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ETHICAL AND PHILOSOPHICAL DIMENSIONS OF MATHEMATICS ASSESSMENT

Anette Bagger

Örebro University
anette.bagger@oru.se

and

Juuso Henrik Nieminen

University of Hong Kong

Abstract

This article provides an opportunity to re-think traditional ways of assessing students' knowledge in mathematics through a discussion of the ethical and philosophical aspects of assessment. This is achieved by applying Bornemark and Cusa's thinking of humans' calculating (ratio practices) and reflecting (intellectus practices) capacities on assessment and discussing the possibilities and pitfalls that emerge as these capacities come into use. This is illustrated with the policy and practice concerning the assessment practices of students with intellectual disabilities (ID) in Sweden. The article provides a path for recognizing and reflecting on what kind of knowledge production researchers, teachers, and students contribute to as they engage in assessment. This creates an opportunity to re-think how we fabricate students, knowledge, and mathematics and how we wish to do so in the future.

Keywords: Assessment, ethical stress, knowledge production, ratio- and intellectus practices, Intellectual Disabilities.

1. The role of mathematics assessment

Assessment has a unique role in mathematics education. Mathematics education stands out as a frequently tested subject at classroom, national, and international levels, and few other subjects contribute to the governing of education to the extent that mathematics does. Thus, assessment in mathematics goes far beyond serving the purpose of validating knowledge or measuring the quality of education. Furthermore, assessment is often presented as the core

purpose of education and sometimes even considered as teaching (Pettersson, Popkewitz, & Lindblad 2016). This positioning of mathematics and assessment fabricates knowledge about what mathematics is and who mathematicians are, and what kind of mathematics and mathematicians count. Values and norms are communicated and negotiated through moments of assessment in classrooms and within and between nations.

Testing has become such an integral part of mathematics education that it has been claimed to be an epistemic part of *what it is to know and do mathematics* (Nieminen & Lahdenperä, 2021). Testing governs education globally through, for example, the Organisation of Economic Co-operation and Development's (OECD) Programme for International Student Assessment (PISA) project. These evaluations of 15-year-olds' knowledge every third year are used for the comparison and competition of and through knowledge between countries, and also to discuss nations' development when it comes to educational quality and equity. This way of fabricating the assessment of knowledge places effort, ability, and outcome as individual responsibilities and opportunities. Thus, students are affected in global and structural ways (Smith, 2016) and are turned into 'subjects of value' (p. 30 Ball, 2018).

These structural circumstances can be particularly unjust for students whose abilities and efforts are not supported or even challenged by assessment itself (Nieminen, 2022). Hence, some students have provided equal opportunities to learn or display knowledge (Bagger, 2022a). These circumstances, along with the combination of ideas of institutional performance, international growth, and the developmental child (see Martins, 2018), risk reinforcing exclusion, both in the assessment of knowledge and, later, in society. The high emphasis on and understanding of knowledge as something that needs to be visible to count is core in these processes of exclusion (Bagger, Roos & Engwall, 2020). In turn, moments of assessment are urgent for teachers to manage, to make students' knowledge visual in a fair way, and thereby possible to assess. This task becomes a challenge for teachers when the displaying of knowledge is hindered or a struggle.

Overall, and not only in mathematics education, assessment tends to derive from a *medical model of disability* in which normalcy is standardized and development is understood as measurable and progressing in a linear manner. 'Disability' is then understood as a deficit that threatens the validity of assessment (Nieminen, 2022). In such a case, assessment is performed in relation to predetermined knowledge hierarchies and the assumptions that such hierarchies can indeed be assessed (see, for example, Anesia, 2019; Lambert, 2015; Meekosha, 2011; Valle

& Connor, 2011). This circumstance – from an equity point of view – predominantly focuses on enabling surface level access to assessment yet leaves the deeper levels of segregation and exclusion in mathematics assessment unchallenged (Bagger, 2022a). Students with ID are commonly excluded from test taking and those who do participate are often marginalized: the focus is on *if* they participated and on adaptations rather than on their knowledge, which indirectly contributes to excluding students with intellectual disabilities (ID) as knowers (see Bagger, 2022b; Nieminen, 2022; Slee, 2018). This aligns with the overall tendency in mathematics education to understand students with disabilities as not being thinkers and doers of mathematics (Tan & Kastberg, 2017).

In the present study we take a critical and socio-political stance to understand *how the social epistemologies on students with ID as knowers is formed through mathematics assessment*. First, we briefly introduce what is known about assessment of students with ID in general. Next, we introduce the theoretical framework that we use to understand the marginalization of students with ID and their knowledge: that of fabrication. Finally, we display the case of how assessment practices are governed and thus marginalized in both ontic and epistemic ways in mathematics in Sweden, comparing a policy analysis of the role of assessment and excerpts from a focus group interview by teachers in a special school. Thus, we offer both a macro- and a micro-scale examination of this issue, as policy and practice both stem from value systems and ideas that affect students through institutional structures in the present and future (Ballard, 2013).

1.2 Assessment as marginalizing

The more emphasis a school system puts on results and high achievement, the more schools will redistribute effort, time, and resources on assessment. The will to rank students and schools will also be enhanced (Falebella, 2020; Klein, 2017). Therefore, a core issue is how a system relates to and understands diversity and how (in)justice and resources are distributed and structured throughout the system (Buchholdz et. al., 2020). In addition, the environment and teaching context can impact students' achievement to a high degree (Barret et. al., 2015). This is even more the case for students with ID. Besides the environment, if communication is a challenge, it must be efficient for the task and for the student for assessment to work in a just way. If not, the assessed and displayed knowledge cannot be trusted (Goldstein & Behuniak, 2012). For example, formative assessment is a situation that is highly imprinted by communicative skills and social interaction, which is especially challenging for some students. If the teacher derives from how things work for most students, that will cloak some of the students' knowledge and how the student experiences the assessment (Ravet, 2013). As

Östlund and Andersson (2017) showed, when teachers assess the knowledge of students with ID, they simultaneously develop and change their view on how learning occurs and can be expressed. Thus, learning, communication, and caring are highly intertwined in assessment.

2. Students with ID and moments of assessment

To explore the knowledge production processes that take place in moments of assessment, it is powerful to turn towards alternative spaces for teaching and learning. In our approach we draw on Watson (2012), who has shown how the use of alternative spaces is a powerful way to display surrounding norms, and to question these prevalent norms of educational systems. Hence, the approach to explore alternative spaces for learning encompasses a broad range of and valuing of learners, ways of learning and knowledges. By alternative, we refer to “teaching perceived by teachers to be different from what they see taking place in the publicly funded mainstream mathematics teaching around them” (Watson, 2021, p.2). For this purpose, we have illustrated mainstream mechanisms and norms in moments assessment through teachers' reflections on their work with understanding and assessing students' knowledge.

The alternative space for teaching that we have turned towards is the often-forgotten group of teachers of students with ID and the case of Sweden. Sweden uses large-scale national assessment intensively and extensively, making it a compelling example for capturing norms about assessment. In Sweden, the School for children with learning disabilities (Grundsärskola) will change its name to adapted compulsory school (Anpassad grundskola) from July 2, 2024. This is a form of school for children aged 7–16 that uses the national curricula. It is a right and opportunity for a student to be admitted into this school form (Department of Education, 2021). One of the four criteria for admittance is that the student has an ID. Besides this, a psychological, medical, social, and pedagogical evaluation needs to be performed and a decision made that this is in the best interest of the child. This school form has currently two directions: the Grundsärskola (school for children with learning disabilities) direction and the *träningsskola* (a track within this school labelled training school) direction. These directions are currently active but will be merged in the future. In Grundsärskola, students study subjects that are described in the curricula such as language, mathematics, and music. Students in this track can also study within subject areas rather than disciplines, such as arts, motoric, communication, everyday activities, and perception of reality.

Assessment in the special school for students with ID is supposed to be varied, broad, versatile, and expedient also for those students who face challenges during traditional forms of displaying

knowledge. The teacher then has the responsibility to carefully evaluate what was displayed and how the assessment data could be interpreted and acted upon. After finishing the ninth year, a student receives a certificate. Grades in Grundsärskolan are given in subjects only if the student or the students' parents or caretakers wish to receive them and request them. Regardless of whether a grade is given, there is still a need to evaluate students' knowledge in other ways, since this is how the student's development is deemed to be monitored and progressed as through the years in school (Swedish Government, 2010; 2021a). There is currently a shift taking place in this school form, in order to make it more similar to the compulsory school, and this shift includes a national assessment in mathematics and languages in certain classes, from July 1, 2024 (Department of Education, 2021).

3.1 Policy change on assessment

The assessment of students with ID is made sense of through two governing documents. These texts work as inscription devices that fabricate certain kinds of students and forms of knowledge (Foucault, 1994; Popkewitz, 2004). As mentioned, assessment has been given a special role in a forthcoming policy change regarding the special school for ID students (Bagger, 2022b). Two reports by issued governmental investigations (propositions) are especially interesting in relation to assessment of students with ID in Sweden: *A ten-year compulsory education – implementation of a new year one in compulsory schools, schools for students with learning disabilities, special schools, and Samí schools* (authors' translation, Swedish Government, 2021b) and *Improved opportunities for students to reach standards – active support and student healthcare work and strengthened education for students with ID* (authors' translation, Swedish Government, 2021c).

In an earlier study of these documents, some specific fabrications of assessment and the students with ID could be identified. The policy change has been argued for by a *need to improve the results of certain students*, which would improve the educational system through the governing of teachers' practice so that assessment is made more equitable. Another core argument is that Grundsärskolan (soon to be named Anpassad grundskola) and the compulsory school need to be more closely tied in organizational alignment with each other. The students with ID are fabricated *as having the right to participate in assessment* since such participation will raise the opportunities to reach the learning targets. Student with ID are also fabricated as having *a choice*: the opportunity to choose curricula and to be compared with other students for selection purposes. This is interpreted as fabricating the students with ID as neoliberal

agents on a school market (Bagger, 2022b). In relation to this, the assessment practices of today's Grundsärskola have been described as follows: "There are today no result measures in Grundsärskolan, since grading is optional and there are no national tests" (Swedish Government (2021c, p. 575). This statement in the policy document indirectly dismisses alternative and traditional assessment practices used in this particular school form. Instead, grading and national assessment is pointed out as the solely trustworthy forms of assessment. This statement seems to argue that the lack of standardized, national assessment and the lack of statistics makes comparison of schools and evaluating the quality of teaching more challenging. The message is indirectly that proper or valid assessment needs to be nationally governed. This, in turn, fabricates the student with ID as *someone who exists outside of the retrieval and control of valid knowledge* (Bagger, 2022b), and outside valid forms of assessment.

3. The politics of schooling and knowledge production

To study social epistemology is to study the political of schooling (Popkewitz, 2014). Such a study explores how systems of categories are used to relate to and understand thoughts and theories of knowledge. Systems of reason become normalized through these categories and are often unreflected, which makes them hard to detect and relate to. Furthermore, social epistemology affects how people are included or excluded in schools and society (Popkewitz, 2013).

The connection between assessment and epistemology is two-fold: assessment reflects the nature of mathematical knowledge and, at the same time, constructs a certain kind of an epistemology of mathematics (Nieminen & Lahdenperä, 2021; Roos, Lindfors & Bagger, 2020). This might happen when a closed-book test promotes a 'right or wrong' kind of an epistemology of mathematics that neglects the social aspects of learning and contributes to framing marginalized students as 'lesser' knowers. Therefore, a theory that makes it possible to identify and analyze the philosophy and production of knowledge is needed. In her work on the philosophy of knowledge, Bornemark (2018a; 2018b) has described non-knowing (*icke-vetande*) as important in relation to knowledge production and has discussed this with the help of the philosopher Cusa:

Cusa emphasizes not-knowing as something which we cannot and should not avoid. As such, it is central to every creation of knowledge. Reason, as the process to gaining knowledge also includes the capacity to relate to not-knowing. In

modernity, the understanding of not-knowing has decreased and accordingly changed our understanding of reason. Reason became a calculating capacity, what Cusa calls ratio, rather than a reflecting capacity, what Cusa calls intellectus. (Bornemark, 2018b, p. 1)

Insights into the unknown and creative knowledge demands the use of our reflective capacity or *Intellectus practices*. Through that, the discovery of new *Quidditas* (whatness or essences), is made possible. When we use this reflective capacity, we are, for example, given the opportunity to find out what it is we need to evaluate and whether there is a need to invent new categories. In contrast to this is the *Ratio practice*, or our calculating capacity. Within this we can create new, deeper, and broader measurements of the knowledge we already can imagine and for which we have pre-determined categories. These two different practices are interdependent, according to Bornemark. As we make use of our calculating capacity, we need guidance from the reflective capacity (Bornemark, 2018a). This is important while developing and inventing adaptations for students, to recognize alternative ways of displaying knowledge or detect other forms of knowledge than those that were first imagined. An overly strong use of the ratio practice might mean that the theories of knowledge are simplified. Concepts are then pushed aside at the expense of other concepts through concept-imperialism, a process by which concepts that stem from higher up in the hierarchy take precedence. This is especially the case in relation to concepts that do not allow for ratification and standardization such as learning, care, empathy, and participation (Bornemark, 2018a).

4. Becoming 'the marginalized' through assessment

The data used in this study consist of teachers talking about their work with assessment with students with ID, collected by the first author. Nine teachers (working with students aged 7–16) had a conversation with the first author about a tool for assessment of knowledge that they wished to use. The focus during the interview was on knowledge, how it could be made visible or displayed, and what knowledge is. The teachers related their experiences, knowledge, and opinions concerning what mathematical and also other kinds of knowledge is, how it might be expressed or detected, why they assessed it, how the assessment could be used, and the governing of their task to assess knowledge.

In the following, excerpts from the interview are used to illustrate the kind of assessment practices, knowledges, and students that were depicted by the team of teachers. This is put in relation to the theory of intellectus and ratio practices to analyze the underlying value systems

and ideas that the social epistemology stems from. A dilemma in relation assessment that surfaces in the interviews was the situatedness of the display of knowledge. The intellectus practice was an asset in the exploration of quidditas:

... but we also know that knowledge is fluent for our students. One day they know and the next day they don't. That's how it is! If it is a child at an early developmental level, we know that she has participated, but we do not know how much she really might have understood

What the essence of knowledge is, or the desired direction of development, is also implied by the assessment tool at hand. The teachers meant that the tool might need to be adjusted and developed to suit individuals' prerequisites to work to assess students' knowledge. Earlier, they rather wrote a diary with notes on the specifics of a student. Of the student's personality, the teachers would make a note of the state that day, method of communication, and how different spaces or personal worked for the student. This was key in following the learning and development of the student. As assessment practices were formalized, there was not time and space for these informal and traditional assessment practices:

Now we are supposed to write as little as possible instead and it is just a cross [in a matrix]. Sometimes we still use it [the diary], and we try and write a few lines. Because sometimes you do not know. Is it a cramp, is it a smile or an expression of understanding? In the diary you can go back and see a pattern and that helps us to see [the students' knowledge].

While the intellectus practice was considered important, it was pushed aside by new ways of assessing knowledge. The view on knowledge that resides in compulsory school (being more constructivist and as developing happening in steps and a predetermined slope) and the formalized assessment practices there are pushed onto Grundsärskolan.

It might be that a student can do something well and that they have done it many times, but in a new exercise they cannot. And you should write a date there. It may even be the case with the exercise that they had the knowledge on that date and then maybe six months later, they do not. Then the matrix says a date when they know, but they do not. A clash between the intellectus practice and the ratio practice is seen here. In addition, it is an example on how language and the assessment practice is colonized. We connect the shifting languages and practices of assessment with the idea of concept imperialism. Concept imperialism refers to concepts that take form far from the real practice at hand and apart from the lived practices.

This might happen through formalized language in educational policy and regulations. This also means that the professional language itself becomes colonized. These concepts carry with them demands, anticipation, and responsibilities (Bornemark, 2018a). One example is the use of matrixes in which knowledge is hierarchically depicted in a chart and the teacher marks the description that matches the students displayed knowledge. This case is a representation of the understanding of the students' knowledge as following a certain development in regards of complexity and raised abstraction, and that it is possible to measure, and that is stable and growing (Martins, 2018). This is not always true, and for some of the students in this school form, knowledge is certainly known to be highly situated or even sometimes to diminish over time.

5. Conclusions and implications

The focus group interview displays tensions between individual adaptations and individualism; between knowledge as something that is situated and fluent, and is also static and growing; between feeling, knowing, sensing, and measuring; and between informal and formal assessment practices. The daily assessment practices that the teachers depicted reflected the entanglement of learning, assessment, care, and teaching, with all these elements containing non-measurable dimensions.

The social epistemology in policy and the assessment practice plays an important role in marginalizing forms of students, knowledge, and educational systems. The possible assessment practices depend on how knowledge is understood and how the student's development is understood. The concept of imperialism is further enhanced in the upcoming policy change. Education and assessment of the students with ID seem to be captured within a neoliberal argumentation in which comparison and choice are the core values of education. A real and troubling friction appears between intellectus and ratio practices. The reflective capacity of the professionals is core in the traditional teaching and caring discourse of Grundsärskolan. In the more recent teaching context, assessment has precedence, and the professionals are asked to make use of their calculating capacity rather than their caring capacity.

Assessment in mathematics for ID students requires attention by the mathematics education community to counteract structural discrimination and marginalization of students and spaces for teaching and learning. Our main argument is that all kinds of people need to be included in the attention from the collective mathematics education (research) community. This means that

we need to recognize diverse knowledges, lives, bodies, and minds in mathematics assessment and beyond. If this is not recognized, mathematics is indeed not for all, and assessment plays a key role here. Also, we argue that the mechanisms at play when reflecting on how the intellectus and ratio practice can be advocated, is quite illuminating. There is a need to revisit the purpose and role of assessment in mathematics altogether. We join Watson (2020) in asking what kind of learners, teachers, knowledge, mathematics, care, love, and compassion will be needed in the years to come. To keep the horizon open for new quidditas, and thereby contribute to a more sustainable education for a broader range of learners and unexpected events, we all need to continue to ponder and explore assessment, learning and teaching, and, in so doing, make use of both our calculating and reflective capacities.

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