as the foundation for deciding which records were selected.

4.4.1. Screening

The screening was done on various levels, starting first with checking for duplicates and removing them. After that, I evaluated the citations by checking their titles and selecting those whose titles show relevance to this study and excluding those that do not. However, those that appeared like the middle of the road cases were included for further check by reading their abstracts during the next step.

The following third action was to read the abstracts, after which a decision was made about which abstracts to exclude or keep for an in-depth reading of the complete reports. Abstracts that progressed to the stage of their complete reports being read mentioned schools datafication, precisely or about one of the critical issues/concepts linked to the research questions, especially pedagogy or any keyword variants.

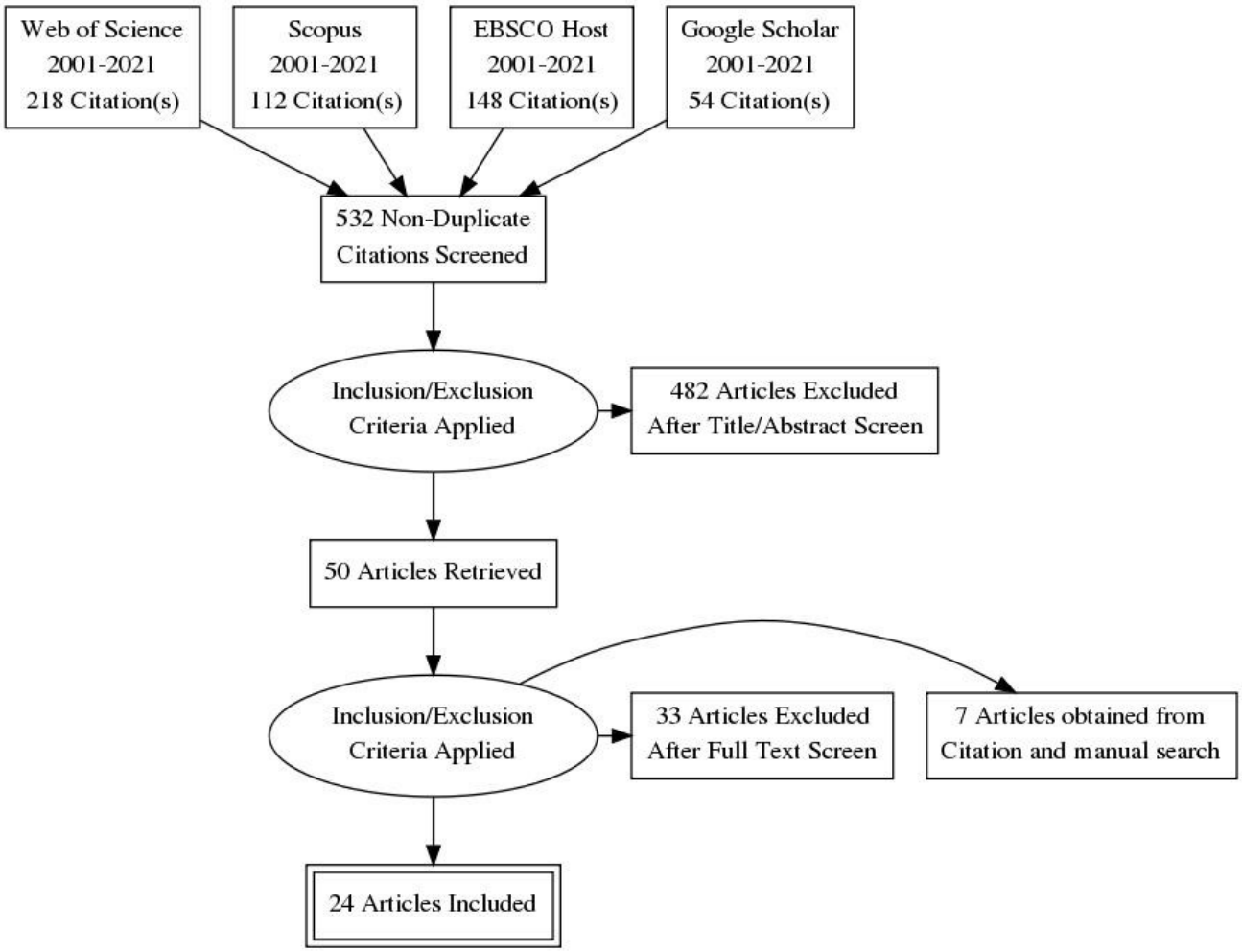
Only peer-reviewed qualitative research published from 2000 to 2021 and written in the English language were selected. Also, articles that were not peer-reviewed or published in languages other than the English language, published before 2001, were excluded. Quantitative and mixed methods research reports were also not included. The result of the selection process is presented in the next section of this report.

Of the 673 records found during the search, 532 non-duplicate citations were screened based on titles and abstracts. 482 articles were excluded after title / abstract screening. Subsequently, 50 articles were deemed eligible to retrieve their full texts. After the retrieval, a further screening was carried out during the full-text reading. 7 additional relevant materials that met the inclusion criteria were obtained through snowballing,

searching key journals in educational technology and pedagogy, such as *Learning, Media and Technology*, *Technology, Pedagogy and Education, and* manually from the articles I collected during the exploratory research for this study. In all, 24 articles were selected for analysis.

A breakdown of the sources of information for the articles included in this study is provided in the following document selection process diagram.

4.5. **Document selection process**



4.6. **Data analysis**

In this section, I present an analysis of the data extracted. The purpose of this section is to describe the characteristics of the included studies, summarize key findings, and generate themes.

Following the selection process, I identified 24 articles published between 2004 and 2021 in international, peer-reviewed journals that focused on at least one of the critical issues linked to the aim of this study. Articles first authors were affiliated to universities in Europe as of publication dates. The number of articles from each location is given in parentheses: United Kingdom (7), Sweden (5), Demark (2), Turkey (2), Norway (3), Finland (1), Germany (2), Hungary (1) and Spain (1). The authors used different qualitative study methods, including interviews, case studies, systematic reviews, surveys, focus group sessions, participants observation, conversation method and documents analysis. 15 of the articles were published between 2019 and 2021, while the remaining nine articles were published within a space of 14 years (2004 and 2018).

Thematic analysis approach is considered relevant in qualitative research for identifying trends, comparing, and contrasting information and viewpoints from several studies due to its flexibility, straightforward nature and ease of application, when compared with other methods of qualitative analysis like discourse analysis and content analysis, especially from new researchers (Braun and Clarke, 2006; King, 2004).

Braun and Clarke (2006) suggested a six-stage process for identifying, analysing, and reporting qualitative data, utilizing the thematic analysis approach. The process comprises familiarisation with the data, initial codes generation, searching for themes, reviewing themes, defining, and naming themes, generating the report. The manner and extent to which I employed the stages of the analysis process is outlined below:

Stage 1: Familiarisation with the data contained started at the data collection stage, with the full-text review of the articles during the studies selection process. At the analysis stage, more attention was paid to appraise what the data entailed and identify patterns. Next, initial coding was generated from the articles interrogation and aligned with the key concepts of the research topic and aims.

Stage 2: Next, the initial codes were collapsed into ten descriptive codes which stood out, namely, learning analytics, data visualisation, data extraction, accountability, testing/assessments, marketisation of schools, learning technologies, digital learning, algorithms, adaptive learning, big tech's influence, surveillance, and pedagogy. The descriptive coding was based on the similarities of the data they contained. These descriptive codes formed the sub-themes

Stage 3: The descriptive codes were grouped into three categories, data practices, learning platforms/technologies and performance-based accountability

Stage 4: The data under each analytical codes/themes were evaluated again for answers aligned with the different research questions. *data practices* (Foster and Francis, 2020; Ratnera, H., Lindsø, Madsen, 2019; Hoel, Chen and Yu, 2020; Robert-Holmes, 2016; Bradbury, 2019; Harrison et al., 2020; Neumann, 2019; Roberts-Holmes, 2015, *learning platforms/technologies* (Webb and Cox, 2004; Ibañez and Villalonga, 2019; Sonmez and Koc, 2018; Harju, Koskinen and Pehkonen, 2019; Mcgilchrist, 2019; Yu and Couldry, 2020; Ideland, 2020; Maguire, 2019; Lindh and Nolin, 2016) and *accountability* (Pagès, 2021; Mausethagen, 2013; Werler and Færevaag, 2017; Holm and Lundström, 2011; Hanberger et al., 2016; Thiel, 2021; Lidar, Lundqvist, Ryder and Östman, 2017).

Stage 5: For this study, I conceptualised the three themes as described below to mean the following:

Data practices - data practices refer to the different digitally powered or mediated processes and activities for generating, recording, storing, and managing school data, for analyses and use for decision-making

Learning platforms/technologies – learning platforms/technologies refer to the digital platforms integrated into the teaching and learning process, for example, learning management systems, digital/interactive whiteboards, and digital devices used to automate and support teaching and learning.

Performance-based accountability is a relationship between a responsible party and an authority or agent of the state, aimed at achieving predetermined outcomes or targets. In the case of schools, that power dynamic revolves around the school head and the government.

Stage 6: Finally, I reviewed and checked the data organised into the three themes against the definition of the themes, and research questions or key concepts that they are linked. Across the findings from the studies, I synthesized the information gathered and delineated the impacts of the three themes on pedagogy. Following that, the report of the analysis was written up - presented and discussed.

In spite of the several benefits of employing thematic analysis, it is vital to note how the usefulness could be limited. For example, Braun & Clarke (2006) observed that users of thematic analysis are at a disadvantage due to this method not giving researchers latitude to delve into claims around language use. Equally, Holloway & Todres (2003) pointed out that the flexibility of this technique can bring about discrepancy and absence of consistency when developing themes obtained from the data. As a mitigation for this probable downside, they advise that the researchers use and clarify their epistemological positions that can coherently bolster the study's empirical claims.

The characteristics and summary of the included studies are contained in the next section, followed by a presentation of the findings of this study.

5. Characteristics and summary of included studies

I developed two sets of forms for collating data from the selected studies after detailed reading and review of the full texts of the 24 studies included. I extracted data about author(s) name(s), year of publication, the title of article, publication, location of the first author, aim/purpose of study, study methodology and key findings, and organized them in tables. The collected data are presented in sections 5.1 and 5.2

5.1. Articles characteristics

Table 3: Article characteristics

Author(s)	Year of publication	Title of article	Location of first author	Publication
Bradbury, A.	2019	Datafied at four: the role of data in the schoolification of early childhood education in England	United Kingdom	Learning, Media and Technology
Foster, C. & Francis, P.	2020	A systematic review on the deployment and effectiveness of data analytics in higher education to improve student outcomes	United Kingdom	Assessment & Evaluation in Higher Education
Hanberger, A., Carlbaum, S., Hult, A., Lindgren, L., & Lundström, U.	2016	School evaluation in Sweden in a local perspective: A synthesis,	Sweden	Education Inquiry
Harju, V., Antti Koskinen, A., & Pehkonen, L.	2019	An exploration of longitudinal studies of digital learning	Finland	Educational Research
Harrison, M. J. et al.	2020	(Un)teaching the datafied student subject: perspectives from an education-based masters in an English university.	United Kingdom	Teaching in Higher Education Critical Perspectives
Hoel, T., Chen. W., & Yu, L.	2020	Teachers' perceptions of data management as educational resource A comparative case study from China and Norway	Norway	Nordic Journal of Digital Literacy
Holm, A., & Lundström, U.	2011	"Living with Market Forces "Principals' Perceptions of Market Competition in Swedish Upper Secondary School Education	Sweden	Education Inquiry
Ibañez, P., & Villalonga, C.	2019	Exploring Student Activity with Learning Analytics in the Digital Environments of the Nebrija University	Turkey	Technology, Knowledge and Learning
Ideland, M.	2020	Google and the end of the teacher? How a	Sweden	Learning, Media and

		figuration of the teacher is produced through an ed-tech discourse		Technology
Lidar, M., Lundqvist, E., Ryder, J., & Östman, L.	2020	The Transformation of Teaching Habits in Relation to the Introduction of Grading and National Testing in Science Education in Sweden	Sweden	Research in Science Education
Lindh, M., & Nolin, J.	2016	Information we collect: Surveillance and privacy in the implementation of Google Apps for Education	Sweden	European Educational Research Journal
Maguire, L. H.	2019	Adapting to the test: performing algorithmic adaptivity in Danish schools	Denmark	Discourse: Studies in the Cultural Politics of Education
Mausethagen, S. (2013)	2013	A research review of the impact of accountability policies on teachers' workplace relations	Norway	Educational Research Review
Mcgilchrist, F.	2019	Cruel optimism in edtech: when the digital data practices of educational technology providers inadvertently hinder educational equity	Germany	Learning, Media and Technology
Neumann, E.	2019	Setting by numbers: datafication processes and ability grouping in an English secondary school	Hungary	Journal of Education Policy
Pagès, M.	2021	Enacting performance-based accountability in a Southern European school system: between administrative and market logics	Spain	Educational Assessment, Evaluation and Accountability
Ratnera, H., Lindsø, B. A., & and Madsen, S. R.	2019	Configuring the teacher as data user: public-private sector mediations of national test data	Denmark	Technology, Knowledge and Learning
Roberts-Holmes, G.	2015	The 'datafication' of early years pedagogy: 'if the teaching is good, the data should be good and if there's bad teaching, there is bad data.'	United Kingdom	Journal of Education Policy
Robert-Holmes, G.	2016	The datafication of early years education and its impact upon pedagogy	United Kingdom	Improving Schools
Sonmez, E. E & Koc. M.	2018	Pre-Service Teachers' Lived Experiences with Taking Courses through Learning Management Systems: A Qualitative Study	Turkey	Turkish Online Journal of Distance Education
Thiel, C.	2021	Side effects and the enactment of accountability: results of a comparative study in two German federal states	Germany	Educational Assessment, Evaluation and Accountability
Webb, M., & Cox, M.	2004	A Review of Pedagogy Related to Information and Communications Technology	United Kingdom	Technology, Pedagogy and Education
Werler, T., & Færevaag, M. K. (2017)	2017	National testing data in Norwegian classrooms: a tool to improve pupil performance?	Norway	Nordic Journal Of Studies In Educational Policy

Yu, J. and Couldry, N.	2020	Education as a domain of natural data extraction: analysing corporate discourse about educational tracking	United Kingdom	Information, Communication and Society	

5.2. **Aims, methodologies and key findings from primary studies**

Table 4: Stated aims, methodologies, and key findings of included articles

S/N	Author(s)/ publication year	Title of article	Aim/Purpose of study	Methodology	Key findings.
1	Bradbury, A. (2019)	Datafied at four: the role of data in the schoolification of early childhood education in England	Investigate the datafication processes in early childhood education institutions (ECE) for children from birth up to five in England and their connection with increased formalization	The research was based on data from interviews	• Quality of work has been linked to numbers, and teachers are expected to translate complex information about a child into numbers. • The ECE has been converted into measurement, costing, monitoring, ranking and digital and measurable units. •
2	Foster, C., & Francis, P. (2020)	A systematic review on the deployment and effectiveness of data analytics in higher education to improve student outcomes	A systematic review of the primary research literature on the use and effectiveness of educational analytics to improve student results through targeted academic and professional support measures at universities.	Systematic Review of 34 studies	• Educational analytics helps improve student outcomes. • There exist a lack of quality innovation and student voice in research in the field and a lack of clarity about the role of data in interventions and how analytics can improve student learning outcomes. • Reduced drop-out rates among students who received an educational analysis intervention were the primary outcome of two student capacity studies
3	Hanberger, A., Carlbaum, S., Hult, A., Lindgren, L., & Lundström, U. (2016)	School evaluation in Sweden in a local perspective: A synthesis	To examine how local school actors in Swedish compulsory education have reacted to the prevailing assessment systems and the	Analysis of policy documents, reports, minutes from municipal education committee meetings, municipal websites,	• The actors use their discretion to interpret the evaluations, empower themselves, and fulfil their roles, which affects the practical consequences of the evaluation for schools. • Some school administrators and principals tried to cope with the adverse effects of evaluation and

			growing accountability created by the decentralization, marketing, and globalization of education governance	and interviews.	the growing accountability pressure, adapt evaluations to the needs of teachers' daily practice and protect teachers from too many external evaluations. • External evaluations have generally not been used by teachers in teaching development because their results cannot help teachers improve their school practice • While some principals warned that these evaluation systems promote strategies like teaching to the test, others have used evaluation to hold teachers accountable and support them. • The use of evaluations to hold teachers accountable for student performance promotes the leadership role of school management, which can be understood as a constitutive effect. In contrast, school principals use evaluations to support teachers promote collegial learning and protect core pedagogical values. • Teacher participation in mandatory evaluations has resulted in fatigue and stress, reduced time for reflection, and undermined creativity and job satisfaction and feelings of mistrust.
4	Harju, V., Antti Koskinen, A., & Pehkonen, L. (2019)	An exploration of longitudinal studies of digital learning	To examine how the use of digital technologies affects student learning	Systematic Review	• The authors identified both positive and negative influences of technology on learning. The studies examined did not produce clear conclusions about the effects of technology on student learning.
5	Harrison, M. J. et al.(2020)	(Un)teaching the datafied student subject: perspectives from an education-based masters in an English university.	To provide a unique perspective on the impact of datafication on qualified, experienced teachers as learners in education-based master's programs.	Conversation methodology is used to explore lived experiences	• Teachers are modelled in the image of data - they become more of a data producer, generator, or collector who organizes environments to improve data production, measured according to data about their students. • Teachers lose their autonomy, professional practice, and creativity when following a script that generates data. • The professionalism of the teacher depends on how well the teacher is familiar with and responding to their data and how well they can produce data that conforms to the standards of

					the government or government agency themselves and their practices as data
6	Hoel, T., Chen. W., & Yu, L. (2020)	Teachers' perceptions of data management as educational resource - A comparative case study from China and Norway	To study the reactions of teachers to requests for the use of Big Educational Data in the two countries	A qualitative, interpretive/hermeneutic multi-case approach was combined with a survey, supplemented with interviews	• This study showed that Chinese teachers are more optimistic about any informational data they might provide, while Norwegian teachers are more concerned with acquiring knowledge and skills on teaching, learning, and privacy and data monitoring issues. • Both groups of teachers are closely monitored for educational outcomes. • Learning analytics is not popular with teachers in Oslo, unlike teachers in Tongzhou. • Both groups focus on improving outcomes using educational data. The interest in educational activities was about the same at both locations
7	Holm, A., & Lundström, L. (2011)	"Living with Market Forces "Principals' Perceptions of Market Competition in Swedish Upper Secondary School Education	This article examines how upper secondary school principals perceive increased competition between schools and its impact on their work and school organization	Interviews with principals at eight schools in five municipalities	• The school principals argue that competition increases staff efforts and improves school development. • Competition is also perceived as problematic, as it leads to more stress and uncertainty. • The professional identities of school principals seem to have shifted from an educational to a more economic role. • Most school principals are pragmatic and try to deal with the new political context as well as possible
8	Ibañez, P., & Villalonga, C. (2019)	Exploring Student Activity with Learning Analytics in the Digital Environments of the Nebrija University	To study the behaviour of online and blended degree students during an academic year to collect critical data for decision-making in classroom design and to identify aspects for improving the student experience	The researchers extracted data from the Blackboard learning management system, which they studied and analyzed to understand students' experience interacting with the platform.	• Educational institutions use the data generated by learning management systems to make decisions to improve the online learning experience for students. • Learning analytics techniques could help instructors and administrators to record student activities and behaviour on digital platforms. • The learning management system provides data that may be useful to customize learning for the learner. Some of the data provided will be useful to the university beyond teaching and learning direct experience
9	Ideland, M. (2020)	Google and the end	To analyze how a	The ethnographic	• The figuration of the Googlified teacher is seen as

		of the teacher? How a figuration of the teacher is produced through an ed-tech discourse	figuration of the teacher is built up within an Ed-Tech discourse and to examine whether the platformization and digitization of education signal the beginning of the end of the teacher as we know him.	study consisted of interviews	a prerequisite for success -certified trainers are trained and certified in the curriculum prescribed by Google. The traditional authority of teachers is inferior and taken over by artificial intelligence devices inside and outside the school. • Googlified, in this case, refers to people who exhibit, show creativity, have a pioneering effect, influence, are visionary, innovative and can shape and communicate the vision of a great future
10	Lidar, M., Lundqvist, E., Ryder, J., & Östman, L. (2017)	The transformation of teaching habits in relation to the introduction of grading and national testing in science education in Sweden	The overarching aim of this study is to investigate teachers' responses to the introduction of increased centralized control in science education in the form of grades and national testing	Interviews were conducted to collect data.	• Teachers in this study were often working to find a balance between accountability to the external reform of assessment and local autonomy • The reform elicited different reactions. In some cases, it reinforced the teaching habits, and in others, it did not. There were cases in which the response was neutral, and teaching habits remain unchanged.
11	Lindh, M., & Nolin, J. (2016)	Information We Collect: Surveillance and Privacy in the Implementation of Google Apps for Education	This study aimed to show how Google's business model is hidden in Google Apps for Education (GAFE) and how such a bundle is perceived within an educational organization consisting of 30 schools.	The study consisted of documents and interview studies in a Swedish educational organisation.	• The benefits of Google Apps for Education (GAFE) services are apparent to users, while backend strategies remain hidden
12	Maguire, L. H. (2019)	Adapting to the test: performing algorithmic adaptivity in Danish schools	This paper analyses the role of adaptive algorithms within the Danish national test to contribute to the broader discussion within digital educational governance.	The work used ethnographic methods, including case studies, interviews, participatory observation and documents analysis.	• Adaptive testing proceduralizes the interactions between students, teachers, and digital technologies with little or no thought about how students and teachers fit into the framework. • The institutional response was not to change the adaptability of the algorithms but to change the role of teachers in adapting the children to the algorithm. • The students have to become adaptable and develop the ability to react to new and previously unknown conditions.

					• Adaptive testing also creates new affectivities, and teacher responsibilities, practices and subjectivities arise. • The role of the test supervisor is an emerging category in the school system that has dramatically increased the importance of testing.
13	Mausethagen, S. (2013)	A research review of the impact of accountability policies on teachers' workplace relations	To investigate how an increased emphasis on student performance and changes in teachers' workplace relations are addressed in existing research.	A Systematic review method was used. This review was partly integrative in the sense that it summarizes broad themes in existing research	• Increased testing and teacher accountability have changed teacher-student relationships and reduced the opportunities for teachers to develop and nurture caring relationships with their students. • More emphasis on student testing and teacher responsibility affected teacher-student relationships due to the increased focus on monitoring student performance. Some studies questioned the content and form of high accountability collaboration, and the results highlighted the importance of the organizational context in the experience of workplace relationships, although this may vary depending on the context
14	Mcgilchrist, F. (2019)	Cruel optimism in edtech: when the digital data practices of educational technology providers inadvertently hinder educational equity	To examine the data practices of edtech providers to identify tensions that indicate broader societal problems in today's society	An ethnographic approach with interviews was chosen to examine how edtech companies describe their handling of digital data.	• The promise that Ed-Tech will help make things better and more efficient in the education sector is not what it seems. The stories of data generation, protection and use for change are a cover for what lies beneath their mission - control, power, marketing, and money, hence the promises
15	Neumann, E. (2019)	Setting by numbers: datafication processes and ability grouping in an English secondary school	To explore how the accountability shift and datafication have affected student grouping practice and student educational experience.	Case study	• Accountability and data-driven education systems create pedagogical dilemmas and enforce power relationships that have reshaped the subjectivity of teachers and learners. • Education has shifted to a performance-oriented, hierarchically grouped environment, with data gathering and students surveillance driving teaching. • Teachers see no need to question the

					developments but share how they deal with the ambiguities and pressures. The authority of the data, its accuracy and objectivity were found by the teachers to be undeniable and fair. While market and accountability policies have created the norm of public competition between schools based on examination performance, without being explicitly set as a political priority, this norm appears to have been reproduced within the school by creating an environment of competition between students.
16	Pagès, M. (2021)	Enacting performance-based accountability in a Southern European school system: between administrative and market logics	This research aims to improve understanding of accountability implementation in different school settings. In particular, the main objectives of the study were (i) to analyze the interplay between the various forms of accountability to which schools are subject; (ii) better understand how school actors understand these forms of accountability; and (iii) identify the strategies and practices schools use to address external accountability.	Qualitative empirical research based on a case study, combined with interviews and document analysis	• Market forms of accountability are often tied to administrative instruments of external evaluation. • Schools are fixated on attracting and retaining students with a profile necessary to maintain their reputation with education authorities and parents, forcing schools to satisfy family preferences at the expense of educational principles and standards. • The ambivalence of market and administrative forms of accountability can provoke superficial reactions from school actors. • Administrative and market forms of accountability work together to increase outside pressures. • School actors develop complex interpretations of performance-based accountability and take critical, neutral, and contradicting interpretations of the same policy framework. • Schools employ different strategies and practices in response to performance-based accountability, based on their pedagogical approach, performance culture, student population, and subjective perceptions of external pressures.
17	Ratnera, H., Lindsø, B. A., & Madsen, S. R. (2019)	Configuring the teacher as data user: public-private sector mediations of national test data	To study how teachers are configured as data users when creating Danish national test data visualizations for municipal primary and	Qualitative study, using interviews	• Teachers are not given time to learn complex visualizations. This is complicated because, despite the value of teachers using visualizations to understand national test scores, Learning Advisors warn that National Tests take too much time for teachers to understand at the expense of

			secondary schools.		their teaching duties. They also cautioned against making national testing a predominant assessment tool in teaching practice, so teachers focus on the students' progress between tests rather than fixating on the students' results on a test.
18	Roberts-Holmes, G. (2015)	The 'datafication' of early years pedagogy: 'if the teaching is good, the data should be good and if there's bad teaching, there is bad data.'	The research looked at teachers' understanding of the revised Early Years Foundation Stage Profile and the impact of this assessment on their pedagogy for the early years	The researcher used ethnography. Email correspondence, telephone interviews, focus group and individual interviews were followed up with participant observation.	• The majority of the sample indicated that they are now under pressure to produce data for inspection. • The shift in assessment to formal mathematics and phonetics led to pedagogical shifts towards replicating the performance culture of the elementary school in the initial phase. The teachers saw the pressure to perform as a threat to the application of suitable child-centred principles and pedagogy Some of them questioned, challenged, and opposed the culture of performativity and kept their child-centred focus where they could.
19	Robert-Holmes, G. (2016)	The datafication of early years education and its impact upon pedagogy	Examining the diffusion of performance data in early childhood professional activity and its impact on the awareness and identity of early childhood teachers, as well as the narrowing and formalization of early childhood pedagogy	The article empirically refers to two studies. The first used email, focus group, and interviews, while the second comprised case studies	• The teachers were cynical about the value of increasingly subjecting them to the demands of data production. • Despite teachers' awareness of the pitfalls of the above trend, their working life is determined by specific demands on data production and analysis, and work progress is now tied to that data work, which has become a performance metric. • So, teachers are reluctant to take the push of digital governance thrust on them For the teachers in the first grade came the various tasks of the data production and analysis process, such as struggling with the constant need to improve performance:
20	Sonmez, E. E & Koc, M. (2018) .	Pre-Service Teachers' Lived Experiences with Taking Courses through Learning Management	To explore what teachers and students think about the benefits and limitations of using a learning management system based on their	Phenomenological Study. The primary method of data collection was through semi-structured in-depth	• Participants indicated that Moodle was an application of great use for teaching and learning. Quick and easy access to course resources and lecturers regardless of time and place, a function of Moodle that they perceive to be of great importance.

			Systems: A Qualitative Study	actual usage experience.	interviews with open-ended questions. The content analysis was carried out using the NVivo 7 software	• Task activity was found to have the most significant impact on how students use the Moodle LMS. Many of the users agreed that Moodle's design is clear and understandable enough. • Some participants find Moodle helpful in enhancing social interaction between students while enhancing classroom collaboration between students and teachers. • The participants agree that the Moodle interface design is user-friendly. The disadvantages identified included the limited upload capacity, insufficient synchronous communication, and technical problems
21	Thiel, C.	(2021)	Side effects and the enactment of accountability: results of a comparative study in two German federal states	Explore the side effects of accountability in education in the theoretical framework of enactment research	Document analysis, survey and group discussion	• Teachers are confident that they get all the information they need for their daily work, so no need for externally imposed accountability. • Also, they contend that as professionals, they possess the competence to diagnose and deal with the learning deficits of their students. • Between Berlin and Thuringia, the meaning attached to performance standards varies, making teachers' responses in the two states differ.
22	Webb, M., & Cox, M.	(2004)	A Review of Pedagogy Related to Information and Communications Technology	Identify aspects of ICT pedagogy and practice by teachers and review trends in how ICT is understood and used in the curriculum, as evidenced by studies in the literature.	This article is based on reviewing the existing literature on information and communication technology pedagogy in recent years.	• Teachers lack the digital literacy required to take full advantage of the capabilities of the internet and digital tools to instruct students and guide them in using results from their experiments. • • Teachers must develop digital literacy continuously to guide and help students take advantage of digital tools affordances. • It was also observed that the integration of ICT into classroom practice led to a change in pedagogical practice in which teachers became more student-centred.
23	Werler, T., & Færevaag, M. K.	(2017)	National testing data in Norwegian classrooms: a tool to improve pupil	The aim is to examine how teachers perceive students 'assessment data and how they think	In order to operationalize the research problem, semi-structured	• Teachers seem to believe that parents have confidence in the test results, as the truth about their children's class performance. • They described the time after the national tests as

		performance?	about being held responsible for improving students' ability to learn	interviews with teachers were carried out.	stressful and experienced periods of hectic activity. Stress-related to teachers assuming that students did very poorly when they were yet to know the results.
24	Yu, J. and Couldry, N. (2020)	Education as a domain of natural data extraction: analysing corporate discourse about educational tracking.	To follow the development of supporting discourses and consider how the intensive embedding of software platforms in everyday teaching could further naturalize surveillance practices.	Analysis of the public discourse (around educational provisions) from eight major publishers who provide learning analysis and social media platforms for children and research institutions in the education industry	• Education service providers in the USA and Great Britain are re-classifying themselves as a focus of education, organized around the needs of data systems and commercial data production. • Based on the analysis of the extracted data, personalized learning environments are continuously created about learners and their contexts, which are supported by continuous monitoring. • Using familiar digital platforms for students leads to greater engagement. • Data-driven environments heavily influence pedagogic agency in the classroom. System knowledge is becoming just as important as the individual knowledge of teachers or students, even if marketers of the digital platforms disguise the suppressing effects of the learning platforms. Continuous datafication of early childhood years with learning platforms is disguised as much-needed support. All of the above will help create and maintain surveillance over people.

6. Findings

The overall aim of this qualitative meta-synthesis was to examine how the impact of digital datafication on pedagogic practices in European schools is addressed in existing research. I used a systematic literature review protocol to obtain relevant reports of primary research from different databases and journals, based on which I explored the interplay between school governance, datafication and digitization of teacher and student practices. The following research question guided the study design: How does digital datafication of teacher and student practices affect pedagogy in European schools?

- What is the relationship between datafication and governmental control of schools in Europe?
- What are the pedagogical implications of using platforms for teacher and student practices?

The following sections discuss the three major themes discovered during the data analysis: how data practices, learning technologies/platforms, and performance-based accountability influence pedagogy in European schools.

6.1. Impact of data practices

Datafication of school practices is advanced as having the capacity to transform teaching and learning in many ways. Some studies' findings indicated that educational analytics is a crucial component of digital datafication in schools and improves student outcomes. According to Foster and Francis (2020), two studies found that learning analytics intervention reduced dropout rates. Another indicated that it is possible to create personalized learning environments that adapt the learning process to individuals peculiarities and contexts (Yu and Couldry, 2020). These findings suggest that such analytics interventions promote students engagement and participation in learning activities.

Although the data generated by learning management systems are found to help schools improve the learning experience for students (Ibañez and Villalonga, 2019), it is argued that there is no clarity about how exactly learning analytics drives learning. Lack of students voices in research in the field is worrisome, according to Foster and Francis (2020).

Findings from a study on teachers' perceptions of data management as educational practices compared teachers' experiences in Norway and China (Hoel, Chen and Yu, 2020) indicated a difference in teachers' responses towards the request for big data in education between the two countries. While the Chinese were optimistic about providing any data that may be requested, their Norwegian counterparts were not. Instead, there are particularly concerned about privacy and data monitoring issues. It is unclear whether the Norwegian teachers' disposition is due to their consideration

of the requirements of General Data Protection Regulations (GDPR) or other matters, given its broad application.

Across the studies that focused on this theme, one significant finding is the collateral impact of data requirements and practices on the teachers, which can ultimately negatively affect the discharge of their pedagogic and related role in schools. Education's move to performance orientation has made school practices to be predicated on data gathering and students surveillance (Neumann 2019). As data practices consume a lot of teachers time at the expense of their teaching duties, it is questionable how this conflict plays to the advantage of the teaching and learning process. With the quality of teachers work being linked to numbers, and teachers are expected to translate complex information about a child into numbers, teachers are modelled in the image of data, becoming more of a data producer, generator, or collector who organizes environments to improve data production, measured according to data about their students. They lose their autonomy, professional practice, and creativity by following a script focused on generating data.

The teacher's professionalism depends on how well the teacher is familiar with and responding to their data and how well they can produce data that conforms to the government or government agency's standards and practices. This puts teachers under intense pressure (Bradbury, 2019 Harrison et al., 2020; Roberts-Holmes, 2015), and teachers were cynical about the value of increasingly subjecting them to data demands (Robert-Holmes, 2016). Teachers working life is determined by exhaustive demands on data production and analysis, and work progress is now tied to that data work, which has become a performance metric. (Robert-Holmes, 2016). The governments and their agents project these data practices as crucial to improving schooling and student outcomes, but the teachers directly involved in the teaching and learning process do not necessarily align with this viewpoint.

Pedagogic agency in the classroom is heavily influenced by the data-driven environments, with system knowledge becoming just as important as the individual knowledge of teachers or students, even if marketers of the digital platforms disguise the suppressing effects of the learning platforms (Yu and Couldry, 2020). The use of learning technologies in schools has resulted in the situation where a majority of them are not able to draw the line between when schoolwork should be done or not, as they are told to, or they believe that they are expected to be online and available every time, having been provided with mobile digital devices like laptops, tablets and phones.

The escalating pressures that teachers experience can be counter-productive to the quality of their work and could create mental and psychosomatic health problems for them.

6.2. **Impact of learning technologies/platforms**

In a study to explore the perceptions of teachers and students about the benefits and limitations of using a learning management system based on their actual usage experience, they noted that the quick, easy and access to course materials and lecturers that the platform enables to make it of great importance (Sonmez and Koc, 2018). Also, some authors reported that the integration of ICT into classroom practice led to a change in pedagogical practice in which teachers became more student-centred (Webb and Cox, 2004). Harju, Koskinen and Pehkonen (2019) investigated the impact of digital technologies on learning over some time, and the studies were unable to demonstrate the effects of the use of technology on student learning. This striking departure from the position of the previous authors is not surprising because, like Selwyn (2017) pointed out, I believe that integrating technology within the school system does not, on its own, translate to improvement in school and student outcomes. The result of this study by Harju et al. (2019) further supports the idea that deploying the best technology for teaching and learning can never guarantee the right pedagogical impact on the students, if the integration of technology into the learning environment is not undergirded by a very firm foundation of pedagogical principles and knowledge.

The transformative capacity and power of technologies in the classroom have been over-hyped over the years. While adaptive testing in Norway proceduralizes the interactions between teachers, students and technology, Maguire (2019) argues that no thought is given to the pedagogical implications. Rather, teachers and students are constrained to develop new abilities to react to new and changing conditions stemming from the operationalization of the algorithms embedded in the digital platforms used for testing. Teachers and students labouring to adapt to the algorithms go against the grain of the type of adaptability useful for personalized educational practices. The algorithms are configured to adapt to the peculiarities of the students as they interact with the platform processes.

The assertion that technology, mediated through digital platforms, leads to efficiency and projects hope for change are simply a distraction from what lies beneath their mission - control, power, marketing and money, hence the promises (Mcgilchrist, 2019). Yu and Couldry (2020) research indicate that education service providers in the USA and Great Britain are re-classifying themselves as a focus of education, organized around the needs of data systems and commercial data production. This corroborates the positions of researchers (Mcgilchrist, 2019), who maintain, based on findings from their studies, that the platforms are not neutral, as the technology companies would have people believe, but instead, they are power and control levers for google, representative of what obtains with the big technology companies and other providers of learning cum administration platforms in schools.

A prominent example found in this research is the case of Google Apps for Education (GAFE). While the benefits of Google Apps for Education (GAFE) services are evident

to users, the backend strategies remain hidden (Lindh and Nolin 2016). Googlified, in this case, refers to people who exhibit, show creativity, have a pioneering effect, influence, are visionary, innovative, and can shape and communicate the vision of a great future (Ideland, 2020). The figuration of the Googlified teacher is seen as a prerequisite for success - certified trainers are trained and certified in the curriculum prescribed by Google. The traditional authority of teachers is inferior and taken over by artificial intelligence devices inside and outside the school. In these data-driven environments, the pedagogic agency in the classroom is affected, and system knowledge is becoming just as important as the individual knowledge of teachers or students, even if marketers of the digital platforms disguise the suppressing effects of the learning platforms (Yu and Couldry, 2020) as much needed support for effective teaching and learning.

These findings do not in any way negate the fact that technology serving practical purposes in schools.

6.3. **Impact of performance-based accountability**

Accountability and data-driven education systems create pedagogical dilemmas and enforce power relationships that have reshaped teachers' subjectivity (Neumann, 2019). Making standardized testing outcomes predominant in measuring teachers work causes teachers to be fixated on test results instead of teaching. (Ratnera, Lindsø & Madsen, 2019). For teachers in places where testing and ranking have become institutionalized, the national tests are usually stressful and periods of hectic activity. Stress-related to assuming that students did not do well when they were yet to know the results were also reported by teachers (Werler & Færevaag, 2017). In addition, teachers participation in mandatory evaluations has resulted in fatigue, reduced time for reflection, undermined creativity and job satisfaction and engendered feelings of mistrust (Hanberger, Carlbaum, Hult, Lindgren & Lundström 2016).

Increased testing and teacher accountability have changed teacher-student relationships and reduced the opportunities for teachers to develop and nurture caring relationships with their students (Mausethagen, 2013). The pressure to perform posed a threat to applying suitable child-centred principles and pedagogy (Roberts-Holmes, 2015).

Hanberger, Carlbaum, Hult, Lindgren & Lundström (2016) found that some principals see external evaluations as important to hold teachers accountable for student performance, promote their leadership roles and support the teachers by promoting collegial learning and protecting core pedagogical values. However, participation in mandatory evaluations has resulted in fatigue and stress, reduced time for reflection, undermined their creativity and job satisfaction, and produced negative emotions in the teachers

The ambivalence of market and administrative forms of accountability provoked superficial reactions from school actors, with schools fixated on attracting and retaining students with a profile to maintain their reputation with education authorities and parents. According to Werler & Færevaag (2017), teachers, awareness of the value parents attach to standardized tests results in evaluating the profile of the classes that their children belong to influence how they approach their work. As a result, they focused on satisfying family preferences at the expense of pedagogical principles and standards. Also, Pagès (2021) observed that school actors developed complex interpretations of performance-based accountability and took critical, neutral and contradicting interpretations of the same policy framework.

The professional identities of school principals appear to have shifted from an educational to a more economic role (Holm and Lundström, 2011).

The school actors use their discretion to interpret the evaluations, empower themselves, and fulfil their roles, which affects the practical consequences of the evaluation for schools. External evaluations have generally not been found by teachers to be of help in developing their teaching because their results cannot help teachers improve their pedagogic practices (Hanberger, Carlbaum, Hult, Lindgren & Lundström, 2016). Some studies questioned the content and form of high accountability collaboration (Mausethagen, 2013). On the other hand, school principals argue that competition increases staff efforts and improves school development. Competition is also perceived as problematic, as it leads to more stress and uncertainty (Holm and Lundström, 2011), but teachers are confident that they get all the information they need for their daily work and believe that they do not need externally imposed accountability. Also, they contend that as professionals, they possess the competence to diagnose and deal with the learning deficits of their students. Between Berlin and Thuringia, the meaning attached to performance standards varies, making teachers' responses in the two states differ (Thiel, 2021).

Teachers are torn in pedagogical dilemmas and power relationships that reshape their pedagogy and professional practice in accountability and data-driven education systems. These dilemmas force them to become more mechanical towards achieving the system's expectations and focus on teaching to the test to maintain students who do well in the national tests. In one of the studies reviewed (Werler & Færevaag 2017), teachers fixation on meeting parents expectations was high as those parents had confidence in the value of the results of the test as a marker of the quality and profile of the schools, and the profiles mattered for parents' choice of where their children attend school. Given this, teachers and schools are provoked to put up superficial reactions to issues rather than settling down to confront issues based on pedagogic principles and needs. Students needs are abandoned in favour of the government's needs to belong to the top of the schools and countries ranking league table. As in the case of the big technology companies sway over the governance of schools, governments inadvertently submit some of their power over determining the direction of every aspect of their school systems to organizations like the

Organization for Economic Cooperation and Development (OECD). They administer one of the most popular schools ranking globally, the PISA ranking. In one of the studies, principals indicated that using performance-based assessments was crucial for controlling teachers.

Lidar et al. (2017) found that the introduction of grading and national testing in science in Sweden transformed teaching habits in different directions, reinforcing teaching habits positively, negatively and in some cases keeping them unchanged. Teachers worked hard to balance the pressure between accountability to external reforms and their local autonomy.

While teachers experience implementing externally motivated performance-based accountability systems as counter-productive professionally, psychologically, mentally and physically, the government and school management nonetheless find the ambivalent practices helpful in effectively controlling the teachers and students and making it appear as the best interest of the teachers.

7. Discussion

As noted in the introductory section of this report, datafication in schools has a long history, dating back to the evolution of the modern state. However, the emergence of the concept of "big data" and its permeation across different spheres of life has given rise to the requirement for data in such volume, diversity, and speed that could not be possible using manual or analogue methods. To keep pace with this development, digital technologies in education became inevitable to automate the teaching, learning and administration of school activities and processes. Digital technologies and datafication have therefore become inseparable in schools.

The reviewed studies highlighted the various ways that data practices, technology integration and performance-based accountability in schools interact to shape and influence pedagogy in European schools.

Relevant case studies examined in this study on data practices (Ibañez and Villalonga, 2019; Foster and Francis, 2020; Yu and Couldry, 2020), found that the practices have been elevated to a prime position, with the promise and expectation that doing so will help transform the schooling process. The requirement for and trust in the power of data to play transformative roles in the school system put learning analytics as a crucial data practice. It is recognized that the availability of the correct type of data is helpful for good decision-making, providing evidence and signposts that enable informed decisions. These notwithstanding, elevating data over teachers professionalism, competence, autonomy, creativity, and pedagogical principles is problematic and counter-productive and blot out what benefits are derivable, like creating, enabling personalized and adaptive learning environments and promotion of students engagement with their studies.

These findings are consistent with several studies in the learning analytics (LA) literature that have highlighted LA's contribution to improving academic performance, student engagement, reducing dropout risk, and improving the process and outcomes of feedback (Na and Tasir, 2017; Banihashem et al., 2018; Alfy, Gomez and Dani, 2019; Ifenthaler and Yau, 2020), and raised concerns about lack of consideration for theoretical principles (Alfy, Gomez and Dani, 2019).

While teachers may be dissatisfied and disturbed by this trend, governments see and paint this as a necessity for quality and school improvement. For them, the accumulation of data from the school data practices put the schools, students and teachers in the spotlight and makes all aspects of their day-to-day experience visible to government actors daily, even when they are not at school. The heightened visibility that the practices engender helps the government indirectly manipulate and exert firmer control over the teachers and students. This corroborates an essential premise of governmentality, that of modern governments operating through a network of indirect power (Miller and Rose, 1990).

My study found that teachers were divided on the usefulness of technology integration in teaching, learning and administration of schools. While some see

technology as helpful in improving student learning outcomes, providing quick and easy access to study materials and changing pedagogical practices (Webb and Cox, 2004; Sonmez and Koc, 2018), others see technology as not making any significant difference over an extended period of use, as shown by the results of a review of longitudinal studies by Harju, Koskinen and Pehkonen (2019).

Similar to my results, various studies (Papamitsiou & Economides, 2014; Schwendimann et al., 2017; Catlaw & Sandberg, 2018; Bakar., Maat and Rosli, 2018; Lai & Bower, 2019; Stancin et al., 2020; Pappas & Giannakos, 2021) also found evidence that technology integration in schools has a positive correlation with students cognitive and affective outcomes.

However, it needs to be pointed out that technology in schools is neither bad nor capable of delivering all the benefits ascribed to it by advocates. Instead, teachers must understand the integration of technology, and they are knowledgeable about how to maximize their use as an enabler of their classroom activities, with them still driving learning experiences as competent professionals.

This is not straightforward considering that teachers are limited in their control of digital platforms and so are the government education authorities. The findings of my systematic literature review indicate that the grip of the big technology companies over countries' education sectors may be effectively diminishing the governance of schools by governments where platforms are used. By deciding what can and cannot be done with the platforms, how they should be used, and in some cases providing guidance integrating curricula with the platforms, the roles and contributions of teachers are reduced to that of analysts, observers and co-teachers with the technologies in use. Additionally, the integration of specific components that control users actions and algorithms into the systems ensures that schools, teachers and students do precisely what the technology companies want, thereby executing their agenda, which is more aligned with economic interests and the companies ideologies rather than with a promising, context-specific pedagogies. Googlification of the teacher is a case in point and applies as long as any school signs up to use the Google Apps for Education (GAFE) suite.

Faced with accountability and data-driven education systems, teachers find themselves torn in pedagogical dilemmas and enforce power relationships that reshape their pedagogy and professional practices. These dilemmas force them to become more mechanical towards achieving the system's expectations and focus on teaching to the test to maintain students who do well in the national tests.

In one of the studies reviewed (Werler & Færevaag 2017), teachers fixation on meeting parents expectations was claimed to be high, as those parents had confidence in the value of the results of the tests as a marker of the quality and profiles of the schools, and these rankings mattered to parents' in their choice about which schools their children attend. Given this, teachers and schools are provoked to put up superficial reactions to problems rather than settling down to confront issues

based on pedagogic principles and needs. Students needs are abandoned in favour of the government's needs to belong to the top of the schools and countries ranking league table.

As in the case of the big technology companies sway over the governance of schools, governments inadvertently submit some of their power over determining the direction of every aspect of their school systems to organizations like the Organization for Economic Cooperation and Development (OECD). They administer one of the most popular schools ranking globally, the PISA ranking. In one of the studies, principals indicated that using performance-based assessments was crucial for controlling teachers. As principals profiles become more economic-oriented than academic, schools are treated and managed as production centres instead of teaching and learning places, and decisions are driven more by market forces than students and teachers pedagogic needs.

The influence of the big technology companies and international bodies driving the accountability and competition initiatives of school rankings and government's acquiescence to them is another clear case of modern governments operating through a network of indirect power (Miller and Rose, 1990), counting on diverse agents, in this case, the big tech companies and the international large scale testing and ranking organizations. Though in this case, the results of this systematic review show that some power may actually be shifting away from governments toward technology companies. At the same time, while teachers may experience implementing externally motivated performance-based accountability systems as counter-productive professionally, psychologically and physically, governments and school managements may nonetheless find them helpful in effectively overseeing and controlling the practices of teachers and students while making it appear to be in their best interests.

Limitations of the study

The study was limited to the formal school system, irrespective of the level of education and the non-formal school sector was excluded. Limiting the literature search to only articles published in an international, peer-reviewed journal may have led to not finding enough articles to use for the study. Also, given the scope of the study, I concentrated on schools in Europe. Since this was a master's thesis, I did the appraisal of the articles alone. These limitations may have impacted the scope and richness of the study.

Recommendations for future research

A study focusing on the non-formal education sector or a comparative study involving formal and non-formal schools could focus on issues and ideas and generate findings that this study did not. While the use of only peer-reviewed journals was adopted as a quality control decision, and to make the selection process manageable, given more time and resources, it may be helpful to also to include materials from conferences, dissertations and position papers in a future study.

Also, not limiting the study to any continent may yield richer results in available research records. Finally, having more than one author involved in the systematic review over a more extended period is suggested to yield better results due to their combined and diverse competencies and viewpoints.

Studies that prioritize involving students as key participants will likely result in new and useful findings that will be significant in the continuing debates on the impact of datafication on pedagogy. Since this can have serious consequences, it will be worthwhile to explore and better understand the impact of digital datafication and performance-based accountability on teachers mental health.

8. Conclusion

In this study, I examined how digital datafication of teacher and student practices affects pedagogy, the relationship between datafication and government control of schools, and the pedagogical implications of using platforms for teacher and student practices in European schools. This was based on a systematic review of articles from electronic databases, citation chasing, and manual search, with an emphasis on identifying the impact of data practices, learning technologies, and performance-based accountability on the practices of teachers and students, and finding answers to the following research question:

- How does digital datafication of teacher and student practices affect pedagogy in European schools?
- What is the relationship between datafication and government control of these schools?
- What are the educational implications of using platforms for teacher and student practice?

A key finding in the data practices area is the collateral effect of increasing data requirements and practices on teachers, including a loss of professional autonomy, creativity and initiative, the combination of which leads to pressure, disillusionment, cynicism, and dilemmas, exposing them to the likelihood of mental and psychosomatic health problems. The dilemma obscures the benefits of using data to improve teaching and learning.

Although several studies found that technology integration offers significant benefits in the classroom, such as automation of pedagogic processes, creation of adaptive and personalized learning environments, it is essential for education policymakers and other industry stakeholders to hold technology companies schools accountable to a greater degree to strive for transparency in their dealings with the school system and to take back responsibility for education for the common good.

Given the politico-economic power and influence that the big tech companies currently wield, this may seem like an excessively big task, but school leaders could start by assessing areas where they could have small wins and start from there.

Findings concerning the performance-based accountability theme suggest that schools are gradually deviating from the essence of their existence as knowledge generation and mediation institutions to a kind of championship league, which leads school principals and government to prioritize ranking over real teaching and learning and the professional leadership profile of school administrators to a market economy determined one. Competition is rife for the wrong reasons. It is necessary to re-evaluate these issues further, using a larger sample, different methods in more geographic regions and educational settings, to deepen the conversation and understanding of the effects of digital datafication on teacher and student practices.

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