Chapter 10
Governance Through Digital Formations – The Case of 'What Works' in a Norwegian Education Context

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Abstract The Norwegian education system has experienced a shift from originally being strongly rooted in social democracy, equity and the welfare state, to being characterized by a focus on digitized data-work where the 'what works' agenda has become a pivotal matter. Digital technologies are now providers of evidence, and important to identify what best practice *is* and what it *should be*. This chapter reports on a sociomaterial analysis of in total four policy documents related to an upcoming national school reform in Norway. We treat the policy documents as 'windows' into the policy of digitization in Norwegian schools. The findings show an assemblage of heterogeneous actors that are to partake in digital practices in schools. By tracing their relations, we find that digital formations are potentially important actors in steering the governance of Norwegian schools. Findings also show that relations may be forged at school level. The authors discuss how the coming together of heterogeneous actors generate governable forms of digitization. In particular, the analysis of the assemblage shows that the relations provoke a governance agenda of quality assessment. The findings suggest further empirical research in schools to map school actors' knowledge of and practice with digital formations and its functions in governance.

Keywords Digital education governance · Digitization · Policy assemblage

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Introduction

Norway has an education system strongly rooted in social democracy, equity and the welfare state. Local teachers, school leaders and schools have had great autonomy and have been viewed as agents of the civic society, helping build the nation and shape the national identity as the country grew out of poverty and into prosperity in the nineteenth and twentieth century. The population in Norway has been and remains widely dispersed, paving the way for a regional and municipal policy dimension in education. Educational institutions in Norway operate on a national, regional, and municipal level where responsibility is shared among politicians, professional administrators and local schools.

As the wave of neo-liberalist influences hit Norway and other Nordic countries in the 1980s and 1990s, it was argued there was a need to ameliorate national and local education authorities to ensure more efficacy across all levels (Uljens, Møller, Ärlestig, & Frederiksen, 2013). The introduction of individualized and efficient public institutions gave rise to parental involvement in education, as well as a flattened municipal hierarchy. The inauguration of New Public Management (NPM) mechanisms and the launch of international testing such as the Programme for International Student Assessment (PISA) resulted in a shift in the Norwegian education system (Møller & Skedsmo, 2013). This shift is characterized by a strong focus on student outcomes and results, new assessment-and output-oriented policies; all features which gave fuel to the rise of student data. 'What works' became a matter of tracking student activity, from the earliest accounts of results in national testing to achievement of curriculum targets. Evidence-based research and effectiveness models that were highly influenced by the use of student data were, and continue to be, central sources of reference for educational policy makers in Norway (Baek et al., 2017).

A growing body of educational policy research has focused on the use of student data, especially highlighted by cases in Anglo-Saxon countries and within supranational institutions such as the European Union (EU). Some of these have displayed outcomes and strategies of data use in school inspections and within self-evaluations (Ozga, 2009; Ozga & Grek, 2012). Other studies show how multinational and supranational organizations, as well as the rise of 'edu-business', enable the collection, distribution and analysis of student data (e.g. Lawn & Grek, 2009; Pettersson, Popkewitz, & Lindblad, 2017; Souto-Otero & Beneito-Montagut, 2016). Although data undoubtedly has become eminent to a wide range of educational professionals, less attention has been paid to the digital initiatives that facilitate the process of accumulating data in regards to the matter of the 'what works' agenda in education.

Multinational organizations, 'edu-business', and national assessment systems undoubtedly enable the real-time and fast-pace collection of student data, however, the digitization and datafication of education governance (Williamson, 2017) is increasingly dependent on and being realized by complex entanglements of digital formations such as learning analytics, algorithms and visualizations. Digitization and datafication is in this sense an intertwined process of translating big data into

educational practices in a digital form (Williamson, 2017). This notion has consequences for a wide range of actors; students are increasingly having their every digital move traced by advanced data analytics that can visualize, assess and 'transform' their progress (Høvsgaard Maguire, 2019), parents are able to follow these developments through websites with school comparisons (Decuypere, Ceulemans, & Simons, 2013), and teachers and school leaders are expected to use digital data technologies to inform their own practice (Ottesen, 2018; Selwyn, 2016).

In Norway, educational policy research has also paid emphasis on the use of student data in particular to the National Quality Assessment System [NQAS] (Gunnulfsen & Møller, 2017; Skedsmo & Møller, 2016). Key to the NQAS is its focus on output-oriented and evidence-based policies (Skedsmo, 2009), often characterized by the collection, distribution and analysis of student data. Norwegian schools are expected to utilize data from the NQAS found on various platforms, software and test-practices to collect information, and to make decisions for future school development plans (NOU, 2015:8; Ottesen, 2018). In this sense, digital platforms and software have become a necessity in Norwegian schools in order to comply with governmental expectations of performance measurement. Digital technologies are now providers of evidence, and important actors in identifying what best practice *is* and what it *should be*. As such, we argue educational governance research should also be sensitive to the wide range of (digital) entities that facilitate governance mechanisms such as the collation of data.

Recent policy studies have moved beyond established conceptualizations of the 'doings' of policy to explain emerging governance mechanisms. Some of these studies have adopted sociomaterial approaches to theory and methodology. In particular, the sociomaterial concept of *policy assemblage* has surfaced in education policy research (Gorur, 2011; Youdell, 2015). In policy assemblage, the sociomateriality is treated as a *sensibility* to trace the process by which various elements come together in an assemblage, or a network (Savage, 2019). Studies that have investigated the emergence of digital formations in education find that relations between heterogeneous actors characterizes such networks (see for instance Landri, 2018). We build on this prior research to investigate how heterogeneous actors are assembled in Norwegian policy documents to fulfill governmental aims of digitization. We have analyzed in total four policy documents, all leading up to and related to the upcoming incremental school reform *Fagfornyelsen*. Researching assemblages through documentary analysis can reveal particular legitimations of thinking by working as 'windows' into the mobilization and application of component parts (Baker & McGuirk, 2017, p.434). The following research questions guide our analysis:

(i) What relations between heterogeneous actors form through the descriptions of digitization in the policy documents?
(ii) How do these relations shape policy intentions of the digitization in schools?

This chapter proceeds as follows: the phenomenon of digitization in a Norwegian context will first be presented. We will then frame the concept of policy assemblage, which serves as the analytical foci in our analysis. The methodology will then be

presented, before we outline the main findings of the analysis. Lastly, we will discuss some of the main findings before presenting concluding remarks with recommendations for future research.

Digitization and Big Data in Norwegian Education (Context)

The collection of data is not new, and has persisted in large parts of society for centuries. However, as new technological achievements and an increased interest in documenting precise, detailed and personalized information has augmented in the twentieth century, so has the techniques for collating data. Today, the collection of data transpires in large parts of our everyday-lives; from social media and commercial platforms, to wellbeing and fitness applications. The twenty-first century human is repeatedly exposed to the collection of data, and is constantly reminded as they enter unvisited webpages online as a result of the General Data Protection Regulation (GDPR). In education, this trend is best explained by the concept of Big Data (Williamson, 2017). Generally, big data refers to complex types of data analytics such as learning analytics, predictive analytics, and machine automation. These are comprised of data sets that have great *volume* (large in quantity), *velocity* (real-time and fast-paced), and *variety* (stem from different sources) (Kitchin & McArdle, 2016). However, big data often entails more; it is also *exhaustive* in scope, *relational*, *scaleable*, and carries *variability* (Kitchin & McArdle, 2016). Small data may hold some of the characteristics described above, however such data sets are always slow and one-sided in nature making triennial tests such as PISA questionable in terms of its fit with the concept of big data.

The digitization of education relies on big data in the translation process of practices into software and code (Williamson, 2017). Such practice can represent a wide range of mundane school practices (i.e. teaching, assessment), as well as governance mechanisms such as the 'what works' agenda. Making sense of databases comprised of big data is generally accomplished using software that has been coded to visually present and analyze the information. Software inherits the power to be selective; the information and data available on software and platforms are hand-picked and tailored to fit the purposes an actor wishes to enlighten (Kitchin, 2014). Digital technologies enable evidence-based practices, and in Norway, this may imply a type of soft-governance that sets the 'what works' agenda for policy makers as well as for local school development. Big data and software will always be partial and selective; the question is on behalf of who or what such a bias stems from.

The digitization of education in Norway has developed rapidly from the beginning of the century. Early efforts include the focus on digital literacy within the Knowledge Promotion in 2006, and although this period was characterized by access, infrastructure and building teachers' ICT competence (Ottesen, 2013), it set the stage for further policy initiatives. Simultaneously, the NQAS was introduced in the aftermath of the first PISA results. Data provided within the NQAS includes national testing, self-evaluations, student surveys and publicly available statistics. It

also offers national and municipal authorities a way of measuring, coordinating and managing Norwegian education. The datasets within the NQAS can be accessed separately and directly from the source, however, the introduction of new assessment practices saw a rise in platforms that were able to assemble all the datasets in one place (Caspersen, Røe, Utvær, & Wendelborg, 2017). The company Conexus has worked on behalf of the Norwegian Ministry of Education and Research for over a decade and is a leading company in providing software with learning analytics in the Nordic countries (Conexus, 2020). From its outset, Conexus has offered several platforms that gather data from a variety of sources and visually present the data for teachers and school leaders. In Norway, some of these sources include results on national tests, student surveys, mapping tests and other subject-specific tests. Today, some of these assessments also include algorithmic thinking that allows the level of the test to change accordingly to how students answer (Høvsgaard Maguire, 2019). Through software like Conexus, students' performance is constantly being recorded to a meticulous level, all available and administrated within one place. Best practice and 'what works' is presented as desired outcomes, sometimes color-coded where red implies the need for immediate intervention.

In 2019, the Norwegian Directorate for Education and Training introduced the Value-Added-Indicator (VAI) – a measurement tool for schools and municipalities to estimate indicators of school contribution to students' achievement in Norway (Directorate for Education and Training, 2020). The VAI takes into account indicators for student performance such as earlier performance results, but also cross-sectional indicators such as family background (parents' education and income) and immigrant background. The results are publicly available online on the Directorate's webpage for quality assessment, Skoleporten, and are subject to comparison across municipalities. The concept of value added by schools resembles economic approaches used to express learning outcomes as school profit (Kirkebøen, Kotsadam, & Raaum, 2016). More than building on economic concepts from the private sector, however, is the VAI's potential to be scrutinized by digital means to enhance the 'what works' agenda. We may see a rise in digital technologies offering predictive analytics (such as in VAI) – a process grounded in complex forms of big data. Building on what *has been,* and what *is* to predict what *might be* is vital to predictive analysis, a process that has expanded in scope in several parts of the public sector, including education (Williamson, 2016).

Policy Assemblage

Key to sociomaterial approaches is that 'things' can be performative. While educational policy may include descriptions of curriculum texts, teaching material, and databases, educational research often neglects the performative contribution of these materials (Waltz, 2006). In sociomaterial approaches, both social (human beings, values, discourses) and material (i.e. texts, data, evaluation tools) entities are of equal importance, and neither are given importance over the other.

We use *policy assemblage* as an analytical concept in this chapter. Often, policy is examined by looking at individual component parts, and seen as something 'clear, abstract and fixed' (Ball, 1997, p.265). However, in a (digitized) world with complex human and non-human systems made up of sophisticated and versatile relations, assemblage thinking seeks to move away from conceptual abstractions of policy to shed light on how such relations produce agency of relevance to broader, educational issues (Savage, 2018). In our analysis, this implies viewing assemblage as a process where heterogeneous entities are gathered, brought together and linked in an assemblage (Fenwick, Edwards, & Sawchuck, 2011). It is through this very process that entities may gain agency as they acquire characteristics *relationally* (Law, 1994). By forming relations with other entities in the assemblage, entities may become actors that have 'the capacity to act and give meaning to action' (Callon, 2005, p.4). Thus, in what follows, 'entity' and 'actor' will be used interchangeably.

In this paper, we use Savage's (2019) three core analytical foci of policy assemblage; (i) relations of exteriority and emergence; (ii) heterogeneity, relationality and flux; and (iii) attention to power, politics and agency. First off, relations of exteriority characterize assemblages; meaning an entity that is part of one assemblage can at any given time also be part of other assemblages where its characteristics are different (DeLanda, 2006). Policy assemblages are not stable or made already, but are always becoming in complex entanglements. In short, assemblages can be infinite. Second, assemblages are "heterogeneous, comprised of a multiplicity of component parts that have been arranged together towards particular strategic ends" (Savage, 2019, p.7). We use the notion of heterogeneity, relationality and flux to examine how entities are strategically arranged to better steer and govern (Savage, 2019). Policy assemblages are not a result of coincidence or random arrangement, and the mere existence of heterogeneous entities does not automatically translate to the making of an assemblage (Savage, 2019). Lastly, the notion of power, politics and agency includes the comprehension of the workings of heterogeneous relations. Through the relational capacities of heterogeneous entities, policy assemblage offers the possibility to examine how these relations create governable forms (Savage, 2019). In an assemblage, power is potentially everywhere and is distributed as entities gain agency relationally. Slightly rephrased, power is composed relationally through the relations between actors in an assemblage. While we cannot make claims about the entities' power in practice based on our empirical data, we examine the entities' *potential* to exert power as other entities heavily rely on them in order for a digitized activity to be realized.

We use the concept of policy assemblage as means to examine how heterogeneous relations form in the ways that they are articulated, imagined and arranged in policy documents to generate governable forms of digitization (Savage, 2019). This implies analyzing how digitization is being stabilized and legitimized through their embedded relations. The use of policy assemblage raises a few methodological considerations, such as how we identified entities and by what means these were determined to be an actor in the assemblage. The upcoming section will therefore

continue to incorporate and clarify central points of policy assemblage as we describe our methodological steps.

Methodology

The empirical data in this chapter builds on four policy documents (White Papers and Green Papers). These documents have been selected because of their importance to the ongoing subject renewal reform Fagfornyelsen, which is the first to be solely available online. There has been a digital restructure of curriculum, guidelines and support material. Thus, analyzing policy documents that lead up to Fagfornyelsen provides information about current digitization strategies in the Norwegian context. One official report (NOU) has been included in the analysis, because these types of reports are funded and appointed by Royal Norwegian Commissions and has been an important policy document in the pre-phase of the subject renewal. Although documents may very well be considered actors in an assemblage, we have analyzed the policy documents as 'windows' into the policy of digitization (Baker & McGuirk, 2017). The policy documents are therefore not part of the assemblage in our analysis, but are used as sources to reveal particular socio-material relations of imagined school practices with the digital (Table 10.1).

To show our process of identifying entities and mapping relations in the assemblage we have used a mix of types of content analysis. We draw from three types in particular: summative content analysis, conventional analysis and directed content analysis (Fauskanger & Mosvold, 2014; Hsieh & Shannon, 2005). These three types were used as three individual steps in our analysis, and build on each other in order to provide a thorough investigation of the policy assemblage at hand.

The start of our analysis was done through a simple version of summative content analysis. Summative content analysis can be based on tracking words in textual data to find meanings (Fauskanger & Mosvold, 2014). We used this approach to search for words related to digitization in the three documents that were not distinct digital strategies (White Papers and Green Papers that covered much more than the topic of digitization). The search for words directed us to segments in the policy documents that solely articulated practices in relation to *something* digital. However, we found that not all the segments identified in the word search were relevant to our

Table 10.1   Policy documents analyzed

Policy documents analyzed
NOU 2015:8 – Fremtidens Skole [School of the Future].
Meld. St. 21 – Lærelyst – tidlig innsats og kvalitet i skolen [Apprenticeship – Early efforts and Quality in School].
Meld. St. 28 – Fag – Fordypning – Forståelse. En fornyelse av Kunnskapsløftet. [Subjects – Specialization – Understanding. A Renewal of the Knowledge Promotion].
Framtid, fornyelse og digitalisering. Digitaliseringsstrategi for grunnopplæringen 2017-2021. [Future, renewal and digitalization. Digitalization Strategy for Basic Education].

research. Assemblages can be infinite (Savage, 2019), and we did a methodological choice to cut the assemblage considering the focus of our study; governmental expectations to use digital technologies in schools. This is best explained by the notion of exteriority (Savage, 2019), as entities in one assemblage can at any given time be part of other assemblages with different characteristics, or have extending assemblages imbued within them. The level of our analysis and the limit of the assemblage was therefore set to be on the level of school and school governance in regards to digitization. We acknowledge that an expanded version of the assemblage would include far more entities, however, such an expansion could potentially be bottomless and outside the intentions of this study.

We proceeded to code entities through a conventional content analysis (Hsieh & Shannon, 2005). In conventional content analysis, codes are deduced from the dataset. Entities were coded, identified and included in the assemblage if their described characteristics showed they were expected to either perform a digital practice in schools or take part in one. For instance, the entity Learning Analytics was coded because its characteristics illustrate action: the digital formations within learning analytics actively collects data, and can track student development over time. In fact, when school practitioners are expected to collect and distribute data, it is learning analytics that partly performs the action. The relations that form between entities is intrinsic to policy assemblage, and for understanding how agency and power is distributed across the assemblage (Savage, 2019). We were therefore interested in coding the relations between entities that were expected to partake in the activity. To build on the previous example: the entity learning analytics engage with digital teaching material because it exists and is exploited on these platforms; students may engage with it as their information is collected; teachers are expected to analyze the information to inform teaching and learning; school leaders can make use of it for further school development plans. In this conventional content analysis, we were able to identify four entities in relation to learning analytics; digital teaching material, students, teachers, and school leaders (Table 10.2).

We identified additional relations by using directed content analysis that typically deduces codes from theory (Hsieh & Shannon, 2005). We proceeded to do a third reading of the segments drawing from conceptualizations in the field of digitization (Hsieh & Shannon, 2005). We drew in particular from previous knowledge of the characteristics of big data (Kitchin & McArdle, 2016), as well as the workings of big data and digitization in educational governance (Williamson, 2016, 2017). Our use of directed content analysis can be demonstrated by taking the example of the entity the NQAS. By reading the characteristics of NQAS we found that it is highly based on gathering vast amounts of information. With some previous knowledge of what learning analytics entails, we were able to identify that these information sources are indeed forms of learning analytics. Thus, the NQAS forms relations with the entity learning analytics, in the way that the policy documents imagines the NQAS to digitally gather, process and analyze information (data). Lastly, we included descriptions of the expected outcomes in order to better analyze the coded entities and relations' potential to create a governable space for action (Savage, 2019).

Table 10.2 Example from coding scheme

Entity	Characteristics	Relations	Expected outcome
Learning Analytics (LA)	Exploited by digital teaching material to collect large amounts of data. Track student development over time (digitally). Students, teachers and school leaders are expected to engage with such digital teaching material, and always evaluate its potential for teaching and learning.	Teachers School leaders Students Digital teaching material	To be used in assessment (especially formative assessment), for differentiation of teaching and learning, for continuous feedback. The individual students' needs is in focus. Will require new teacher competence (KILDE).
The National Quality Assessment System (NQAS)	Comprised by: gathering information to form a knowledge bank, tools, routines and measures. The data is gathered digitally. The digital data within the NQAS includes: results on international tests, national tests, mapping tests, and student surveys.	Teachers School leaders Students Learning analytics	For teachers to plan, assess and conduct teaching. For schools to ensure quality and to assist in school development. For educational authorities to govern.

Findings

The policy assemblage in our analysis is comprised by heterogeneous entities with various relations. To address the aim of our study, the following analysis reveals how entities are imagined to connect and form relations to generate governable forms of digitization. Three main categories of entities emerged from our analysis: (i) digital formations, (ii) governance tools, and (iii) human beings. In the forthcoming, we present findings from these three categories.

Digital Formations

Intrinsic to big data is its varying forms of data analytics that allows digital data to be collected in a speedy and timely matter (Kitchin, 2014; Kitchin & McArdle, 2016). We found presentations of big data in our analysis, although the term itself was not used in either of the policy documents. However, terms within the realm of big data and digitization that are explicitly articulated in the documents, are learning analytics and adaptive algorithms. These entities are consistently described in relation to digital teaching material.

We found that digital teaching material is reported as being enablers of a wide range of activities. The entity is first off a presentation of digital textbooks and didactic aid. In Norway, the selection of digital technologies (including teaching material) lies on a municipal level (Gilje et al., 2016). However, teachers and school leaders are increasingly invited to evaluate and assess the possibilities of such teaching material (Ministry of Education and Research, 2015, 2017b). Moreover, we

found that digital teaching material is highlighted as having the potential to offer customized aid for each individual student. Students are to make use of the digital textbook or platform to assist with their learning, often leaving a digital 'footprint' in terms of assessment or evaluation data. Teachers and school leaders may take advantage of such material to differentiate teaching and learning for low-performing and high-performing students according to their needs and prerequisites (Ministry of Education and Research, 2017a). In order for digital teaching material to offer an individualized and personalized teaching experience for students, these platforms rely on learning analytics and adaptive algorithms.

Adaptive algorithms has been identified as an entity as it is imagined to be part of digital teaching material that is able to change the course of action for students interacting with it. This may be algorithmic testing (Høvsgaard Maguire, 2019). Algorithmic testing relies on information from the students 'as they go'. Students may engage with it as they answer questions with predefined choices on the test. The algorithms come into place as they collect the students' answers there and then, analyze it, and steer the remaining of the test in the 'right' direction according to the level of their answers. In addition to forming links with digital teaching material and students, we find that adaptive algorithms are also entangled with teachers and school leaders in the assemblage. Teachers and school leaders are encouraged to assess the predefined choices in adaptive testing, considering what is being measured and understand its learning approach (Ministry of Education and research, 2017a). We find that the imagined digitalization practices with adaptive algorithms is assessment, as well as differentiation of teaching and learning. In this sense, the algorithm is imagined to perform the differentiation and are important actors in identifying 'what works' for each individual student in that particular moment. We find that this description enforces an individualized, personalized and evidence-based assessment practice, as the interest lies in the peculiarities of each student. Keep in mind that context knowledge is often outside the workings of algorithms, which is where teachers and school leaders need to exercise professional judgement. Adaptive algorithms, like digital formations of big data in general (Kitchin & McArdle, 2016), are not neutral instruments. Revealing the 'black box' of adaptive algorithms is consequently an important job for its users. The policy documents are careful in demonstrating school leaders and teachers' possible response to the workings of adaptive algorithms in mundane school practices, such as questions of their professional autonomy. They do however acknowledge that it will be particularly difficult for school practitioners to evaluate pre-defined choices, and comprehend what material that becomes available to which students on digital teaching material that uses adaptive algorithms (Ministry of Education and Research, 2017a). The expectation to interpret and analyze the workings of adaptive algorithms invites teachers and school leaders to do in-house 'policy work' by engaging in evidence-based discussions, albeit questioning whether school practitioners have the necessary competence to do so.

The entity learning analytics forms relations with digital teaching material that is designed and coded to offer the collation of data. We find that its intended characteristics are to collect vast amounts of data and to monitor student development over

time. Its relations include students; students may engage with learning analytics by taking a test or a survey, leaving a set of data behind. It also forms relations with teachers and school leaders as they are expected to exploit the data to inform their own practice (NOU, 2015:8; Ministry of Education and Research, 2017a). In particular, its intended action is to assist in the digitalization of assessment. As written in NOU, 2015:8 Fremtidens skole [School of the Future] on page 89:

> An area such as learning analytics may be used to enhance the work with formative assessment. This means that digital tools could be used to track pupil development over time in the form of many observations and results. Such technology may change the conditions for learning, teaching and formative assessment in school, and will require new teacher competence.

As learning analytics may facilitate practices of formative assessment, we find that it is expected to equally facilitate practices of evidence-based policy. As the above quotation implies; there is an interest in tracking student development over time. Within learning analytics, this phenomenon is best exemplified by its possibility to record the performance of individual students, groups of students, and schools to create new ways of imagining and intervening in education (Williamson, 2017). We find that in Norway, learning analytics is imagined to make things (in forms of data) visible, observable and trackable, thus providing a governable form of evidence in a 'real-time' matter. Information provided by learning analytics will in turn support students, teachers and school leaders in 'other ways than the practice is today' (NOU, 2015:8, p.89), suggesting a shift in school practice that will call for new competence. New, digitalized competence for teachers, school leaders and students includes the evaluation of selectivity and bias in digitized systems using learning analytics (Ministry of Education and Research, 2017a). The policy documents are careful in detailing learning analytics' role in educational governance. However, through our directed content analysis, we find that the imagined school practices with learning analytics generate links with governance tools, implying that learning analytics has been an area of digitization that has prevailed in Norwegian schools for some time.

Governance Tools

In total, we coded two separate governance tools in the assemblage: the NQAS and the Point-of-View (PoV) analysis tool. The NQAS' strategic design evolves on gathering data to best govern, monitor and develop quality in Norwegian schools. The information provided within NQAS has thus various goals (expected outcomes); from improving assessment practice in schools, to map students who face specific challenges, and for local and national educational authorities to better govern. The PoV tool is a process tool for schools to ensure quality as is intended in the NQAS. It is comprised of three steps; to gather information (data) provided within the NQAS and other relevant data within the school, create a knowledge bank based

on this data, and set targets for further actions. In Meld. St. 21 on page 69, the first step of the PoV tool is described as (translation by authors):

1. Gather information: In the first phase, information about the schools' resources, students' learning environment and learning results is collected from Skoleporten. It is also possible to include local information.

We find that the relevant data that is to be gathered in the PoV is closely linked to the NQAS, as schools are encouraged to gather information from the Directorate's webpage for quality assessment, Skoleporten. The relations between the NQAS and the PoV tool is thus visible, however, we identified other, extending relations to digital formations. Specifically, we find that in the reflection and analysis stages of the PoV and NQAS, the entities highly rely on learning analytics to perform the action of quality assessment as is intended from the Directorate. Learning analytics performs the digital collection, distribution and presentation of data, whereas the governance tools 'soak up' the information to spark a desired action in schools. Analyzing learning analytics in relation to the governance tools tells us that learning analytics is the very foundation of the NQAS and the PoV tool, and is indispensable to the performative side of the governance tools. Without digital formations in place, the governance tools would lose essential characteristics such as the capability to track student data. This entails that learning analytics, within the governance tools, is imagined to provide automated information for schools to govern in-house and up-close through constant interactions with individual students. The close relation between the governance tools and digital formations thus engenders the possibility to identify, analyze, allocate, and delegate duties based on automated, evidence-based practices. Put differently: the NQAS and the PoV tool materialize by using digital policy instruments that exploits techniques of big data.

It is worth mentioning again that we identified the relations between the NQAS, the PoV tool and learning analytics through a directed content analysis based on previous conceptualizations in the field of digitization. However, learning analytics' role in Norwegian school governance is not explicitly addressed in the documents, neither the question of autonomy of local teachers, school leaders, and schools in relation to big data. The expectations towards teachers and school leaders to engage in digitized practices is nevertheless addressed in the documents and paints a picture of considerable local responsibility to ensure digital competence and ethical considerations amongst the staff.

Human Beings

Once relations form between digital formations and governance tools, we find that new relations may be forged in the assemblage with human actors at school level. Students are to use the digital teaching material, their data is gathered in various forms of learning analytics, and they may engage in assessment practices using adaptive algorithms. Teachers are expected to utilize these presentations of digital

formations to diversify and differentiate their teaching, both in the organization of teaching and in the classroom. This goal presupposes that teachers have the necessary competence to analyze and evaluate the advantages and disadvantages of digital teaching material that uses learning analytics and adaptive algorithms. While the documents clearly state that the teacher profession should engage in these issues collectively, they are also apprehensive to the fact that both newly qualified teachers and experienced teachers may not have sufficient digital competence to assess the quality, ethics and data security of digital teaching material (Ministry of Education and Research, 2017a).

The school leadership team is responsible for making sure that all staff have the necessary expertise in ICT, in information security and privacy, as well as to ensure that personal data is handled in accordance to laws and regulations (Ministry of Education and Research, 2017a). School leaders are also responsible for facilitating practices of quality assessment in schools to enhance school quality and teaching practices. This may include time and effort to identify school development issues through tools like the PoV. As such, school leaders are imagined to engage with the NQAS, learning analytics, and adaptive algorithms through careful monitoring and follow-up of results on national tests, mapping tests, algorithmic tests, and student surveys. This mirrors an evidence-based approach as teachers and school leaders are expected to make decisions based on data-informed practices. We argue that these digital, data-informed practices will have implications for school leaders and teachers as they will have to acquire sufficient knowledge about 'new' concepts, 'new' expectations, and the coherence between digitized systems while simultaneously being able to effectively exploit the digital tools.

Discussion

In this chapter, we aimed to investigate how heterogeneous actors are assembled in Norwegian policy documents to fulfill governmental aims of digitization. The analysis above shows that relations form between (potential) heterogeneous actors of digital formations, governance tools and human beings as policy intentions of digitization practices are formulated in the documents. Savage (2019) argues that what is most important in an assemblage approach is to understand the nature of relations of the component parts, rather than the mere presence of them. This, in turn, draws attention to the capacities such relations generate as they *come together*, *emerge* and *become* in complex entanglements. This notion is further highlighted by the focus on heterogeneity, relationality and flux in assemblage approaches (Savage, 2019). In our analysis, we find that the specific relations that emerge between the entities are crucial to understand the imagined practices of digitization. On the one hand, examining the characteristics of an individual entity could yield some fruitful findings. For instance, the analysis of the entity NQAS describes its internal workings and possibilities to collate data and inform on evidence. However, when examining the activity that the NQAS is imagined to facilitate, it can hardly be analyzed in

isolation. Our findings suggest that the NQAS relies on learning analytics, alongside teachers, school leaders and students, to be able to perform potential policy intentions of governance and digitization at school level. Thus, we find that agency is distributed across the assemblage, and one entity without the other may not have generated the same imagined activity.

In policy documents, the assemblage of potential entities is arranged to best serve the policy intentions (Savage, 2019). The way entities come together may determine the potential practices of a policy or an agenda (Savage, 2019), such as a 'what works' agenda. The analysis of the assemblage of digital formations, governance tools and human beings shows that the relations provoke a governance agenda with some expected outcomes. These outcomes are mostly descriptions of assessment, differentiation of teaching and learning, and quality assessment. Catering to the needs of both high performing and low performing students is one of the main goals of the imagined digitization in Norwegian schools, for instance through the use of adaptive algorithms. Within these descriptions, we find that the relations between heterogeneous actors engender practices with personalized solutions where the individual student, individual class, and individual school is of interest. The digital formations in place will facilitate the necessary personalization and individualization that the governance tools seek to accomplish. Teachers and school leaders are expected to engage in these digitization practices in order to make evidence-based decisions. This suggests that teachers and school leaders may be dependent on digital teaching material to achieve governmental ambitions of quality assessment in Norwegian schools. This resonates well with Williamson's (2017) argument that data analytics, software and database instruments play an important role in efforts to govern teaching and learning. Our findings indicate that the described heterogeneous actors shape the policy intentions of digitization in relation and interaction with each other to put forward and legitimize governmental ambitions of evidence-based practice. The analysis has in particular shown that digital formations are expected to be important actors in identifying 'what works' for each individual student (such as algorithmic testing), best practice (learning analytics) and evidence (learning analytics through the NQAS).

Findings further suggest that in Norway, digitization has not only been enhanced by introducing ICT in education, but by an intertwined process of digital developments and an effort to optimize governance mechanisms. In a way, we argue that it might be challenging to distinguish the NQAS, the PoV tool and learning analytics from each other in the assemblage. The characteristics of learning analytics as an individual entity is clear-cut, however, we found that the very nature of the governance tools build on essential premises of learning analytics (such as the continuous tracking of performance results). These findings indicated that the governance tools highly rely on learning analytics to have the potential to become performative. In fact, using a policy assemblage lens (Savage, 2019), the governance tools are *made into being* by the expected, performative actions of learning analytics that allows schools and educational authorities to harvest, distribute and analyze student data. It is difficult to imagine a quality assessment system without technological advancements and important questions arise; how would the NQAS look like without

sophisticated digital formations in place? Who or what would collate, analyze and present the data (and thus perform the action)? The NQAS and the PoV tool is dependent on learning analytics to perform the practice of quality assessment in Norway. Learning analytics is in this sense a crucial and strategic entity in the assemblage (Savage, 2019), and exerts power as other entities depend on it to comply with governmental ambitions of digitization.

While the documents frame big data practices as something 'new', we have found that sophisticated forms of big data have been introduced to Norwegian schools over a decade ago – the NQAS have since its beginning built on learning analytics in order to reinforce and intensify governance mechanisms. Learning analytics, as expressed within governance tools, may have been based on a less complex form from its outset, but it has nevertheless existed and persisted in Norwegian education for years. As the policy documents informs that the use of learning analytics and adaptive algorithms will increase in the years ahead, they simultaneously warn about the lack of teacher and school leader competence to exert the necessary judgement of such materials. This suggests that Norwegian schools should already be acquainted with practices of big data, albeit with limited competence to partake in such practices. Consequently, this means that while teachers and school leaders in Norway may be given the opportunity to exert professional autonomy by engaging in local data-interpretation, this autonomy is influenced by lack of competence. Digital formations may in this sense gain authority as it becomes an important actor in steering the direction of governance, and in so doing both opens up and limits the professional autonomy of school practitioners (Høvsgaard Maguire, 2019; Williamson, 2017). The materialization of governance tools is imagined to digitize mundane school practices such as assessment, evaluation and quality assessment. We find that digitization then becomes a question of a re-imagination of governance mechanisms in a personalized, precise, and digital form. With new governance tools being rolled out in Norwegian schools (i.e. the VAI), it will be important to continue to disentangle its sociomaterial entities to fully grasp its potential in questions of agency, power and governance.

Conclusion

Overall, this study has found that policy intentions to digitize Norwegian schools result in complex entanglements of heterogeneous actors as they together may *become* in the relations they are expected to take on. This study found three categories of heterogeneous actors: digital formations, governance tools, and human beings. The relations that form between the prior two have been of particular interest. Within the relations that arose from our analysis, the study yielded two overlapping discussion points. The first one is the importance of studying (digitization) policy as assemblages with their heterogeneity, relationality, and emergence, as is discussed by Savage (2019). The second is the discussion of the very nature of the heterogeneous actors' characteristics and relations that create the potential to exert

power and agency. The latter point demonstrated how the heterogeneous actors in the policy assemblage relationally enacted governance mechanisms through digital means. The relation between the NQAS and learning analytics exemplified this; the entities have the potential to become performative as a result of the relations they form. As such, our study confirmed predominant conceptions of educational governance as being realized by digital formations (Landri, 2018; Williamson, 2017). The analysis therefore demonstrated 'how multiple heterogeneous components are arranged to create governable forms' (Savage, 2019, p.10), for example, the expectations for teachers and school leaders to ensure quality in schools by analyzing individualized data sets – a practice that is manageable by using digital teaching material with adaptive algorithms or learning analytics.

Educational policy is filled with intentions that materialize in potential actions of human and non-human actors (Gorur, 2011). We have found this to be the case in Norwegian policy documents targeting digitization. There is a need for educational policy research to acknowledge the potential practices of digitization; to view policy as assemblages with a wide range of actors that create the conditions of possibility for certain activities to merge (and others not), and to acknowledge how non-human actors may exert agency, form potential actions, and help legitimize policy of the 'what works' agenda (Baker & McGuirk, 2017; Fenwick et al., 2011; Savage, 2019). This positions policy assemblage as a promising approach in educational research. That said, we stress that we have analyzed policy documents. The actual realities in schools, how digital actors gain power and govern (or come to be governed) is up for future empirical investigation. Such studies may examine a specific digital tool in practice; how teachers and school leaders respond to it; and how some actors may resist or accept the relations with other heterogeneous actors in the assemblage. This suggests further empirical research in schools to map teachers' and school leaders' knowledge of and practice with data analytics, and its functions in governance. Nevertheless, we have established that digital formations are potentially important actors of gathering evidence and identifying what best practice is, and what it should be in Norwegian education. This raises the question of whether digitization reproduces or re-imagines existing governance mechanisms of evidence and the 'what works' agenda.

References

Ball, S. J. (1997). Policy sociology and critical social research: A personal review of recent education policy and policy research. *British Educational Research Journal, 23*(3), 257–274. https://doi.org/10.1080/0141192970230302.

Baek, C., Hörmann, B., Karseth, B., Pizmony-Levy, O., Sivesind, K., & Steiner-Khamsi, G. (2017). Policy learning in Norwegian school reform: A social network analysis of the 2020 incremental reform. *Nordic Journal of Studies in Educational Policy*. https://doi.org/10.1080/20020317.2017.1412747.

Baker, T., & McGuirk, P. (2017). Assemblage thinking as methodology: Commitments and practices for critical policy research. *Territory, Politics, Governance, 5*(4), 425–442.

Callon, M. (2005). Why virtualism paves the way to political impotence: A reply to Daniel Miller's critique of the laws of the markets. *Economic Sociology: The European Electronic Newsletter, 6*(2), 3–20. Available at: http://econsoc.mpifg.de/archive/esfeb05.pdf.

Caspersen, J., Røe, M., Utvær, B. K., & Wendelborg, C. (2017). *Utdanningsdirektoratets brukerundersøkelser: Et verktøy for kvalitetsutvikling i grunnskolen?* (Rapport 2017 Mangfold og inkludering). Available at: https://www.udir.no/globalassets/filer/tall-og-forskning/forskningsrapporter/brukerundersokelser-og-kvalitetsutviklingsarbeid-i-skolen.pdf

Conexus. (2020). *Conexus' front page*. Available at https://conexus.net/

Decuypere, M., Ceulemans, C., & Simons, M. (2013). Schools in the making: Mapping digital spaces of evidence. *Journal of Education Policy, 2013*, 1–23.

DeLanda, M. (2006). *A new philosophy of society: Assemblage theory and social complexity*. London: Continuum.

Directorate for Education and Training. (2020). *Hva er skolebidragsindikatorer for grunnskolen?* Available at https://www.udir.no/tall-og-forskning/statistikk/statistikk-grunnskole/skolebidragsindikatorer-for-grunnskoler/hva-er-skolebidragsindikatorer-for-grunnskolen/

Fauskanger, J., & Mosvold, R. (2014). Innholdsanalysens muligheter i utdanningsforskning. *Norsk pedagogisk tidsskrift, 98*, 127–139.

Fenwick, T., Edwards, R., & Sawchuck, P. (2011). *Emerging approaches to educational research: Tracing the sociomaterial*. London: Routledge.

Gilje, Ø., Ingulfsen, L., Dolonen, J. A., Furberg, A., Rasmussen, I., Kluge, A., et al. (2016). *Med ARK&APP. Bruk av læremidler og ressurser for læring på tvers av arbeidsformer*. Oslo, Norway: Universitetet i Oslo.

Gorur, R. (2011). Policy as assemblage. *European Educational Research Journal, 10*(4), 611–622.

Gunnulfsen, A. E., & Møller, J. (2017). National testing: Gains or strains? School leaders' responses to policy demands. *Leadership and Policy in Schools, 16*(3), 455–474.

Høvsgaard Maguire, L. (2019). Adapting to the test: Performing algorithmic adaptivity in Danish schools. *Discourse: Studies in the Cultural Politics of Education, 40*(1), 78–92. https://doi.org/10.1080/01596306.2018.1549705.

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288.

Kirkebøen, L. J., Kotsadam, A. and Raaum, O. (2016). Effekter av økt lærertetthet. Økonomiske analyser, 5/2016. Available at https://www.ssb.no/utdanning/artikler-og-publikasjoner/_attachment/286193?_ts=158b49d98e8

Kitchin, R. (2014). *The data revolution: Big data, open data, data infrastructures and their consequences*. London: Sage.

Kitchin, R., & McArdle, G. (2016). What makes big data, big data? Exploring the ontological characteristics of 26 datasets. *Big Data & Society, 2016*(January–June), 1–10.

Landri, P. (2018). *Digital governance of education: Technology, standards and Europeanization of education*. London/New York/Sydney, Australia/Delhi, India: Bloomsbury.

Law, J. (1994). *Organizing modernity*. Oxford, UK: Blackwell.

Lawn, M., & Grek, S. (2009). A short history of Europeanizing education. *European Education*, *41*(1): 32–54.

Ministry of Education and Research. (2015). *Fag – Fordypning Forståelse. En fornyelse av Kunnskapsløftet* (Meld. St. 28 2015–2016). Available at: https://www.regjeringen.no/no/dokumenter/meld.-st.-28-20152016/id2483955/?ch=1

Ministry of Education and Research. (2017a). *Framtid, Fornyelse og Digitalisering. Digitaliseringsstrategi for grunnopplæringen 2017–2021*. Available at https://www.regjeringen.no/contentassets/dc02a65c18a7464db394766247e5f5fc/kd_framtid_fornyelse_digitalisering_nett.pdf

Ministry of Education and Research (2017b). *Lærelyst – tidlig innsats og kvalitet i skolen* (Meld. St. 21 2017) Available at: https://www.regjeringen.no/no/dokumenter/meld.-st.-21-20162017/id2544344/?ch=1

Møller, J., & Skedsmo, G. (2013). Modernizing education: NPM reform in the Norwegian education system. *Journal of Educational Administration & History, 45*(4), 336–353.

NOU 2015:8. (2015). *The school of the future: Renewal of subjects and competences*. Available at: https://www.regjeringen.no/contentassets/da148fec8c4a4ab88daa8b677a700292/en-gb/pdfs/nou201520150008000engpdfs.pdf

Ottesen, E. (2013). Grunnleggende ferdigheter og individuell vurdering – mellom regulering og profesjonsmakt. In: B. Karseth, J. Møller, P. Aasen (red.), *Reformtakter. Om fornyelse og stabilitet i grunnopplæringen* (pp. 119–134). Oslo, Norway: Universitetsforlaget.

Ottesen, E. (2018). Committing to school development. Social and material entanglements. *Nordic Journal of Comparative and International Education, 2*(2–3), 181–195.

Ozga, J. (2009). Governing education through data in England: From regulation to self-evaluation, Special Issue of *Journal of Education Policy*, *24*(2), 149–163.

Ozga, J., & Grek, S. (2012). Governing through learning. School self-evaluation as a knowledge-based regulatory tool. *Recherches sociologiques et anthropologiques, 43*, 35–52. https://doi.org/10.4000/rsa.786.

Pettersson, D., Popkewitz, T. S., & Lindblad, S. (2017). In the grey zone: Large-scale assessment-based activities betwixt and between policy, research and practice. *Nordic Journal of Studies in Educational Policy, 3*(1), 29–41.

Savage, G. (2018). Policy assemblages and human devices: A reflection on 'assembling policy'. *Discourse: Studies in the Cultural Politics of Education, 39*(2), 309–321. https://doi.org/10.1080/01596306.2017.1389431.

Savage, G. (2019). What is policy assemblage? *Territory, Politics, Governance, DOI*. https://doi.org/10.1080/21622671.2018.1559760.

Selwyn, N. (2016). 'There's so much data': Exploring the realities of data-based school governance. *European Educational Research Journal, 15*(1), 54–68.

Skedsmo, G. (2009). *School governing in transition? Perspectives, purposes and perceptions of evaluation policy.* PhD dissertation, University of Oslo.

Skedsmo, G., & Møller, J. (2016). Governing by new performance expectations in Norwegian schools., In H. M. Gunter, E. Grimaldi, D.Hall, & R. Serpieri (Eds.), *New public management and the reform of education. European lessons for policy and practice*. Routledge. ISBN 978-1-138-83381-4. Chapter 4. s 53–66.

Souto-Otero, M., & Beneito-Montagut, R. (2016). From governing through data to governmentality through data: Artefacts, strategies and the digital turn. *European Educational Research Journal, 15*(1), 14–33. https://doi.org/10.1177/1474904115617768.

Uljens, M., Møller, J., Ärlestig, H., & Frederiksen, L. F. (2013). The professionalisation of Nordic school leadership. In L. Moos (Ed.), *Transnational influences on values and practices in Nordic educational leadership: Is there a Nordic model?* (pp. 133–158). Dordrecht: Springer.

Waltz, S. B. (2006). Nonhumans unbound: Actor-network theory and the reconsideration of 'things' in educational foundations. *The Journal of Educational Foundations, 20*(3/4), 51.

Williamson, B. (2016). Digital education governance: Data visualization, predictive analytics, and 'real-time' policy instruments. *Journal of Education Policy, 31*(2), 123–141. https://doi.org/10.1080/02680939.2015.1035758.

Williamson, B. (2017). Big data in education. In *The digital future of learning, policy and practice*. Los Angeles/London/New Delhi, India/Singapore/Washington, DC, Melbourne, Australia: SAGE.

Youdell, D. (2015). Assemblage theory and education policy sociology. In K. N. Gulson, M. Clarke, & E. Bendix Petersen (Eds.), *Education policy and contemporary theory:Implications for research* (pp. 110–121). New York: Routledge.