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Juliane Jarke & Andreas Breiter

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Editorial: the datafication of education

Juliane Jarke  and Andreas Breiter 

Institute for Information Management Bremen (ifib) & Centre for Media, Communication & Information Research (ZeMKI), University of Bremen, Bremen, Germany

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The increasing datafication, in particular the availability of data and corresponding algorithms introduces new means to measure, capture, describe and represent social life in numbers. The education sector is one of the most noticeable domains affected by datafication, because it transforms not only the ways in which teaching and learning are organised but also the ways in which future generations (will) construct reality with and through data. The datafication of education comprises of the collection of data on all levels of educational systems (individual, classroom, school, region, state, international), potentially about all processes of teaching, learning and school management. This proliferation of data changes decision-making and opinion-forming processes of educational stakeholders such as education policy, school supervision, school authorities, teachers, students and parents. For example, data are used to improve school development, to hold schools and teachers accountable, to control access to schooling or to compare student achievements across countries. Such use cases raise expectations with respect to increased transparency, accountability, service orientation and civic participation but also associated fears with respect to surveillance and control, privacy issues, power relations, and (new) inequalities (e.g., Anagnostopoulos, Rutledge, and Jacobsen 2013; Eynon 2013; Selwyn 2015; Livingstone and Sefton-Green 2016; Lupton and Williamson 2017).

Within the educational context, more and heterogeneous data are being generated – deliberately – for monitoring, surveillance or evaluation purposes, but also – automatically – through routine operations of a manifold of digital devices and systems (Selwyn 2015), producing ‘digital traces’ (Breiter and Hepp 2017). Schools, for example, are being transformed into ‘data platforms’ in which ‘a wide range of data tracking, sensing and analytics technologies are being mobilised’ (Williamson 2015a, 134). These digital educational data are distinct from pre-digital forms as they may be exhaustive in scope, highly detailed, and can be combined in a flexible manner and at different aggregation levels (Parks 2014). Such possibilities have always existed on a small scale, but new data infrastructures and algorithmic capabilities allow for analytics of an ‘unprecedented complexity and scope’ (Parks 2014, 356). However, the underlying algorithms and the ways in which data are produced by data providers, statisticians as well as the role of software companies and educational technology providers are hardly understood (Eynon 2013; Williamson 2015b).

This special issue aims to shed light on the dynamics of datafication and related transformation of education. Contributions consider data practices that span across different countries, educational fields and governance levels from *early childhood education* (Bradbury, this issue), to *schools* (Ratner et al, this issue; Manolev et al, this issue), *universities* (Jones & McCoy, this issue), *educational technology providers* (Macgilchrist, this issue) to *educational policy making and governance* (Williamson & Piattoeva, this issue). In the following, we provide a brief overview over datafication in these different educational domains and subsequently reflect on the ambivalent consequences described in the contributions of this special issue.

Depending on the national educational governance structures, the **relevance of digital data for educational processes in schools** such as teaching and learning as well as for educational administration and educational policy **has increased continuously** throughout the last decade. This has had an impact on how education is measured, managed and controlled. ‘Governing by numbers’ (Grek 2009) has become a new paradigm. National and international student assessments, standardised achievement tests, school inspections and rankings are part of new forms of educational governance covering all three levels (Altrichter 2010). On the macro level, public pressure on changing education policy are often shaped by international non-governmental organisations such as the OECD and are based on data (Martens and Jakobi 2010). It is part of a larger movement towards standardisation in education, output measurement and accountability (Jacobsen and Young 2013). While the political perspective has been studied intensively, the underlying data practices of key stakeholders (students, teachers, parents, administrators) are under-researched (Breiter 2016). This relates to the meso level of school administrations by introducing methods of new public management for budget control, benchmarks and goals to measure effectiveness. The role of districts and educational authorities in handling data and using data for accountability (Anagnostopoulos, Rutledge, and Jacobsen 2013) varies significantly between countries and makes an international perspective necessary. On the micro level of the school, different forms of data use have been identified on both the managerial level of principals to teachers on the classroom level (Schildkamp, Poortman, and Handelzalts 2016). Learning analytics (Papamitsiou and Economides 2014; Perrotta and Williamson 2016) are promoted as a powerful tool to better support students and their learning.

In this special issue, *Ratner et al* analyse how teachers get configured as data users and consider otherwise ‘hidden’ data mediators and their role for making sense of data visualisations. *Manolev et al (this issue)* present the case of ClassDojo, an educational technology that transforms discipline and student behaviour, and in so doing normalises the surveillance of students. *Williamson and Piat-toeva (this issue)* look at evidence-based education governance and examine practices of ‘objectivity-making’ related to new data-driven technologies. Their particular focus is on data about students’ social-emotional learning and skills (SEL). While most of these accounts are rather critical on the ways in which educational technologies and educational data transform education, *MacGilchrist (this issue)* gives voice to educational technology providers ‘who are not simply making token gestures towards justice and equality’ (p. 78). She presents examples of ‘cruel optimism’ along three distinct data stories relating to ‘(i) generating data to close the achievement gap, (ii) protecting data to ensure student privacy and (iii) using data to expose inequities’ (p. 79).

While the datafication in schools (as the main institution in compulsory education) has received increased attention by scholars, the **role of data in early childhood education is often overlooked and underresearched** (*Bradbury, this issue*; Roberts-Holmes 2015). As digital media find their way into pre-schools and nurseries (e.g., through pedagogical concepts or through parents and the media use practices of their children), collecting data will become more than a side effect. This is particularly relevant, since young children require an even more thoughtful and responsible approach (Livingstone 2018): Children’s rights in the digital age are under scrutiny, requiring a special treatment regarding privacy and asking for a new agenda (Livingstone and Third 2017). In particular, in England the extent of datafication (e.g., through a formalised curriculum) is noteworthy (Bradbury, this issue). *Bradbury* describes how organisations of early childhood education are subject to the demands of data and argues that an increasing datafication of early childhood education leads to its ‘schoolification’ and produces ‘data-driven subjectivities for both teacher and child’ (p. 7).

Higher education institutions (HEI) are widely affected by datafication and have a long tradition of being measured on their research outputs, teaching evaluations, transfer activities and research project money (Apple 2005). Various rankings are available to compare their performance internationally, which led to an increase of data practices within universities in order to cope with external pressure and to shape / massage the internal data in an appropriate way to climb up the ladder in rankings (Stack 2016). With the advent of massively open online courses (MOOCs, see Van Dijk and Poell 2015), the amount of collected data has increased dramatically (Selwyn 2015).

Hence, the practices of data collection in higher education are manifold and stretch along all processes of teaching, learning and administration. Starting with comprehensive learning management systems as well as campus management systems, the variety of data infrastructures has steadily increased. Entrance tests are automatically analysed, student success predictions are based on learning analytics (Heuer and Breiter 2018) and e-assessments with multiple choice are common in basically all subjects. In this issue, *Jones and McCoy* propose a documentation studies framework to critically research data in learning analytics. The framework allows to investigate how individuals are ‘made into’ data points and data become ‘considered as’ representations of particular phenomena.

In sum, digital data allow for the analysis of different educational practices to a degree of complexity not previously possible and to a much greater extent, as they can be very detailed, cover a more complete scope and can be flexibly combined. This is increasingly happening in real time due to the power of computers and algorithms. In the near future, sensors will provide further data. As such digital data not only serve to support decisions, but also fundamentally change the organisation of learning and teaching. These transformation processes lead to partly ambivalent consequences (Hepp 2017). We will outline some of the most prominent consequences in the following:

First, datafication leads to **new spatio-temporal entanglements and transforms translocal relationships**. The boundaries of educational institutions as learning places change when activities within the learning environment come to be represented on digital platforms and measurable learning outcomes are translated into assessment data based on standardised tests of students, teachers, professors or an entire institution. Digital (data) practices form a translocal space that links and associates different, previously distant actors. Up until to date, parents have only been able to participate to a limited extent in their children’s school activities. *Manolev et al. (this issue)* however, describe how parents may receive daily updates on their child’s behaviour via the ClassDojo platform. This platform facilitates the interaction of different user groups such as teachers, students, parents and school management and in so doing expands the space of communication between educational actors and transforms their relationships. *Bradbury (this issue)*, reports on the changing relationships of teachers and children but also parents and children through digital assessment practices that commence in early childhood education. She reports how reception teachers experience the need to produce data as ‘detrimental to the process of building relationships with children to make them feel secure’ (p. 15). The necessity to use tablet-based assessments changed the previous interaction and ‘reduced focus on building relationships’ (ibid). Parents however, having access to these assessment data become constant observers of their child’s ‘progress’.

The structuring and experiencing of time also changes: The temporal structure of education has always been determined by the school or academic year. The digital data practices in our special issue describe a cycle in which the spatio-temporal entanglements relate pupils, school classes and school districts as well as students and HEI to each other and define new temporal sequences. In *Manolev et al.’s account (this issue)* the ‘timeframe from which data is represented within student reports is adjustable’ (p. 40). Such adjustable (and potentially immediate) feedback loops apply to all educational actors. For example, *Williamson and Piattoeva (this issue)* describe how emerging technologies to capture data on students’ socio-emotional learning and skills (SEL) rely on biometric sensors to measure and track body signals in real time rather than rely on student self-reporting at long periodic intervals.

Second, the datafication of education allows for and requires **new forms of participation**: The increasing evaluation on all levels of educational institutions and the subsequent publication of evaluation results, change the options for action and the scope of possibilities of all actors involved. These new forms of participation are partly possible because classrooms are transformed from a physical location with teacher grade lists to a—to some extent—transparent and distributed datascape (e.g., *Manolev et al, this issue; Bradbury, this issue; Williamson & Piattoeva, this issue*). For example, *Manolev et al. (this issue)* argue that regular updates on student behaviour via systems such as ClassDojo may ‘foster parental engagement’ (p. 43).

However, datafication may not only allow for new forms of participation, it also requires them. For example, *Jones and McCoy (this issue)* discuss the limits of Big Data methods and their ability to

detect previously unknown patterns. They argue that ‘too often computer scientists identify and analyse data without the aid of individuals for whom the studied phenomena would be familiar’ (p. 57). Yet ‘without the proper contextual lens through which to look at data patterns, the patterns themselves stand to become meaningless, if not harmful’ (ibid). Similar to participatory design approaches, that aim to involve future users in the design of systems because of their use-context expertise and because they will be affected by new systems (e.g., Vines et al. 2013; Bratteteig and Wagner 2016), Jones and McCoy promote an approach that considers questions such as: ‘Are the data analytics intelligible by those for whom they were designed to be used?’ or ‘Will a diverse set of institutional actors see the usefulness of the data analytics in the same way?’ (p. 58)

Third, these new possibilities of participation depend strongly on the respective competences to interpret data (critically) and may thus promote a **new digital divide and increase inequalities**. For example, *Ratner et al (this issue)* raise the issue of the intelligibility of Danish national test data to ‘help teachers assess student abilities and how (much) students learn’ (p. 23). They describe how ‘schools and municipalities are offered advice on interpreting and using national test [data] for pedagogical aims by “learning consultants”’. Ratner et al. argue that it is important to understand how specific representations of teachers’ needs are inscribed into data visualisations and configure them as (literate) data users. Dealing with data on all levels of the educational system requires new forms of training for educators (Mandinach and Gummer 2013; Schildkamp, Poortman, and Handelzalts 2016) which at the same time reinforce the role of data in educational decision making. *Macgilchrist (this issue)* reflects how different educational actors strive to translate values into ‘ethical socio-technical practice’. However, in at least one of her data stories, she argues that the optimism to use data to expose inequity may result in the individualisation of responsibility to ‘become informed and expose injustice’ (p. 84). Moreover, all her data stories ‘show how the fantasy of equality is projected onto a socio-technical mediator (a personalised literacy platform, data privacy practices, and active parents armed with data visualisations)’ (ibid). A new digital divide may relate to those socio-technical mediators.

Fourth, inevitably, the datafication of education leads to a **redistribution of agency across socio-technical networks**. *Bradbury (this issue)* argues that data come to be used to structure education (e.g., the composition of smaller learning groups with classes). Yet, it is not the teacher who determines the composition of such small groups, but algorithms identify groups (e.g., based on ‘student performance’), which receive special attention. Wehner, Passoth, and Sutter (2012) described this phenomenon as ‘numerical inclusion’, others speak of the construction of public spheres or collectivities by algorithms (Gillespie 2014; Ruppert and Isin 2015). In Bradbury’s account data and grouping practices work together: ‘data facilitate the allocation of children to groups by providing evidence of different “abilities”’ (p. 17). In so doing they ‘mutually reinforce the dual ideas of fixed “ability” and reliable measurement’ (ibid). Another example in this special issue is provided by *Jones and McCoy* who report on predictive analytics used at US universities to identify and group students unlikely to succeed in their studies and dismiss their applications in order to ‘improve the university’s retention data, which accreditors, prospective students, and national rankings [...] use to make judgements about an institution’ (p. 56). Similarly *Ratner et al (this issue)* conclude that ‘important decisions about how teachers are to interpret and engage with student learning [are distributed] to new digital and computational centres of expertise’ (p. 31). And *Williamson and Piattoeva (this issue)* describe a process of ‘objectivity-making’ in the field of socio-emotional learning (SEL) that ‘closes down room for subjective personal judgment’ (p. 73) and distributes it in ‘dynamic sociotechnical networks of people, policies and technologies which together produce new ways of measuring, evaluating, and governing education’ (p. 65).

Finally, digital data practices may allow for **new forms and possibilities of monitoring and surveillance**, while at the same time **promoting transparency**. The orientation on educational performance and success, goes hand in hand with increased monitoring and control of and by educational information systems (Behn 2003). This is also reinforced by neoliberal reforms (new public management, (Pollitt and Bouckaert 2000)) towards an ‘audit culture’ (Apple 2005) as well as by the broad availability of data. As Anagnostopoulos, Rutledge, and Jacobsen (2013) put it, the original intention

of supporting school development was diminished by the sudden realisation that an effective control instrument was also available; these became ‘infrastructures of accountability’. And along with an expansion of translocal relationships comes the expansion of student surveillance that ‘penetrates the family’ (*Manolev et al, this issue*), when parents have all-time access to their children’s school records.

In sum, data do not provide a ‘window’ to the social world, but rather the relationship between data and what they are meant to represent is recursive: Data are not ‘natural’ by-products of social actions, but must always be understood in the context of their origin and the affordances of the respective digital infrastructure. The datafication of education does not only transform education but also our understanding of education, of what is understood as ‘good education’, associated objectives and good practices.

The contributions to this special issue take you on an exciting journey across a variety of educational domains and aspects of their datafication. They exhibit ambivalent and at times contradicting consequences of datafication using different theoretical and conceptual frameworks. More research is needed to understand the continuously shifting and situated educational data practices and their ambivalent consequences. For now, we hope you find the contributions stimulating and thought provoking.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Juliane Jarke is a senior researcher at the Institute for Information Management Bremen at the University of Bremen working on public sector innovation, digital (in)equalities and participatory design.

Andreas Breiter is a Professor at the University of Bremen and scientific director of the Institute for Information Management Bremen, working on information management, educational technologies and media/data literacies.

ORCID

Juliane Jarke  <http://orcid.org/0000-0001-8349-2298>

Andreas Breiter  <http://orcid.org/0000-0002-0577-8685>

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