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En/countering the doings of standards in early childhood education: drawing on Actor-Network Theory to trace enactments of and resistances to emerging sociomaterial policy assemblages

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ABSTRACT

There has been an increasing move worldwide in education policy towards standardization in combination with a global trust in digital quantification and calculation. These policies cause frictions in early childhood education (ECE). Hence, this paper examines the way standards 'work' in ECE. The empirical study draws on the ideas of Actor-Network Theory to recount and examine the highly material processes of calculation and representation, in which standards become enacted and act in practice. The data was drawn from extensive interviews with early childhood teachers in the Netherlands as well as additional 'object interviews'. The analysis describes how a particular standard becomes enacted as an assemblage, which both invites and compels teachers and managers to engage in particular educational practices. Foregrounding standards and highlighting the way professionals work with, through or around them, enables educational professionals to (re)consider the doings of standards and creates a space to imagine how practices – and policies that shape these practices – might be assembled differently. We advance the argument that it is important for professionals to critically analyse their professional practices in light of increasing datafication. Enhancing sociomaterial sensibilities of teachers might support them to offset persuasive powers of sociomaterial policy assemblages.

Introduction

Standards have become ubiquitous in education worldwide (e.g. Ceulemans 2017; Fenwick 2016; Lewis and Holloway 2019; Nerland and Karseth 2015). A common view of standards is that they are sets of rules designed to guarantee quality of work and to make this quality transparent (Nerland and Karseth 2015). Standards which measure

learning progress and quality of schools are accepted as a means to evaluate the effectiveness of education (e.g. Gelderblom 2017; Landri 2021; OECD 2013, 2020). However, such universal standards are also repeatedly criticized as such (e.g. Biesta 2009; Frans 2019; Stremmel et al. 2015). Researchers in many countries are noticing tensions among Early Childhood Education (ECE) teachers, which seem to be caused by the daily pressures of current accountability policies that contradict the professional expertise of ECE teachers (Moss and Dahlberg 2008; Osgood 2006).

Early childhood educators are drawing attention to the problematic effects on young children due to this increased focus on standards. For example, teachers and researchers indicate that externally imposed performance measures have led to an increased emphasis on teacher-centred didactics, an emergent standardized test culture and a narrowing of the educational content at kindergarten level at the cost of time for 'learning through play' and child-centred pedagogies that are considered to be especially important for this age group (Bassok, Latham, and Rorem 2016; Bodrova 2008; Bradbury 2019; Goorhuis 2012; Wildt-Dienske and de Wildt 2013). Increased pressures on performance lead to less room for young children to develop at their own pace. This is particularly a danger to the self-image and self-confidence of children who fall behind 'the norm' (Bradbury 2019; Goorhuis 2012; Goorhuis and Levering 2006). Furthermore, attention is drawn to the danger that a one-sided emphasis on the core subjects of mathematics and language will be at the expense of broad personal development (Bradbury 2019; Janssen-Vos 2012).

This paper explores these issues in the context of Dutch ECE. We draw on data collected during a recent multi-phase empirical study conducted by the first author (Oosterhoff 2021), which investigated: *How does the workplace environment affect the professional autonomy of early childhood teachers?* The data in the study suggested that a variety of actors exert influence on teaching practice in many different and interrelated ways. In addition to human actors, such as managers, colleagues and parents, a range of nonhuman *things* came to the fore, such as teaching methods, doors and walls, phones, pictures, tests, reports, computers, binders, and tick lists. Inspired and informed by Actor-Network Theory (ANT) (Latour 2005; Law 2004; Mol 2010), the data invited us to bring those things into the foreground and explore further questions about the active role of things in constituting everyday teaching practice. We explore this active role of things by investigating how a national standardized test – the Cito test *Language for young children* (Lansink 2009) – interacts with early childhood educational practitioners and their surroundings.

In the Netherlands, preschool is integrated into primary school, which educates children aged 4–12. By law, Dutch teachers are free to choose the way they design their teaching practices according to their professional expertise and ethics (Constitution 2008, Article 23.2). Final learning outcomes are defined by the government and supervised by the Inspectorate of Education. At the time of data-gathering for this research, schools were required to use a student tracking system (STS) that showed the progress in knowledge and skills at pupil, group, and school levels and to use a national standardized test (Primary Education Act 2017). The Cito Institute is the main provider of nationally standardized educational tests, as well as a commonly used digital STS.

The value of developing sociomaterial sensibilities

This paper focusses on how digital-quantifying mechanisms influence everyday ECE practices and offers a glimpse of the *doings* of standards – that is, their more-than-human agency: how they *work* as part of networks, or assemblages, including extended policy networks. Professional agency is often described as the human capacity to act intentionally and purposively (Engen, Pickering, and Walland 2016). However, a more sociomaterial view of agency takes a co-constitutive perspective. Introna (2014) draws on Barad's (1996, 2003) notion of intra-action, to explain that in this perspective agency is not seen as an attribute of the human or object on its own, but rather as the outcome of ongoing intra-actions between them.

The aim of exploring this distributed agency of standards in ECE practice is to enable people who work with standards (teachers, managers, inspectorates, policymakers) to (re)consider what these standards do, and to reflect on the practices enacted in and through them. Sociomaterial investigations 'are increasingly acknowledged as critical in understanding the politics of public service' (Fenwick 2016, 14). However, ANT is still under-applied in educational studies (Mifsud 2020). Sociomaterial sensibilities provide a way for researchers and practitioners to attune to and respond to how standards are 'assembled' and can perhaps be re-assembled differently in practice. Such work begins by noticing the active role that things play in daily educational practice.

We begin the paper by drawing on ANT to position standards conceptually as assemblages, that is, extended co-constitutive networks of people and things. Next, we will explain how we explored our research data with ANT sensibilities, guided by sociomaterial heuristics. We then turn to our empirical work to untangle the networked spaces in which a particular standard *becomes enacted* and *acts* (Mol 2010) in daily ECE practices. The analysis describes how a particular standard, the Cito standard, is actually multiple assemblages of both human and nonhuman actors, differently powerful. The findings suggest that digital data and technical systems to process these data seem to play an important part in these assemblages. Multiple assemblages manage to both invite and compel teachers and managers to engage in particular educational practices. Multiple versions of the learning child seem to be enacted as part of different practices in different spaces. We conclude the paper by arguing that standards are not just carriers of particular pieces of policy aspirations and strategies but, instead, enacted in – and helping to enact – various practices of knowledge-making, which evokes the responsibility of practitioners to find ways to (re)establish balances between diverse sorts of standards and the realities they enact. Further, developing ANT-sensibilities may be a helpful way of preparing (novice) teachers to the contradictory and increasingly datafied field of ECE practices. The guiding yet open character of the heuristics we employed in our study, might be also beneficial for educating professionals.

Actor-Network Theory to explore the doings of standards

As instantiations of policy, standards appear in ECE educational practices as a collection of *things* – or objects – taking various material forms, such as tick lists, tests, student tracking systems, diagrams, reports, and reflection forms. Often people tend to think about the material things around them in terms of how humans use them to reach their

own goals, such as using tests and test results for pedagogical decision-making. However, scholars who work with the ideas of ANT have shown how those objects themselves have agency as part of *networks* of other *actors* – like other material objects, people, discourses, ideas, and events (Adams and Thompson 2016). Together these human and nonhuman actors form networks, or assemblages, that once entangled, co-constitute what the thing actually *is* and what it *does*. These networks enact agency. In other words, networks *do*: making other human and nonhuman actors behave in particular ways (Latour 2005; Law 2004; Mol 2002). Once one starts seeing agency as distributed across networks of people and things, it is often not immediately clear who or what is in charge: the person or the thing. Is it the teacher who decides to talk with the children about the letter 'C' this morning? Or is it the upcoming test that invites her to address this topic today? Where educational research in general tends to focus on personal and social processes, ANT researchers foreground the active role of material objects and the relational connections that enact practices and are enacted through these practices.

In this perspective, things and humans do not act on their own but through intra-actions between a multitude of other nonhumans and humans. The common way of thinking about material things is to see them as separate objects, each with their own identifiable characteristics. ANT draws attention to the way things in practice are connected to a multitude of other objects and humans. Thus, it is not the test *per se* that invites the teacher to address a certain topic in a certain way, it is the *test assemblage* that acts: the test *plus* a myriad of other actors to which the test is connected. Some of these actors are far removed from the classroom where the teaching happens, such as publishers, knowledge, experts, legal frameworks, funds, technology, policy debates. For example, the current top-down operation of accountability policies creates the situation whereby education is governed at a distance and coordinated remotely through techniques of standardization, which are often amplified through data infrastructures and algorithmic managerialism (Spencer 2014). However, when the test enters a specific classroom, for example as part of accountability procedures, the actors within this classroom assemblage (such as teachers, students, teaching materials, schedules, events) in their turn act upon it, become part of the assemblage, transforming the test into what it *is* and *does* at this moment in this specific practice.

This paper examines how the Cito standard, which appears to be a singular thing, comes into being in ECE practice through many seemingly tangible connections between categories, tests, teachers, computers, and children. The account helps to gain a sense of the way 'people, objects, ideas, discourses and events gather and *do* as an assemblage' (Adams and Thompson 2016, 40), showing how standards both *are produced* and *produce*.

Standards and digital data: how policies of accountability and improvement materialise

Standards have the twofold intention of guaranteeing the quality of work and making this quality transparent to stakeholders (Nerland and Karseth 2015). One frequently used definition of a standard is 'any set of agreed-upon rules for the *production* of (textual or material) objects' (Bowker and Star 1999, 13, emphasis added). Applied to educational practice, educational standards therefore describe rules to produce educational 'objects',

such as desired student learning outcomes. To ensure that a standard is achieved, Fenwick and Edwards (2010) state, a student must be made both calculable and representable so that he/she can be accounted for. The result of this calculation process is a judgement, a ranking and eventually a decision based on this (Callon and Law 2005). Callon and Law (2005) underscore that although the term calculation processes easily is associated with quantitative calculations, the same processes apply to qualitative judgements. For that reason, Callon and Law (2005) prefer the term *qualculations*. They emphasize that in local practice these qualculations can be done, and are done, in many different and sometimes incompatible ways. Therefore, conflicting judgements are often part of professional practice (Law 2004). Formal and universal standards compete with local knowledges (Landri 2021). Such tensions generate questions about (im)balance which need to be explored.

In education policy and governance there has been an increasing move towards standardization in combination with a growing reliance on numerical evidence (Gorur 2018; Landri 2021; Jarke and Breiter 2019; Ozga 2016). Moreover, the use of advanced technical systems that gather, label, and combine data using algorithms and often various forms of artificial intelligence (AI) is increasingly enhancing this move towards digital datafication in education in general (Jarke and Breiter 2019; Lewis and Hartong 2021; Lupton and Williamson 2017) and in ECE in particular (Bradbury 2019), especially in relation to testing and assessment practices. Datafication – that is, translating the world in a machine-readable digital format – comes with 'dataism', the trust in digital quantification and algorithmic calculation as solutions for frictions (Rasch 2021). However, rendering the world in digital data, sets limits on what is visible and what can be known about that world (Lewis and Hartong 2021; Gourlay 2021). Algorithmic decision making is not neutral but informed by prevailing beliefs about what counts as knowledge (Gourlay 2021). Moreover, measurements are not innocent. Comparative measurements, on national and international levels, are crucial reference points for governments to inform their policies (Gorur 2015; Landri 2021). Measurements *do*. They 'loop back into action that can change the very thing that was measured' (Williamson, Bayne, and Suellen 2020, 353). Consequently, these agentic processes are also political, giving rise to important questions about how data in an educational context is made and how it might be made differently (e.g. Gray, Gerlitz, and Bounegru 2018).

In this paper, we attend to the practices that underlie processes of standardization in education, which, according to Jarke and Breiter (2019), have been under-researched to date. Moreover, the dynamics of digital data in ECE are often overlooked (Jarke and Breiter 2019). ANT serves as a helpful set of sensibilities to explore the doings of standards as part of the highly material practices of data-gathering, calculation, and representation in ECE.

Methods: exploring the doings of standards in ECE with ANT

To gather and analyse our research data with ANT sensibilities, we drew for a large part on a series of heuristics for *interviewing objects* provided by Adams and Thompson (2016). Such heuristics, Adams and Thompson (2016) state, are not step-by-step procedures, but *possible ways of inquiry*; a series of questions drawn from theoretical sources such as ANT, (post)phenomenology and critical media studies, which help researchers

attune to nonhuman actors and untangle the way people and things co-constitute practices. Below, we will describe the starting points of the approach that we took – the data and questions about it – and, subsequently, explain the approach to data analysis through an ANT lens. For a more detailed description we refer the interested reader to Oosterhoff (2021).

The starting point of the ANT analysis was the narratives of eight experienced Dutch early childhood teachers, which were developed during semi-structured interviews conducted as part of the larger study of ECE (Oosterhoff 2021). The teachers talked about events that occurred in their daily practice, about their drives and frustrations, about tensions between professional responsibilities and external regulations and about dealing with these tensions. In all eight stories, tests were frequently mentioned. For instance, the teachers recounted how they felt forced to use national standardized tests which are not appropriate for the kindergarten age group.

We became interested in the way teachers work with, through and around standards, that is, how they enact policies of accountability and improvement in practice. However, the teachers did not talk about 'standards' in a straightforward way and rarely used the word 'standard'. In the research data, standards could be made visible and traced in many different material forms (Fenwick 2010), such as tests, test manuals, digital student tracking systems, and computer-generated charts. Standards seemed to encourage gatherings around tests and a variety of educational practices, such as measuring practices, teaching practices, and administration practices. These practices seemed an important issue that all eight participants brought to the fore. Although the initial interview data was materially saturated, these interviews did not set out to purposefully catch insightful glimpses of objects *in action*. Therefore, given the importance of foregrounding the intra-active role of the nonhuman actors, we turned to the process which Adams and Thompson (2016) call *interviewing objects.*

Interviewing objects

Interviewing objects, Adams and Thompson (2016) propose, is a process to give material objects on the research site 'a voice': to 'articulate the unique contributions digital technologies [are] making' (17). Interviewing objects is an iterative and explorative process in which data gathering and data analysis is strongly intertwined. This process is not to be confused with interviewing human participants, although such human interviews can be one productive way to surface the work of 'things' in everyday practices. In this study, interview data were used as a conduit into other data sources, such as field observations, manuals and websites.

Adams and Thompson (2016) present eight heuristics which provide ways of interviewing objects. Although all eight heuristics were helpful for our broad exploration of issues of interest at the start of our explorations, four heuristics were most generative as we began to focus on issues presented in this paper: *Studying Breakdowns, Gathering Anecdotes, Following the Actors* and *Unravelling Translations*. We will describe the process of interviewing objects, including the justification for applying these four heuristics, rather extensively because of its potential for professional development, as we will propose in the final section of this paper. In line with the ontological commitments of ANT to the mundane and the micro, we focused more closely on the materiality of

situated micro-practices of one participant, Britt. Please note that all participant names in this paper are pseudonyms and none are recognizable by contextual details. The study complies with the EECERA Ethical Code for Early Childhood Researchers (Bertram et al. 2015) and the Ethics Regulations of the Ethical Committee for pedagogy and educational science of the University of Groningen (University of Groningen 2018).

Studying breakdowns

Britt described a clash that had occurred during a meeting. This incident served as what Latour (2005) describes as a 'breakdown', which we used as an occasion 'to hear, see, and feel what objects may be doing' (81). Many objects or technologies, such as mobile phones, digital school boards, or coffee machines, are so integrated into our everyday activities that they become unnoticed, taken for granted. However, the moment they stop working, or are unexpectedly missing, their activities and the practices they afford suddenly become clearly visible and tangible. *Studying breakdowns, accidents and anomalies* is one of the heuristics proposed by Adams and Thompson (2016) that helped us to attend to questions such as: 'In the wake of a breakdown, ... what practices and things become more visible?' 'What frictions are evident?' (49).

Gathering anecdotes

To sharpen our sensibility to the lived details of this specific and other events, in particular the materiality of these events, we turned to the heuristic of *Gathering Anecdotes*. ANT researchers describe micro-practices to trace the dynamics of actor-networks in situated practice (Latour 2005). The *anecdote* allows ongoing reflection on and analysis of one's data. Anecdotes are constructed by the researcher as part of the data gathering and analytic process (Michael 2012). An anecdote, thus, is a descriptive reconstruction of 'an incident or life happening that strikes, interests or otherwise concerns us' (Adams and Thompson 2016, 25), as a means to offer an occasion to consider a living event in depth. Constructing anecdotes helps the researcher to attune to 'everyday, personal, affectively charged incidents that are nonetheless highly recognizable' (Michael 2012, 29). Anecdotes enable an account of the performativity of socio-material practices, and reflection on the way certain material contingencies impart certain ways of doing and being (Hultin 2019). Awareness of these contingencies also enables the researcher and ultimately the reader to imagine other possibilities. Anecdotes are therefore actors themselves, created *and* creating (Michael 2012).

Writing anecdotes, then, drew us into reassembling events from interview snippets, field observations and other sources that these data led us to, such as manuals and websites. Furthermore, an additional *thing-sensitive* interview with Britt took place, with both Britt and the first author attuning to the materiality at her school and the practices it helps to enact. To map the networked material spaces of Britt's testing practices, we drew on the interview prompts proposed by Adams and Thompson (2016): 'Can you think back to . . .? [e.g. the moment the clash took place, a particular moment when using the test] Where were you? Can you walk me through what happened?' (27). The first author asked Britt to open cupboards, folders, or screens on her computer, to show or tell explicitly how these things actually *work* in daily practice. By doing so, we invited material artefacts into the interview (Hultin 2019) and the data from this interview served as a starting point for further data collection and analysis.

The descriptive process of writing anecdotes is quite different from 'just' reporting on these data. Writing anecdotes is an iterative process that moves through consecutive stages of data-gathering from different resources to reflecting, writing, reading, thinking, discussing, gathering new data, re-reading, re-writing, and so on, aimed to track and trace the *actor-networks* in action. Anecdotal writing is not about humans using artefacts, but it aims to present a descriptive detailed account of the numerous and often unexpected *connections between* humans and non-humans that are part of events that enact pedagogy in daily practice (Plum 2016).

Following the actors

As we began to untangle these micro-practices, we found ourselves *following the actors* (Latour 2005), with the aim of describing in detail how human and nonhuman beings, mutually entangled, co-constitute and enact practice. The object interviews continued as the first author left Britt's classroom and turned to some of the other key material actors: a user manual for the Cito student tracking system, a test booklet for the Cito language test for toddlers, websites such as of the Dutch Inspectorate of Education, and an online platform which aims to make educational expert knowledge assessable for professionals in the field (wij-leren.nl).

Unravelling translations

As part of following the actors, the analysis involved 'attending to how agency [was] distributed throughout a network and entangled in multiple actor relations' (Adams and Thompson 2016, 39). Furthermore, we sought, as Hultin (2019) states, 'to account for how certain practices have become enacted as appropriate and legitimate, and ultimately taken for granted' (97). The many questions in the heuristic of *Unravelling Translations* served as sensitizing questions from the outset and enabled the exploration of translations: 'how a particular gathering of human and nonhuman actors has come to be, as well as what is happening as these actors inter-act' (Adams and Thompson 2016, 75). Attuning to distributed agency was of great importance in addressing more political questions that could be asked once actor-networks came into focus. In this paper, we will address two questions that Adams and Thompson (2016) propose in the heuristic of *Unravelling Translations*: 'Might there be multiple assemblages – or realities – at work?' (76) and 'Do some actors seem more powerful or persuasive than others?' (75).

In the next three sections, we present our data and what these data suggest when querying them with the help of the heuristics. The first two sections map the networked spaces in which the Cito standard comes into being in ECE practice. First, we offer an entry point by presenting and discussing a 'breakdown' at Britt's school. Second, we follow the actors in an attempt to trace the assemblages that enact the Cito standard. The third section will then address more political issues of multiplicity and power.

Studying a breakdown: a clash

When the first author interviewed Britt about tensions that occurred in her daily work, standards appeared in many different material (trace) forms. In the following anecdote (*The Clash*), we will reassemble a specific event at Britt's school, in which standards appear in the form of a chart (see Figure 1).[1]
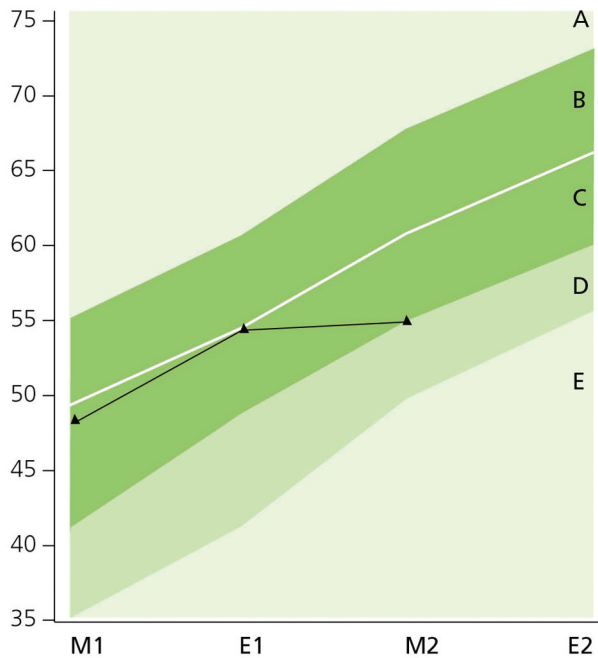
Figure 1. Example of a student report on a language test (annual middle and end tests, grades 1 and 2).

The clash

Britt, her Internal Supervisor (IS)[2] and her school head are sitting in the room of the IS; it is a small room centrally located in the school. They sit amid bookshelves filled with books and folders that contain tests, lesson plans and remedial teaching manuals. At the back, there is a locked cupboard filled with dossiers containing the learning results of all the children in the school. In the corner, there is a desk with a printer and a PC, the screen of which displays a form from an STS. In this room, data from all over the school is gathered, observed, and stored. At this moment, an evaluation meeting is going on. On the table, there are some sheets of paper that had just come out of the printer, showing the individual test results of the children in Britt's group in the form of charts (Figure 1).

These charts display the results of three earlier tests against a coloured background that depicts grading categories into which the results fit. A white line indicates the national standard average score. Based on the declining trend of the line on one of the charts that relates to the progress of language skills, the IS suggests that one of the children should be discussed in a special meeting that considers children who might be in danger of lagging behind, with the aim of deciding on the need for remedial teaching. Britt refuses to discuss the child as a 'problem'. The others, however, insist: 'The chart shows clearly: this child didn't make his jump'. Britt, then, becomes upset, saying: 'Come and take a look in the classroom. Look at what the child is doing, don't look solely at your little diagram, but look at the child. It's not a paper kid! We spend all day with these kids in our classrooms and certainly know whether there is something to worry about or not'.

This occasion might be seen as what Latour (2005) describes as a breakdown. Charts are integrated into the flow of daily school practice in Britt's school. They indicate learning progress and, as such, are enrolled to support pedagogical decision-making, enacting further practices, such as meetings and remedial teaching activities. This is what the chart normally does. However, this time it did not work as smoothly as usual. On this occasion, the chart seems to fail to support pedagogical decision-making, as no agreement was reached. Its mundane work stopped abruptly. In this moment, the practices that the chart affords became visible and it became possible to obtain a glimpse of other actors (the child, the classroom) and of a tension (demonstrated by Britt's frustration).

Such a breakdown can be used as an entry point into making the sociomateriality of the data more visible (Adams and Thompson 2016). The ANT way of doing this is to follow the actors (Latour 2005). Who-what is actually acting? In the anecdote, Britt points to another space, her classroom, which seems to be relevant to the clash. In what follows, we take a closer look at the micro-practices in Britt's daily teaching to discover how the 'little diagram' that was on the table in the supervisor's room is enacted.

Following the actors: how an educational standard is made to be

In this section, we follow the actors, focusing on the object interview questions: 'What micro-practices can be discerned?', 'Who-what is acting?' 'Who-what is excluded?' (Adams and Thompson 2016, 33).

Translating children into charts

For our first interview, Britt invited the first author into her classroom. They both sat on tiny chairs around a square of small tables. The classroom was full of things that belong to the world of early childhood education, still exuding the energy of the children who had just left the building, such as towers constructed with wooden blocks; paintings left to dry on the tables; cupboards packed with puzzles, toys. Chairs with names on them stood in a circle, expecting the children back again tomorrow. This is the regular setting in Britt's classroom. However, a few weeks before our interview
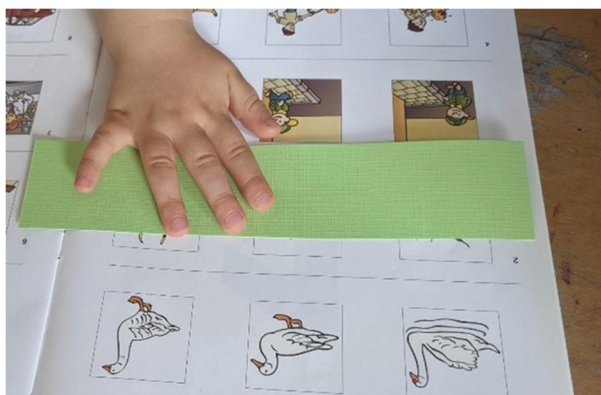

Figure 2. Children put the strip on the page.

things were assembled differently. In the first two grades of Britt's school, the children are tested twice a year on language and mathematical skills. The school uses Cito tests for this. In the following anecdote (*Testing Practices*), we will reassemble a specific event at Britt's school, in which standards appear in many different forms, such as tests, pictures, manuals and many more.

Testing practices

This morning in Britt's classroom the children are tested on language skills. The tables are lined up separately. There is only a small group of children inside, each one sitting at a table. The rest of the group is in the playground. There is silence in the classroom. The testing occurs as follows: on each table there is a booklet with pictures, a pencil and a paper strip (see Figure 2). The children put this strip on the page under a row of three pictures, and Britt reads out instructions from the test-manual (Lansink 2009, 1): 'Where do you see a "swan"? Put a line under the "swan". Move your strip to the next long line'. While reading the instructions, Britt watches the children. When Danny starts to daydream, she walks over, taps him on the shoulder and asks: 'How is it going?'

Afterwards, when the children have left, Britt sits alone at her desk, all the booklets piled in front of her. One by one she opens them, looks at the lines under the pictures. At the back of the booklet, she notes all the errors, recording the numbers of all the questions answered incorrectly, that is, all the occasions that lines are put under a picture that does not match with the word that was read out. She also records her observations made during the test in the interpretation of individual test results, writing notes at the back of the booklet; for example, 'Danny was tired'. She then considers the mistakes of the whole group, looking for frequently made errors. Based on this analysis, Britt decides on specific activities that might improve poor results. For example, most of the children did not know the difference between a swan, a goose, and a duck. Britt notes in her daily record: 'search for some books with water bird pictures in them and read them together'.

Then, Britt converts the individual results, in terms of the total number of right answers, into a 'proficiency score' to ensure the results are comparable with the results of other tests. She finds these scores in a table in the Cito manual. Opening the STS on her desktop, she then types the proficiency scores into the computer and the software algorithm gives her a corresponding grade category for each child: A, B, C, D or E. Finally, Britt clicks on the 'save' button to save the grading categories and scores in the central database of the Cito STS.

In this anecdote, a particular Cito standard becomes enacted in Britt's daily practice as part of an assemblage of booklets, pencils, tables in rows, children divided into groups, pictures and lines, a teacher, a manual, silence, a daily record, proficiency scores, algorithms, categories, computers, and a database. Through a series of negotiations and moves, these entities are combined, manipulated, transformed, and moved from one place to another, showing the easy and seemingly unproblematic way in which children become translated into numerical scores and categories. In the next stage of this process of calculating, new entities are produced: the algorithms of the STS software compare the specific test results with earlier results. A chart comes out of the printer in the room of the IS. The chart-teacher-IS-assemblage in turn produces a judgement that is meant to be converted into a decision about whether a child should be discussed as 'a problem', in need for remedial teaching activities.

Britt's refusal to align with the way the child is framed as 'a problem' in the first anecdote (*The Clash*) indicates the difficulty in stabilizing the vocabulary standard as accepted fact in practice. For the IS and the school head, the chart showed an undisputable fact that they took for granted, as the head teacher states: 'The chart shows clearly; this child did not make his jump'. Britt plays that particular 'fact' against another one: 'Come and take a look in the classroom'. To discuss this contradiction, we turn to the notion of multiplicity (Mol 2002) in the next section.

Unravelling translations: multiple realities and power differences

We now draw on the heuristic of 'Unravelling translations' to query the data on a more political matter, examining if there might be multiple assemblages – or realities – at work and if some actors seem more powerful or persuasive than others (Adams and Thompson 2016).

Multiple versions of the learning child

Based on several empirical studies in healthcare, Mol (1999, 2002) convincingly argues and illustrates that what *exists* are not singular things *out there* that can be registered objectively if only we use the right tools and procedures. Instead, actors – such as diseases – become real as part of highly material activities that take place 'then and there' (Mol 2002, 33). Consequently, the ontological question of what exists is answered in a specific way. Practices that emerge as an effect of a specific gathering of actors, shape what *is*. In this way, gatherings of people and things enact *reality*. Moreover, because different things are gathered and used in different places, multiple versions of reality emerge.

What stands out in the second anecdote (*Testing Practices*) is the way Britt's gaze being directed towards the children, as well as a handwritten note on the back of the booklet, 'Danny was tired'. This note does not travel with the proficiency scores to the central database of the Cito STS. The note stays in the classroom. Numbers travel smoothly from one place to another, but the note does not. It is stuck, silenced, hidden somewhere in the pile of booklets in the drawer of Britt's desk. It is Britt that brings the observations back again into the meeting: 'We spend all day with these kids in our classrooms and certainly know whether there is something to worry about or not'. The way Britt sees her pupils in their daily activities, doing things such as building towers and painting pictures, seems to generate important knowledges that should also be reckoned with when defining the development of a child. However, the clash shows that the diagram is a strong actor. Questioning the chart is futile according to the IS and the school head, leaving Britt upset.

This analysis firstly shows how knowing is *performed* into being, as an effect of gatherings of people and things (Ahn et al. 2015; Fenwick 2014). In the wake of these networked performances, in different practices at Britt's school, multiple versions of what we call the 'learning child' seem to be enacted. In the room of the IS, the learning child is enacted as a representation of a pre-set selection of learning outcomes in the form of a diagram, a *'paper kid'*, enacted within a standard assemblage which depends on statistical methods. In the classroom, the learning child is a *learning body*, enacted as individual performance, witnessed amidst a large variety of three-dimensional things and

social constellations. Learning in the classroom is shown to be what Mulcahy (2012) calls "an experimental mode of learning [which] attunes to the complex particularities of practice in its specific circumstances' and is 'embodied, materialised, involved" (134).

Secondly, the first anecdote (*The Clash*) further indicates some tensions between both realities. Mol (1999) argues that different realities emerge historically and co-exist, often without any trouble. They may collaborate or depend on each other, but sometimes realities clash (Mol 1999). During the meeting in the room of the IS the two versions of the learning child clashed. A breakdown occurred because the two co-existing realities did not give corresponding answers when pedagogical decisions had to be made: the 'paper kid' had a problem that had to be solved, the learning body did not. Moreover, practices and the realities they enact are not always equally powerful. In the next section we discuss the persuasiveness of the Cito-standard.

The persuasiveness of the cito-standard: aligning and resisting

Despite her firm refusal of the consequences of the outcomes of the test in the first anecdote (*The Clash*), in other moments Britt's practices became aligned to the test, although Britt adapted her practices reluctantly. Furthermore, the second anecdote (*Testing Practices*) describes how Britt pays close attention to the mistakes made by the children to decide on follow-up activities such as '*search for some books with water bird pictures in them and read them together*'. It happens more often that Britt adjusts her teaching practices, often in an unwilling way. Teaching adaptations have become part of the usual routine in Britt's practice. The next anecdote (*Christmas Candles*) exposes some new elements that have become part of Britt's' daily teaching routine as an effect of utilizing the Cito test for measuring learning progress in her school.

Christmas Candles

A large Christmas tree in the corner of Britt's classroom demonstrates the time of the year. Lights in the classroom are dimmed. Children enter. Each child brings in a candle from home this morning. The children put them on the tables grouped in a square in the middle of the classroom. After a few morning rituals, the candles invite a lively conversation. Who has the tallest candle? The thickest? The children pick up the candles, put them side by side, on top of each other, arguing about weight, colour, burning, shrinking. Then Britt turns on the light in the classroom and points to the wall. A large black 'C' on white paper hangs next to a picture of a burning candle. Britt asks question about that letter. How does it sound? Can you hear the letter when I say 'candle'? Britt writes the word candle on a white card, the 'C' in red, the rest of the letters in black, and puts the card next to the picture on the wall. The children start to mention other words that begin with the same letter, such as Christmas, cosy, cake, Carla. Then Britt stops this activity by pointing to the other squares of tables. Pencils and worksheets lie waiting for them there. On the worksheets are all kinds of Christmas pictures in different sizes, grouped together in different order. The children take their chairs, move over to the worksheets. Britt says: 'Where do you see the pictures from big to small? Draw a line underneath.'

New objects have appeared. Letter walls and worksheets were not in the classroom before the Cito tests appeared. Albeit grudgingly, Britt now spends more time on

teaching the letters of the alphabet. She observes: 'Cito has raised the norms. Today we teach them so many more characters. This takes place at the cost of other important activities, with no considerable positive effects'. Worksheets have entered her classroom to accustom the young children to work in two-dimensional ways, as required by the Cito tests. This does not sit well with Britt, who states, 'I prefer to work with real materials, like candles in Christmas time'. The contradiction between Britts' preferences and her practices seems to suggest that the Cito standard has become a powerful policy instrument. The use of the Cito tests has become more established in daily practice in Britt's school, changing practices, engaging Britt in specific actions, even those that are intrusive. These teaching practices became part of the complex dynamics that enact policies of accountability and improvement in mutually entangled practices, gradually contributing to the rise of Cito norms and, hence, to their compelling effects. In an article published by the Cito-Institute, Visser, Papenburg, and Hollenberg (2014) explain how standards are being adjusted: the Cito-Institute conducts annual checks to ascertain if the norms still fit. When newly collected test data do not correspond to the previously established norms, the Cito-Institute updates the norms accordingly. Test preparations generate better results. Subsequently, these better results generate higher national averages. It becomes more difficult to score average or higher. The dynamics described by Visser, Papenburg, and Hollenberg (2014) indicate that it is not *'the Cito'* as such that *'raised the norms'*, as Britt stated. It is the extended *assemblage* that did this 'work': Dutch ECE teachers + the Cito-Institute + worksheets + books about water birds and all other teaching materials and practices that emerge in the Dutch ECE classrooms aimed, as Visser, Papenburg, and Hollenberg (2014) put it in their explanation, to fill the 'educational gaps' exposed through the test results.

Britt's account is situated and specific; however, these teaching adaptations also came to the fore in other interviews. Data shows how the authority of the Cito-standard also can be resisted. Fleur, for instance, finds alternative ways of accounting for developmental progress. To account for the developmental progress of the children Fleurs' smartphone is ready to hand all day to capture moments of significance. Fleur and the children choose pictures to send to parents.

Interestingly, Fleur also actively campaigned against the mandatory use of nationally standardized tests, as a member of the Young Child Union (VJK (Vereniging Jonge Kind) 2009). Recently, the Dutch government decided to prohibit the use of nationally standardized tests like the Cito, arguing that they are not appropriate for measuring learning progress at this age (Van Engelshoven 2018). From 2021 on, only observational – albeit nationally standardized – instruments will be mandatory. Comparability at national level still needs to be ensured. This political change demonstrates the need for educational professionals to continuously evaluate, and speak back to, policy directions. Attuning to things, we demonstrated, offers a way to critically engage with policy: seeing assemblages and tracing the effects of sociomaterial forces, like, for example, demonstrating the way in which children become translated into data points and how practices become reshaped in (un)desirable ways. Eventually with the aim to be able to interrupt and imagine alternatives, when necessary.

Concluding remarks

More work could be done to explore the authority of the Cito and other standards in ECE, focusing on how these, as complex policy networks, materialize to account for performance of teachers and the school, enrolling more actors and multiple actor-networks, such as school evaluation meetings, inspectorate reports and surveillance results websites. As Suchman and Weber (2016) stress, 'discrete units of analysis are not given but made', thus, the work of 'cutting the network' is foundational in any sociomaterial account (20). Deciding when to stop following the actors is a persistent dilemma for sociomaterial researchers (Adams and Thompson 2016). Latour (2005) stresses that it is impossible to be complete or total. We are influenced by Latour's (2005) view of the writing of a sociomaterial account as an exploration. When this work is completed is decided by the researcher, often on mundane grounds, such as what fits into the wordcount allowed for an article (Latour 2005). The crucial question, however, is: 'Can the materiality of a report on paper, a story, or rather a fiction … extend the exploration of the social connections a little bit further?' (Latour 2005, 12). The account which is presented in this paper is the result of such an exploration. During this investigation, the text alternately expanded and contracted until it finally pushed the understanding of the social connections concerning the doings of standards in ECE a 'little bit further'.

ECE practices as part of emerging sociomaterial policy assemblages

The aim of this paper was to investigate the doings of standards in situated ECE practices with an ANT lens. It contributes to the growing critique on external performance measures and its effects on ECE by using sociomaterial sensibilities to recall the mundane processes of policy enactment that often escape our attention because these processes are so integrated into daily routines. The concept of sociomateriality itself emerges in this study as performative and agentic, given the way this concept, as Lenz Taguchi and St. Pierre (2017) put it, continually interrupts and reorients our thinking. The heuristics assisted us to work in the spaces between theoretical and methodological innovation: to use sociomaterial concepts as not only abstract concepts but as methods to investigate our data (Thompson 2022). As Lenz Taguchi and St.Pierre (2017) state, researchers create scientific or philosophical concepts, 'not to represent something in the actual world … but instead to create intensive orientations for thinking' (645). By following actors, unravelling translations, and exploring multiplicity in an iterative and experimental way – learning *with* these sociomaterial concepts – we obtained glimpses into a myriad of intra-actions between objects and humans, all working to enact a specific policy instrument, the Cito standard, in the daily educational practices of a Dutch ECE teacher. Educational practice and policy appear to be intertwined: and in this paper, emerging through assessment practices. In this section, we will consider how querying the data with sociomaterial sensibilities moves thinking about education policy forward. In addition, we will consider the implications for practice.

Similar to Gorur's (2015) findings from tracing the making of the OECD indicators, we demonstrated that measurements *produce*. The seemingly universal Cito standards have slipped into Britt's daily educational practice through booklets, test items,

algorithms, proficiency scores and grading categories that have become aligned with many other network entities, such as books, worksheets, and letter walls. As a result, Britt's aims and teaching practices appear to have been gradually reshaped, as she has increased the time spent on a narrow set of skills which are predefined in the Cito test and on the use of teaching materials and strategies that prepare the children to the test. However, the data also show that this adapting-process is not a straightforward one-way transition. Britt also tailored the scripted instructions that accompanied the test to fit her local practice, by splitting the group, observing the children, helping them to keep concentrated, and making notes. Based on those observations she firmly rejected some of the consequences that seemed to arise from the highly material test procedures.

The heuristic of *Unravelling translations* enabled exploration of more political questions about the emerging collection of actors and the practices they performed. Two issues came to the fore: the existence of multiple standards and power differences between them. In Britt's practice, there seemed to exist diverse versions of standards, which enacted multiple versions of the learning child. Practices which depend on statistical methods enacted a *paper kid* in the form of a chart. A *learning body* was enacted as a child's performance, witnessed by the teacher in the midst of educational things that belong to the world of ECE, such as candles, worksheets, letter walls, books, tables and chairs. As the data foregrounds, the learning child is enacted as multiple, a paper kid co-exists with the child as a learning body. The two different realities clashed in the room of the internal supervisor. The co-existing realities produced conflicting judgements when pedagogical decisions had to be made: the paper kid had a problem that had to be solved, the learning body did not. The account illustrated that tensions in education can be investigated and understood in terms of different practices enacting different realities. As Gourlay (2021) states: the 'very ontological status of the student' is altered as it is rendered a digital document (160).

The data also allowed us to ponder the way power is distributed. Similar to what Mulcahy (2011) shows, in Britt's school, versions of standards which rely on statistical methods are well established. The versions that are based on forms of 'wisdom of practice' (Mulcahy 2011, 109), are less visible. Numbers seem to travel smoothly from one place to another, but Britt's observational notes do not. The notes are lost; they are absent in the chart. As Lewis and Hartong (2021) put it: 'If the data are unable to be collected from or sent to a certain person or place, then these people and places, by definition, are excluded from the infrastructure' (3). In these processes, things are lost, become invisible and, thus, cease to exist, at least in the standardizing practices they bolster. The first anecdote (*The Clash*) shows how Britt was able to make her observations present again, because she was at the table herself. Here, professional responsibility becomes manifest.

Implications for ECE practice: professional response-ability

The current analysis of the doings of standards in ECE practice has important implications for policymakers and managers involved in these doings of standards as extended networks. Here, however, we highlight the implications for the ECE professionals in the field, because of their important role and responsibilities.

As processes of judgement increasingly are delegated to algorithms, it becomes important that measurements, calculations, and data visualisations are re-translated through professional judgements in practice (Fenwick and Edwards 2016). Fenwick and Edwards (2016) argue that digital technologies may supplement and inform, but cannot replace, professional judgement. What they argue for the health sector also applies for education: 'only human professionals can listen to [students] with nuanced understanding of complexities. Digital technologies do not attune or intuit, and, to date, they are not considered conscious agents that can bear responsibility for decisions' (125). Professionals need to rethink what their responsibility is in these new circumstances, in which agency is distributed. Professional responsibility could shift 'from notions of individual felt duty to the active responding to others . . . *towards* questions about how response is excited, by whom or what, what forms it takes and what are its consequences' (Fenwick and Edwards 2016, 119–120). Human agency, decision making and taking action, 'cannot be realized without an in-depth understanding of education "in its becoming", as it unfolds and emerges' as complex more-than-human practices (Gourlay 2021, 165). Looking at responsibility as an active *response* draws attention to the need for professionals to develop the ability to engage critically with the complex networked realities of policies of accountability and improvement; in other words: to acquire *response-ability*, as suggested by Fenwick (2016).

Questions about how to respond in a *response-able* way as an ECE professional are particularly important in the dynamic of current educational policies of accountability and their accompanying regimes of standardization and calculation because standards and digital data *do*. In Gorur's (2015) words: they act upon the world. They produce (un) intended network *effects*. The datafied representation of young children may overrule professional judgement and meaningful human experience, as evident in the data. Britt's teaching aims and practices became reshaped, against her will. The same effects are evident in international research on datafication and new regimes of digital governance. Bradbury (2019), for instance, warns that processes of datafication have already come to 'dominate notions of "good practice" and "quality" of ECE in official discourses in England' (17), producing a datafied version of the child, stripped of all the complexity of the child in the classroom. Bradbury's (2019) empirical work shows that increasing datafication in ECE is interacting with a shift towards 'schoolificaton' in UK kindergartens (11). Experts from the ECE field and the social sciences are concerned about these effects because of the harmful consequences for the development of young children (e.g. Bodrova 2008; Boland 2015; Goorhuis 2012; Oenema-Mostert et al. 2018). Furthermore, researchers and practitioners also warn about the detrimental effects of defining children as 'problems', with the outcome of creating anxious children. These effects are especially problematic given their relation to the need of young children to develop emotional security and self-confidence (Bradbury 2019; Goorhuis 2012; Wildt-Dienske and de Wildt 2013).

However, similar to Mulcahy (2011) and Ceulemans (2017), it is not our intention to argue that any one standard should prevail. It seems important to acknowledge that, as Moss and Dahlberg (2008) argue, we live in a world in which different perceptions of quality exist and, thus, many possible languages of evaluation are spoken. The recognition of multiple standards as an indispensable part of professional practices opens up the possibility to investigate the sociomaterial practices through which policies of accountability and improvement are enacted, and of engaging in performative politics; that is, of finding ways to (re)establish balances between diverse sorts of standards and the realities they enact.

An important question is: how to support professionals in developing the response-ability that is needed for such engaging in performative politics? How to resist the persuasive power of data visualisation (Williamson 2016), the strong belief in digital systems as 'solutions' which 'carry promises of efficiency and ease' (Nerland and Hasu 2020, 66) and the accompanying 'discourse of inevitably' (Gourlay 2021, 159)? One way to address these questions is to help practitioners to attune to the sociomateriality of their practices – to see differently, to ask different questions, to envision different ways to respond, even to see 'response' itself differently: as distributed across human-technology assemblages. To this end, the guiding and thought-provoking heuristics for *interviewing objects* developed by Adams and Thompson (2016) might be a helpful point of departure. The guiding yet open character of the heuristics allowed us to perceive professional practices in new and unsettling ways, and to recognize agency as distributed (Oosterhoff et al. 2021). Further research should be carried out to determine how these timely heuristics might be utilized in teacher education and for in-service professional development to support professionals worldwide in adopting a new way of thinking about responsibility – the idea of moving towards questions – and in developing response-ability in currently rapidly shifting professional practices within schools. Thus, exploring ways to trigger and support practitioners to *encounter* the continuous sociomaterial becoming of their educational practices and, through this, to enhance their ability to *counter* undesirable doings of policy assemblages.

Notes

1. The figures in this paper are meant as illustrations and are not the originals.
2. Every Dutch school has an IS: a colleague who is exempted from teaching duties to contribute to the educational needs policy of the school.

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Disclosure statement

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Declarations and ethical approval

This study complies with the EECERA Ethical Code for Early Childhood Researchers (Bertram 2015) and was carried out in accordance with the recommendations of, and with approval from the Ethics Review Committee of the Department of Pedagogical and Educational Sciences, Faculty of Behavioural and Social Sciences, University of Groningen and archived in the PhD publication Package. Informed written consent to take part in the research has been obtained from the participants prior to the commencement of the study.

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