



Reconfiguring Education Through Data: How Data Practices Reconfigure Teacher Professionalism and Curriculum

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INTRODUCTION

‘Data power’ permeates nearly every aspect of educational policy and practice, governing not only how educational institutions and individuals are made accountable, but also how we come to think about what ‘education’ is, and what counts as ‘good’ educational practice (Grant, 2017). Education is becoming increasingly ‘datafied and digitised’ (Jarke & Breiter, 2019; Williamson, 2017) and data has become a primary mode of governing education (Fenwick et al., 2014; Ozga, 2016). Educational performance is measured, analysed, visualised and applied at every scale—from international benchmarking to individual student assessments—and used to create comparisons, evaluations and interventions across the educational landscape (Gorur, 2015; Grek & Ozga, 2010; Hamilton, 2017;

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Hamilton et al., 2015). This turn to data has permeated deeply into schools' everyday practices, with England's education system characterised as particularly 'advanced' in terms of its extensive production and use of data (Ball, 2015; Bradbury & Roberts-Holmes, 2017; Ozga, 2009).¹ While schools in many education systems have long been required to produce and report some form of quantitative data about their operations (Lawn, 2013), the late twentieth and early twenty-first centuries have seen a sharp increase in the use of pupil performance data as an accountability measure for school and teacher performance (Ozga, 2009). Concurrently, in the last decade, the growth of digital data infrastructures has created new, networked forms of governing education (Williamson, 2016) with an accompanying intensification in practices of generating, analysing, visualising and intervening in education with digital data (Sellar, 2015; Selwyn, 2016).

The datafication of educational practice and policy has far-reaching political implications for how education is governed at every level and scale. It also raises significant implications for how we—as a society—think about what education is, and what it is for. These are political questions that go beyond questions of educational effectiveness to questions of the social purpose of education. Increase in educational datafication, focused around efforts to more precisely monitor and predict pupil performance, risks creating an education that functions as a machine for reproducing existing knowledge and social orders rather than a more *educational* process of creating possibilities for the development of new knowledge and the formation of new subjectivities (Biesta, 2010, 2013).

It can seem that numbers have become an all-powerful and encompassing force governing every aspect of school life. Data policies, discourses and technologies do not, however, have straightforwardly predictable 'effects' on educational practice but are themselves the product of fragile assemblages, performed through political work, and are potentially incoherent and inconsistent (Piattoeva & Boden, 2020). In-depth explorations of how educational data practices work 'on the ground' are therefore needed in order to understand the complexities of how data power works in and through specific people, practices, policies, discourses, and digital

¹ I refer to 'England' throughout to indicate the focus of this chapter on the national education system of England, which, while sharing some similarities, is distinct from the education systems in the other, devolved nations of the United Kingdom (Scotland, Wales and Northern Ireland).

and material resources that come together. This chapter takes an in-depth approach to the study of educational data practices in an educational setting of a secondary school in England in order to understand the specificities, complexities and ambivalences of the workings of data power.

The study reported in this chapter was a critical exploration of how data was made and what it ‘did’ in one school in England, tracing the ‘social life of data’ (Beer & Burrows, 2013) and how it worked to (re)configure educational practices. This ‘up close’ approach to tracing data showed the constraining effects as well as the complexity, contestations and ambivalences of data power as it played out in practice. Datafication was evident in many different aspects of school life, including pupil—and teacher—attendance monitoring, educational and financial accountability processes, as well as pupil performance. While there are many ways in which datafication acts to reconfigure education, in this chapter I focus primarily on how data reconfigured two key aspects of the field: the English curriculum and teachers’ professional judgements.

Since the 1990s, tighter specification of curriculum content and regular testing and reporting of results have become key policy technologies in the political control of classroom teaching and pedagogy in England (Moss, 2017; Ozga, 2009). This high-stakes testing regime has led to a situation in which assessment requirements drive both the content and the pace of delivery of the curriculum, rather than identifying the best ways in which to assess a curriculum built with wider aims in mind (Moss, 2014, 2017). Frequent testing to monitor children’s ‘expected progress’ through a tightly defined curriculum reflects a limited view of how children learn, in which children are seen as “functional machines” who should all automatically progress at the same rate (Llewellyn, 2016). Such measures have significant educational consequences. The process of standardising curricula and monitoring progress can obscure teachers’ ability to develop a more situated understanding of their pupils’ learning and to adapt content, pace and the approach to teaching in relation to the specific learning needs of the pupils in their class (Llewellyn, 2016; Moss, 2017). In this chapter, I explore how new processes of datafication associated with frequent and high-stakes testing of progress, worked to reconfigure the English curriculum around the demands to evidence particular kinds of learning data, and the consequences of this for pupils’ access to a broad curriculum.

A large proportion of teachers’ work now includes facilitating the production and capture of pupil performance data, and incorporating it into

their daily practice (Selwyn et al., 2016). Demand to produce an increasing volume of data in order to monitor, anticipate and intervene in pupil performance has led to a significant reshaping of teachers' subjectivities and professional practice. Data has become an important part of teachers' sense of self-worth and understanding of their own effectiveness (Bradbury, 2019; Lewis & Holloway, 2019), leading to cynical compliance with performative processes of datafication at the expense of building relationships or interrogating data for educational value (Hardy & Lewis, 2016). Within regimes of performative accountability, teachers' work and effectiveness are made visible, subject to comparison and evaluation, and they may internalise data logics as a new sense of professional purpose (Ball, 2003; Bradbury, 2019; Hardy, 2015; Lewis & Holloway, 2019). Contributing further to these accounts of the governing of teachers' work and subjectivities through data, I explore how moves towards 'objective' data as the basis for decision-making orientated teachers' judgements towards data in ways that worked to standardise judgement and exclude more multifaceted, situated and values-driven modes of professional knowledge that were characterised as 'human' and therefore inevitably biased.

DATA PRACTICES RECONFIGURING EDUCATION

Data technologies and practices do not simply measure and represent aspects of social life but rather need to be understood as actively participating in producing new social practices (Barad, 2007; Savage, 2013). They can be usefully understood as part of a world-making practice, performing and reconfiguring the ongoing emergence of the world (Barad, 2007). The question of how data comes to reconfigure education is therefore not primarily about whether data accurately measures educational performance or whether that data is correctly interpreted or applied—points which are usefully addressed by statistical critiques (e.g. Leckie & Goldstein, 2016). The more pertinent question is how educational data practices configure and perform what 'education' is. For example, as Gorur (2015) shows, the data practices within the OECD's Programme for International Student Assessment (PISA) comprise a complex chain of translations and negotiations that condense a selected set of knowledge and skills with the varied experience of millions of school students over several school years to produce a seemingly coherent ranking of national school systems, which then drives further national policy reforms in attempts to move up the rankings. Educational data then, must be

understood as both material and discursive, part of the ongoing sociomaterial reconfiguration of education. The question this then raises is what kinds of education are being configured through data, and how compatible these are with our social values of what constitutes a ‘good’ education.

One of the common concerns about increasing datafication is around its potentially reductive effects, in which complex social and human relations are reduced to only those areas that can be easily measured and opportunities for the individual are restricted. This has been a long-standing critique of high-stakes educational assessment, addressing the way that education systems can render invisible important aspects of education that are harder to measure at scale (Hardy, 2015; Thedvall, 2015). The turn to data in education has also been used to make complex, contestable and ultimately political decisions appear easily resolvable and outside the scope of more democratic and deliberative processes (Amoore, 2019). Such data-driven approaches can also be seen as reducing the scope for valuing un-quantified and unquantifiable social and human factors in education, including pupils’ and teachers’ voices and experiences.

For the educational philosopher Gert Biesta (2010, 2013), determining educational decisions through data is not only potentially reductive of social complexity in the ways discussed above, but also profoundly un-educational. He notes that we must start from an understanding of the purposes and values of education before we can decide what should be measured or how to measure it, and that establishing these purposes must be open to democratic debate. While government and school policies that mobilise pupil performance data might aim to ‘raise standards’, it is not at all clear how these measurements reflect wider purposes or values about the purpose of these standards, or education more broadly.

While discussions of educational purposes are often focused on the domains of qualification (knowledge and skills) and socialisation (induction into social orders), for Biesta (2010), the domain of subjectification must also be considered as an essential domain in any truly ‘educational’ project. Subjectification here, drawing on Arendt, refers to the development of human freedom in relation to others, and in education allows for the possibility of learners developing their own ideas, subjectivities and agency. Subjectification—which emphasises the emergence of *new* subjectivities and *new* knowledge—requires the possibility for pupils to enter into new relations with others’ knowledge and subjectivities with necessarily unpredictable results. The drive towards predicting and determining educational outcomes through data, potentially threatens these kinds of

encounters, and without which, our educational systems will continue to only reproduce the knowledge and subjectivities of the past.

While data practices are likely to shape opportunities for subjectification in education in many ways, the English curriculum and professional judgement provide useful examples of how this is working in two key domains of educational practice. These elements directly touch on the importance of creating possibilities for the formation of new knowledge and new subjectivities.

Data practices are impacting on how pupils encounter, experience and are assessed on new knowledge as they attempt to precisely monitor pupils' progress through curricular content. Data practices come to shape teachers' understanding of pupils' learning in more standardised ways that may offer fewer opportunities for the unique strengths and contributions of pupils to be recognised and responded to.

FOLLOWING THE SOCIAL LIFE OF DATA IN AN ENGLISH SECONDARY SCHOOL

To understand these questions of how data practices come to reconfigure the ways that 'education' is understood, thought about, and enacted, it is important to explore how they are performed and experienced within specific educational settings, as well as understanding how these settings themselves are shaped by their participation in networks of discourses, policies and technologies. By following the social life of data practices within an English secondary school over the course of a school year, I was able to track the specificity of how data practices worked to produce particular reconfigurations of education. Rather than positioning the school as a 'case study' that might be representative of similar cases, or as an illustration of the 'effects' wrought by global and national policies, discourses and technologies, the school site is conceptualised as a point of articulation within multiple intersecting networks and flows, as an entry point into "an assemblage of material, semiotic and social flows and practices" (Sellar, 2015).

Ridgewood School,² in which the fieldwork took place was a large, comprehensive, suburban, secondary (age 11–16) academy school in England. While I am not aiming to show that the findings from this school

²Names of institutions, individuals, titles and locations have been given pseudonyms to preserve anonymity.

are representative of all state secondary schools in England, Ridgewood was not unusual in its overall constitution, or the ways in which it responded to the demands of data. To trace data practices within this school I took an ethnographic approach in order to follow how data was created, circulated, processed, visualised, and represented and brought into relation with other people, discourses and objects. Over the course of December 2014–May 2015, I spent three periods of around one week each within the school, observing data practices, interviewing key members of staff and collecting key documents, displays, and technologies, allowing me to get a sense of the overall yearly cycle of data production. My entry point for fieldwork within the school was the ‘data office’, in which three members of staff worked: Sarah, the Head of Improving Achievement (HIA) and Chris, the Data Manager (who were also teaching staff) and Jenny, a full-time Data Administrator. I also followed the flows of data—digital and printed documents, conversations, school staff—into and out of this office, tracing the connections back to classrooms (including resources and teachers) and forwards to school-level decision-making processes about targeting and resource allocation. Following the data back to classrooms, I observed and interviewed two English teachers, Joe and Sophie, as they engaged with the digital and physical sociomaterial resource in their classrooms to generate, input and interpret pupil performance data.

In this chapter, I focus primarily on interview data from two key participants, Sarah and Joe, alongside fieldnotes and collected documents from the data office and an English classroom. I focus on Sarah as the senior architect of the school’s data systems, as she was in a position to articulate the rationale behind their development and use and how they were intended to integrate into school-wide approaches and strategies. She was a maths teacher and the head of the data office and was engaged in bringing many disparate elements of the school’s work into data-driven control, thereby increasing the scope of the school’s activities that fell within the power of the data office. I focus on Joe as he was an English teacher closely involved in translating school-wide data strategies into classroom practices within the English department. His interview generated a particularly compelling account of the ambivalence of data in teaching as he was both reflectively questioning of the effect of data on pupils’ learning while also being an enthusiastic proponent of the power of data to improve standards at the school. Both teachers allied themselves with the development of new data systems in the school, in the process claiming privileged

positions for themselves as legitimate arbiters of data driven knowledge, interpretation and application. They are chosen here, therefore, not as ‘representative’ of staff within the school, but because their position enabled them to give deep insights into the logics and power of the school’s data practices.

PRIORITISING PUPILS: THE DATA DROP MACHINERY

Data practices can be understood as part of a material-discursive apparatus that works to not just measure but perform the very thing that it measures (Barad, 2007). In this case, data practices including disparate elements of assessment regimes, curriculum policies, children taking tests, software platforms, reports in which data is presented and communicated, league tables published in local newspapers, and so on, work to perform particular ideas, practices and materialisation of what education is and what it should be. These data practices work, together, to make education and schooling both known, and knowable, through data. The data apparatus can thus be understood as a sprawling, extensive arrangement that extended well beyond the school walls.

Staff in the data office alongside teachers in different subject areas had worked to develop a school-wide system for data collection, analysis and decision-making. An important part of this system was the regular generation of pupil progress and attainment data, known informally by staff as “data drops”. To create these data drops, every pupil was assessed to measure their attainment and progress, six times per year—about every six weeks. This data was sent to the data office, where it was collated, processed and displayed as part of a ‘data wall’ in the data office. This data wall displayed postcard sized print-outs of pupils’ photographs and data, arranged in a series of rows. Sarah explained to me that the arrangement of postcards on the data wall represented which pupils were targeted as priorities to receive ‘interventions’ (booster classes) to improve their performance.

Pupils’ priority was determined using a bespoke algorithm that the school had devised themselves and calculated using simple coding in an Excel spreadsheet. This “‘priority coefficient’” calculation, as Sarah termed it, assigned scores to pupils based on their performance data in English and mathematics, teachers’ forecasts for their future performance, and their socioeconomic status, compared against national targets for

attainment and progress. Scores were then ranked in order to indicate the level of priority for pupils to be assigned to intervention classes.

While the formula devised by the school may be bespoke to this school, the use of data-driven algorithms to take a diverse set of attributes and data and derive a single, actionable output, is not. As Amoore (2020, p. 4) notes, “what matters to the algorithm, and what the algorithm makes matter, is the capacity to generate an actionable output from a set of attributes”. Whereas with more complex, proprietary and machine-learning algorithms it is difficult to ‘open the black box’ to see exactly how they work, this school’s relatively simple algorithmic calculations provided an opportunity to explore in more depth the assumptions, decisions and values that went into the making up of this calculation.

RECONFIGURING ACCESS TO AND DELIVERY OF THE CURRICULUM

Starting with the data drop system and the data wall, I traced the data practices at work in Ridgewood School back to where pupil performance data was produced in classrooms, and forwards to how it was used to make decisions about pupils, staff and the allocation of resources, in the process reshaping the ways that staff and pupils thought about and practised ‘education’. One of the notable reconfigurations was how the school’s data practices performed differential access to the curriculum for different pupils and restructured how teachers organised the pace and delivery of curricular material.

An Algorithmic Triage Device Determining Curricular Access

The data practices instantiated in the pupil priority coefficient and materialised in the data wall functioned as an algorithmic triage device that produced differential access to the full curriculum for different kinds of pupils. Pupils who were identified through this calculation as high priority were assigned to attend additional English or mathematics booster classes, or both, aimed at improving their performance data to meet school and national attainment and progress targets. This was a calculated trade-off on the part of the school: some pupils would study a narrower curriculum in return for more pupils achieving higher grades in English and mathematics exams, which counted more highly towards the school’s

accountability targets. In this way, the pupil priority coefficient worked as an algorithmic triage device that determined pupils' access to the full curriculum, as well as eligibility for interventions.

An important element of this algorithm was that pupils who were closest to meeting targets, that is, those pupils who were forecast a 'near miss', were assigned a higher priority than pupils who were a long way from reaching their targets. Sarah described this to me as, "it's all about intervening with the right children", that is, identifying those children whose performance would be more likely to meet school targets with the aid of interventions, rather than those whose performance was so far from targets that even with additional support they may not improve enough. This can be seen as a continuation of the long-familiar process of institutions triaging access to limited resources, automated for an algorithmic age. As Gillborn and Youdell (2000) showed twenty years ago, triage processes in schools targeted resources to pupils seen as 'treatable', or borderline cases, where pupils were just a short distance from meeting attainment targets while ignoring pupils seen as either 'safe' or 'hopeless'. More significantly, in their study, triage processes discriminated against Black and minority ethnic pupils, as teachers' perceptions of pupil's potential were shaped by racism.

In Ridgewood School, data office staff saw the use of pupil performance data and algorithmic calculations as a way of avoiding such teacher bias and ensuring that triage decisions were based solely on objective assessments. This framing of data-driven decisions as objectively fair, however, conceals the ways that inequality and discrimination are already present within the data. While the priority coefficient algorithm did not include data on pupil ethnicity, gender or social class, pupil performance data already reflects unequal educational outcomes between these different groups of pupils (Department for Education, 2018; UNICEF Office of Research, 2018). The algorithm also included an additional weighting for economically disadvantaged pupils in receipt of welfare benefits, meaning that the likelihood of these pupils being assigned to intervention classes was higher than for their more advantaged classmates. The claims of objectivity and fairness were made simply on the basis of an algorithmic data-driven decisions removing the possibility of human bias, thereby overlooking the extent to which bias is already present in data sets.

While the priority coefficient algorithm determined which pupils should be assigned to English or maths intervention groups, it was Sarah who decided which subjects students would be withdrawn from to free up time

for these additional classes. She usually withdrew pupils from arts and sports subjects such as photography, drama or physical education that were not part of accountability metrics. Pupils and parents were not routinely involved in these decisions or even made aware that there was a decision to be made: Sarah explained that she took these decisions on the basis of pupils' best interests. Yet, as pupils' interests were defined by the same accountability metrics as evaluated by the schools' performance, any differences between pupils' and the school's interests were elided. It is of course possible that dropping these subjects in order to gain higher grades in English and maths *was* in the best interests of some pupils, but importantly, this data-driven approach did not allow for pupils', subject teachers' and parents' voices, aims and ambitions to be included. These exclusions limited the scope for more democratic debates about when, why and for whom trade-offs between wider curricular access and individual or school performance might be an ethical—and educational—choice, including those pupils ineligible for interventions because their performance levels were deemed to be too low or high for these efforts to be worthwhile to the school. Thus, data power operated through this triage device by subsuming open questions of different and potentially competing interests with closed answers determined through data. In these ways, a 'good education' for any individual pupil was simply that which produced 'good data' for the school.

Disaggregating the Curriculum to Calculate 'Progress' Data

As well as differentially determining pupils' access to the curriculum, the demands of data practices to show frequent and fine-grained pupil progress data reconfigured how curricular content was organised and assessed. Producing data to measure and predict pupils' progress required teachers to assess pupils six times per year. In English, teachers adopted a pre-and-post-test model in which pupils were tested against four objectives in reading and writing, at the beginning and end of each of six terms—an increase from six to twenty-four tests over the year. As well as occupying a significant amount of the available class time, this regime resulted in far-reaching changes to how curricular content was taught. The objectives precisely specified the skills that pupils were required to demonstrate, yet were generic in terms of the knowledge or content. For example Joe, an English teacher, referred to his marking process against an objective in reference to the assessment criteria as "[i]f there's short quotations then that's Level

Five as well, if they're paraphrasing then that's a Level Six skill and so on and so forth". To coach students to perform well in these tests, each lesson was organised around the explicit teaching and practice of these generic objectives, with pupils required to attach a sticker to their workbooks summarising the assessment criteria for their target level objective, and to assess themselves against these criteria at the end of each lesson. In these ways, the requirements to produce detailed pupil progress data had become materialised in daily classroom practice, shaping each lesson around the practice and performance of skills against their assessment criteria.

Some teachers had questioned the requirements to explicitly focus every lesson on specified assessment criteria, wanting to go beyond the objectives to engage with English literature more widely. Joe, who had devised the use of target stickers, responded that,

if you're not doing it, you're not doing English. I think what they were trying to do is something other than the skills-based practice that I see English as being [...] if you're trying to measure a child against something other than what's on this tracker then that something that you're measuring them against isn't English, as the government wants it to be taught.

While the national curriculum, specified centrally by government, does specify objectives to be taught and the criteria against which they were to be assessed, it does not stipulate that these are the entirety of what should be taught. In the telling quote above, Joe shows how the demands for detailed and frequent data updates had produced a curriculum that was entirely determined by assessment, instead of one embodying wider educational aims and responding to pupils' specific learning needs (Moss, 2017). Educational tests are more usually understood as a proxy for a pupils' learning; even the best tests can only assess a limited selection of the total knowledge, skills and understanding that have been learned. By requiring all teachers to use target stickers in every lesson in order to feed into the demands of the data drop process, however, the entirety of the English literature curriculum had effectively become reduced to its assessment criteria. A focus on pupils' current and target levels had become the only possible way of thinking, doing and talking about pupils' educational journeys (Livingstone & Sefton-Green, 2016).

Averaging 'Progress' Scores

While data drop requirements had given rise to the generation of large volumes of data per pupil, converting these into a single score for each pupil was a complex process in which the result was a compromise between representing coverage of curricular content with pupils' improvement over time. To create a single score for each pupil for the data drop spreadsheet, the English department calculated the mean average of all the 'post' test scores that a pupil had completed to date. This meant combining pupils' scores from tests of entirely separate objectives, effectively amalgamating snapshots of performance across different content areas of the curriculum. By including all scores across the year, the average score also suppressed out any improvement pupils had made over time. In order to feed the demands of the data drop system for simple progress data that could be plotted as a linear and predictable path (Llewellyn, 2016), these measures conflated coverage of the curriculum with improvement in performance. In the English department itself, these compromises were well understood, with Joe commenting, "I know that that's not their attainment, it's an average", and indeed, it remained a live issue as the department actively considered alternative possible compromises. Yet, once the single progress measure had been entered into the data drop spreadsheet, it was treated in subsequent calculations as an objective measure of attainment and used as the basis for the consequential decisions about curricular access and interventions discussed above.

Reconfiguring the Possibilities of Qualification, Socialisation and Subjectification

In a high-stakes accountability system such as in England, it is not surprising that schools' response to policy levers is to focus incessantly on improving measures that will improve their ranking. League tables of pupil performance are published in local and national newspapers, driving 'consumer choice' in the form of parents choosing schools for their child, with funding cuts following if lower numbers of pupils attend. Schools that are deemed as inadequate or requiring improvement in data-driven inspections may have their leadership staff replaced, be taken over by an (often private sector) academy sponsor or re-brokered to a new academy sponsor, and be subjected to more frequent monitoring and inspection until they meet the required standards (Ofsted, 2017).

The school's data practices worked to reorganise how pupils' progress through the curriculum was measured, organised and delivered. The data drop process, designed to monitor and intervene in pupils' performance and progress in order to produce the right kind of data for the school, also reconfigured access to and organisation of the curriculum, with consequences for the kinds of knowledge and learning that pupils were able to encounter.

Returning to Biesta's (2013) domains of educational purposes—qualification, socialisation and subjectification—can help to explore just what is at stake and what is made to matter through these data practices. The domain of qualification—that is, the knowledge and skills in which students must show themselves to be competent—is most clearly related to this reconfiguration of the curriculum. The algorithmic triage processes that restricted some students' access to a wider curriculum in return for higher scores in English and mathematics clearly prioritised qualification in high-stakes subjects that counted more in accountability targets, and for some pupils over others. Importantly, pupils who were identified as disadvantaged were more likely to have to make this trade-off. While there is a worthwhile educational question about whether achieving higher qualifications in English and mathematics is more important than engaging in a wider curriculum, the data practices at work presented these outcomes as the only option rather than open debates, eliding the interests of the school with those of pupils and excluding the voices of pupils, parents and teachers. Yet the data practices did not stop at narrowing the range of subjects in which pupils were able to become qualified. The domain of qualification had been stripped back to a form of 'credentialism', in which the knowledge, skills, understandings, dispositions and judgements that allow someone to be truly qualified to achieve something were limited to performance of skills that could be measured against assessment criteria.

The reconfiguration of the curriculum through data practices also had implications for the educational domain of subjectification. Subjectification—the unpredictable process of creating independent and novel ways of being through encounters with diversity and plurality—was limited by a curriculum focused on performing disaggregated, generic skills, leaving less scope for pupils and teachers to deeply engage with the content and meanings of the literature they read or considering the diverse ways that pupils related to it. Opportunities for more open-ended and expansive educational encounters were replaced with a curriculum organised around reproducing precisely predictable outcomes instead of more

risky, open-ended educational encounters that might lead to learners developing their own, unique ideas and subjectivities.

RECONFIGURING TEACHERS' EDUCATIONAL KNOWLEDGE AND JUDGEMENTS

In elevating data as the primary mode of knowing about education, data practices in the school also worked to reconfigure teachers' epistemological orientations and their judgements about pupils, learning and education. These reconfigurations, however, had not become accepted consensus, but were a matter of some debate and tension within the school, indicating how data epistemologies also play a role in reconfiguring power relationships in institutions like schools.

The privileging of data as the primary way of understanding education, reflects an 'evidence-based' approach to teaching which seeks to identify straightforward causal connections between teaching 'input' and educational 'outcomes' in the form of pupil data (Biesta, 2013). Such an approach aims to identify 'what works' in order to replicate its subsequent situations, which fails to consider how education is dynamic, subject to recursive effects and social interpretations, meaning that repeated inputs do not necessarily lead to predictable outcomes. Teachers are never faced with exactly the same situation twice, and must use their wider professional experience and values as well as any evidence to make situated, informed, and normative judgements that consider the desirability as well as the effectiveness of their actions and decisions at any one time (ibid.). Professional judgement, therefore, is necessary to remain open towards the possibility of emerging new knowledge and subjectivities, as Biesta writes, "we need judgment rather than recipes in order to be able to engage with this openness and do so in an educational way" (ibid. 2013, p. 137).

Excluding Professional Judgement

Frequent, formal tests at Ridgewood School to generate pupil data were part of the data office's attempts to create a more objective and accurate model for monitoring, intervening in and predicting pupil and school performance. In the process, other forms of understanding pupils' achievement through teachers' professional judgements were excluded as

inherently ‘biased’. Sarah described her frustration with some teachers who did not always enter the direct results of pupil tests into the spreadsheet but instead entered a score that reflected their professional view of a pupils’ overall capabilities. In my fieldnotes, I recorded a discussion in which Chris, a maths teacher and the data manager, and Sarah discussed the problem of an English teacher who did not use the spreadsheet to calculate an average level for the pupil from assessed results, but simply input her overall judgement of the pupils’ level. A second teacher was described as *max valuing*, that is, entering the pupil’s highest level rather than their averaged score to date. Chris objected that such “holistic” approaches made it impossible for others to know on what “evidence” the score was based or to compare it to other teachers’ grades, indicating the importance of a data trail to creating accountability for teachers’ judgements of pupil performance. Sarah expressed frustration that these teachers did not understand that the average level was calculated from their own assessment data, and that they seemed to think the averaged test scores were the result of Chris claiming to “know the child better” or the grade just “magically appearing”. In so doing, she framed their approaches as innumerate and illegitimate.

As a result of Sarah’s and Chris’s concerns, teachers were issued with an explicit instruction by Sarah to strictly limit themselves to assessed test results in reporting pupils’ levels: “don’t use professional judgement, use the actual number”. For Joe, who had worked with Sarah and Chris to develop a system of assessment proformas for the English department to standardise marking approaches, this was necessary to “help [...] the teacher to gauge what that child is actually achieving”. Joe drew an explicit contrast between untrustworthy human judgements and more objective data-driven assessments: “people are untrustworthy, just by being human, we make errors and so we test them [pupils]”. Joe’s phrase “actual achievement” equates to Sarah’s “actual number”, in which judgement of a pupil’s level is legitimately defined and determined only through very specific test events, in contrast to illegitimate “holistic” approaches that took account of teacher’s interpersonal and more informal knowledge of pupils learning.

This raises significant questions about the forms of professional knowledge that were made legitimate and illegitimate through the data practices at work. I asked Sarah whether there might be a legitimate reason for a teacher to give a different level to that calculated by averaged assessments; her argument was that unless higher levels could be evidenced through

written work within two days of the initial assessment, then there could be no legitimate reason for teachers to have a different view of a pupil's level. In other words, a pupil's achievement could only be legitimately known through standardised assessments, and any professional knowledge derived from other sources, such as class discussions or work that was not formally assessed, was rendered illegitimate.

While the other teachers I spoke to did not openly discuss concerns about this process with me (in part, perhaps, due to the politics of voicing disagreement with school policy), Sarah's expressions of frustration and issuing of directives to use the "actual number" in response to teachers' alternative methods, indicated that there was far from a complete consensus within the school about how pupil performance data should be generated. This debate perhaps reflects questions about what, exactly, the data was thought to represent and how it fitted into the overall purpose of the data drop system. This tension between approaches to educational data—"professional judgement" or "the actual number"—highlights two points of tension in educational data epistemologies, with implications for what it means to be a professional teacher.

The first tension concerns whether data is being considered at the level of the individual pupil or in aggregate. Teachers who were using their professional judgement as a source of knowledge alongside test results were working with a more personal approach to data that reflected their understanding of a pupil as an individual learner, taking account of their wider strengths, weaknesses and capabilities. Sarah and Chris in the data office had a more statistically driven approach, in which it was more important to standardise data, to be able to compare pupils and compile aggregate data sets from standardised tests. Aggregating data into large sets is also, of course, a key statistical technique in which small, random margins of error in individual data points are cancelled out, allowing an overall pattern to be more clearly seen. The picture of "holistic" teachers focusing on individual pupils and the data office using test data to drive aggregate statistical analyses, was not the whole story, however, as individual pupils' data points were still the basis on which decisions were made about priority for interventions.

The implications for teacher professionalism can be better understood by considering a second tension: whether the data analysis was primarily concerned with generating insights about pupils' learning, or with anticipating and intervening in future pupil and school performance. The concern to reflect a pupil's capabilities more broadly than test results amongst

the “holistic” approach suggests that data was seen primarily as a way of understanding pupils’ learning strengths and weaknesses; an understanding that could potentially inform judgements around approaches to teaching and learning. Analysis of pupil performance data certainly has the potential to yield insights about differential performance, such as between different pupils with different characteristics, which could potentially be used to inform cohort or collective-level responses by the school. For example, data analysis might indicate that pupils from some ethnic groups were outperformed by others, which could lead to an investigation of how and why this might be within this school, and the development of new approaches that better met the needs of all pupils. Following Biesta’s (2013) insistence on the importance of open-ended approaches to education, this would be an *educational* approach, in which teachers were also learners, exploring new questions about their pupils’ learning, and creating new knowledge to inform professional judgements and decisions.

The purpose of analysing pupil performance data was, however, not primarily focused on opening up new questions and possible responses, but on anticipating and intervening in the production of future high-stakes data—pupils’ final exams. Joe was explicit about how tests of pupil progress were designed primarily to replicate final exams rather than give a broader picture of pupils’ learning, “if they’re being tested at the end of their five years by doing a GCSE [end of school exams] we’re just getting them ready for that”. The primary emphasis on using data to anticipate and intervene in future performance can be seen in how the school applied the results of their data analysis. Rather than using insights generated from data analysis to explore, understand, and respond by adapting different educational approaches, responses focused on a more limited approach of simply increasing the quantity of instruction that pupils would receive in English or mathematics. This can be seen as a mode of anticipatory governance, in which data is analysed to identify and quantify future risks in order to determine actions in the present to respond as if those risks were already here (Amoore, 2011); in this case as risks to the school’s performance targets. Pupils were produced through their data as a “risk subject” (Adams et al., 2009), and thereby made subject to further intervention in order to mitigate the impact of those risks. From an anticipatory perspective, data based on test scores alone would be a better indicator of future performance in similar conditions than “holistic” data that tried to include pupils’ wider capabilities and achievements. As an anticipatory regime, the data practices in the school worked not to open up new questions and

develop new responses, but to predict and then incorporate them in the ever-present possible future outcomes.

Becoming a Data-orientated Teacher and School

The data practices at work in the school demanded a re-orientation of teachers' professionalism towards the production and management of pupil data as a core professional practice. For Joe, an orientation towards data seemed to give him a sense of greater control over his own work and pupils' progress, as well as a sense of confidence that he was teaching the subject "as the government intended". Yet, although he was able to show me which pupils were colour coded red on his spreadsheet to indicate insufficient progress, he had not used the data he described as "ridiculously powerful" to investigate *why* some pupils might be struggling and others succeeding, or to inform different approaches to his teaching. Rather, this orientation towards data appeared to be primarily a way of performing his professionalism as a teacher whose sense of self was informed through data and whose professional knowledge was constituted through accountability measures (Hardy & Lewis, 2016; Lewis & Holloway, 2019). The use of mandated resources and procedures such as target stickers, assessment proformas and frequent tests also worked to define and standardise teachers' classroom practice towards producing the data demanded by the school's data drop systems. This worked in the favour of teachers such as Joe, whose alignment with a data-driven approach meant that he was given the additional responsibility of Deputy Head of Department in order to develop and implement new data systems which shaped the practice of his colleagues.

This re-orientation of teacher professionalism towards working with data, served as a form of exercising power by determining the scope of teachers' professional roles, as they became primarily accountable for producing pupil data. Those with the legitimacy to make data-driven claims, such as the data office teachers, held considerable authority within the school. For example, Sarah told me how she "hailed teachers in" to look at the data displays in the data office to show them "which pupils they should be working on", evaluated teachers' performance, and used school data analysis to drive policy-making. Sarah and Chris's approach in the data office was about driving system change throughout the school, as she described to me: "It isn't just about 'we'll crunch some numbers and give you some answers' [...] how I see the work of this office is, actually, we

find a problem, something that's not being done very well, we find a process and a system to make it be done better, we give that system back to that person and that person then does that better". Diverse aspects of the management of school life, from teacher attendance to school performance, were increasingly becoming drawn into a data-driven systems approach in which processes and evidence for decision-making were driven by the data office.

Standardising Judgement and Practice

This elevation of data-derived knowledge and decision-making above teachers' holistic or situated professional judgements can be seen as a part of an overall process of standardisation. As with national and international benchmarking and policy-making, standardised performance metrics are a governing technology that allows for the comparative evaluation of different teachers and pupils performance (Fenwick et al., 2014). Such standardisation is a key part of an 'evidence-based' approach to teaching in which causal, rather than interpretative, relationships are assumed between teaching 'inputs' and pupil performance 'outcomes' (Biesta, 2013). Standardised metrics are employed in order to quantify and codify this relationship and to make data directly actionable.

The data practices in Ridgewood School made education knowable, accountable, and actionable through a data apparatus that also included international comparisons, national accountability frameworks and school data practices. The logics of this data apparatus reconfigured teachers' practice, performing data-driven, standardised, codified and quantified forms of teacher knowledge and decision-making as objective and legitimate, while more holistic professional knowledge and judgements were framed as inherently subjective and therefore illegitimate. The data practices within Ridgewood School were part of an ongoing re-orientation of teachers' professionalism towards producing, managing and responding to pupil data. Teachers such as Joe, Sarah and the data office team who aligned themselves with these practices were able to exercise considerable influence and power within the school, performing themselves as 'good' teachers, able to make legitimate claims about pupils' learning and using their knowledge to shape the work of other teachers within the school.

CONCLUSION: WHAT IS MADE TO MATTER AND WHAT IS EXCLUDED FROM MATTERING?

Educational data practices are shaping education in many different ways, from international policy-making through benchmarking to the subject positions of pupils in and out of the classroom. The organisation of the curriculum and the role of teachers' professional knowledge and judgments are two aspects of this process in which it is possible to closely follow in some depth how data works to make a difference to education. The analysis of these two aspects in this chapter helps to shed some light on the ways that data practices are not only making some elements of education more visible, but how they reconfigure the ways in which it is possible to think about and practice education, and the social purposes enacted through our education systems. These domains help to show how data practices of monitoring, standardising and predicting educational practice and outcomes can undermine the emergence of new subjectivities and knowledge, potentially limiting educational possibilities to the reproduction of existing knowledge and social orders.

Educational data practices are reconfiguring how pupils are assessed on, access, and experience new knowledge as they attempt to precisely monitor pupils' progress through curricular content. Through an algorithmic triage device, decisions were taken about which pupils were deemed priorities to receive interventions, in the process excluding them from participating in the wider curriculum. Importantly, these decisions were designed to prioritise pupils who made the biggest impact on the school's accountability metrics. The use of a data-driven algorithm framed these decisions as objective outcomes in the best interests of both pupils and the school, in the process eliding these potentially different interests and excluding pupils', parents' and teachers' voices from mattering in this debate. In pursuit of more predictable performance data the English literature curriculum had become focused around practising generic skills that could be measured against assessment criteria, resulting in a curriculum that failed to engage meaningfully with the new knowledge pupils may be creating through their engagement with the literature they studied.

As these data practices reached out beyond the system of data collection itself, they also worked to reconfigure teachers' professionalism, away from contextualised and multifaceted ways of knowing and making judgments, towards a more standardised and data-orientated form of professionalism. As data practices shape teachers' understanding of pupils'

learning in more standardised ways, they may offer fewer opportunities for teachers to recognise and respond to the unique strengths and contributions of pupils. These new modes of teacher professionalism were matters of some controversy, but those teachers with the legitimacy to make data-driven claims were able to exercise considerable influence throughout the school.

This exploration of how data practices reconfigured the curriculum and teacher judgement in an English secondary school also serves to open up questions about the implications of data power in its attempts to minimise risk in other areas of social life beyond education. As data power attempts to more precisely predict social outcomes and standardise modes of judgement, it has consequences for how far we are able to engage with the openness, risk, and unpredictability that are necessary to create new knowledge and subjectivities to deal with new challenges and build new worlds.

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