Rethinking and theorising inclusion and equity - The mathematics is MInE project

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This paper aims to display theoretical and conceptual contributions from the MInE (Mathematics for Inclusion and Equity) project, thereby rethinking inclusion and equity in mathematics education. The project has investigated and defined how inclusion and equity are conditioned and can be supported in and through mathematics teaching. For this purpose, mathematics teaching is understood as a system of principles which are displayed in the lived classroom. A new conceptual construct of inclusion and equity is presented: moments of inclusion and equity. We finally elaborate on how these contributions relate to the overall governance of the school system. The project was carried out in close collaboration with local schools.

Introduction

There is an ongoing critique of the Swedish school system for its lack of inclusion and equity (see, for example, Ding et al., 2024). In research, there is a general gap in knowledge about how inclusion and equity emerge and can be sustained in mathematics teaching (Kollosche et al., 2019). This situation is linked to ambiguity in how the concepts are theorised and used in research and practice, as for example Enchikova et al., (2024) have demonstrated regarding educational equity. This indicates a need to rethink and offer an alternative conceptualisation and theorisation. Namely, one that is closely aligned with the context in which the empirical data have been generated. Hence, the overall purpose of this paper is to rethink and reposition inclusion and equity both theoretically and conceptually, and by that contribute to knowledge in how to sustain these in practice. Furthermore, this rethinking and repositioning is deeply situated in, derives from and has been explored in close collaboration with mathematics teachers, representing mathematics teaching from more than 12 classrooms over a period of 3 years. In extension, the project offers policy, practice and research the opportunity to rethink mathematics teaching and education, by making it possible to explore and develop strategies that support the development of increased inclusive and equitable learning environments (see Bagger & Roos, 2024; Roos & Bagger, 2024). Subsequently, the specific aim of this paper is to rethink and theorise inclusion and equity by using examples from a project in Swedish primary school: the MInE project (Mathematics for Inclusion and Equity). The aim is twofold: 1) to rethink inclusion and equity by presenting and elaborating on *moments of inclusion and equity* as a concept. 2) to elaborate on the theoretical construct of *inclusion and equity as principles in mathematics teaching as a system*. Drawing on the work of Ainscow (2020), we understand *principles* as fundamental ideas or beliefs that guide understanding and action, particularly in the context of teaching.

Inclusion and equity in mathematics education

The notions *of inclusion and equity* are handled in this paper as interrelated and as highly systemic, contextual and lived phenomena. Consequently, when occurring in mathematics teaching, we understand these as principles on a system level that emerge and are recreated in the moment of teaching. By inclusion and equity in teaching, we refer to inclusive teaching that affords all students equal opportunities to learn, feel empowered, and have agency in mathematics. This definition builds on prior scholars' exploration of inclusion and equity, such as Athew (2011), Askew (2015), Lambert (2015) and Kollosche et al (2019), and has ethical aspects embedded (see Roos & Bagger, 2024). Evaluations of Swedish schools reveal a lack of equity in mathematics outcomes, but these evaluations do not offer guidance on how to adapt teaching to promote inclusion and equity (Bagger & Vennberg, 2024). This is worrying since the increasing differences that exist between groups of students in Sweden indicate that disadvantages are reproduced (Muench et al., 2023). In Sweden, the lack of a passing grade is more common for students in need of special support, students with low socio-economic status, students with a foreign background and boys (see Swedish National Agency for Education, 2023). Although, with an exception from the school-year 2024, in which boys slightly over performed girls regarding gender, an opposite trend in terms of equity of outcome is visible in Europe (European Commission, 2022), implying that overarching national and societal principles of (in)equity and in(ex)clusion are manifested in the lived classrooms (see Ainscow, 2020; Bagger & Roos, 2024; Roos & Bagger, 2021; 2024).

In the under-researched area of inclusive mathematics teaching, it is essential to take teachers' experiences as a starting point when developing inclusive practices. These experiences are closely tied to the challenges teachers face in their classrooms (Lindeskov & Lindhardt, 2021), allowing theory to be informed by teachers' professional knowledge. Furthermore, research has repeatedly shown that inclusion in mathematics teaching seeks to address inequity (e.g., Kolloshe et al., 2019), which relates to challenges faced in the classroom. This, in turn, signals a tight relationship between inclusion and (in)equity. In relation to inclusion and equity, we join scholars as Abthai and Planas (2024) who aim to work "towards equity, diversity and inclusion" (p.307) by addressing practices to challenge marginalisation. These practices are influenced by an economic agenda on a societal level where inclusion and exclusion are intertwined, giving rise to processes of in(ex)clusion. This implies that inclusion and exclusion depend on societal norms, where mathematical knowledge is tied to human value (Valero, 2017).

Equity is often under-defined and addressed in a rather general way in research, resulting in blunt instruments that make it difficult to determine for whom this specific equity would work and how to know if it has increased. Consequently, little is known about how teaching strengthens different kinds of equity and their interrelatedness (Enchinova et al., 2024). Despite these conceptual confusions, it is well known that lack of equity is often associated with structural factors that lead to differences in students' equality of outcome in mathematics and to participate meaningfully in the teaching (e.g., Gutierrez, 2022). Enchinova et al., (2024) have developed a conceptualisation of equity

which includes and points towards contextual and individual aspects of equity. This consists of four different constructs, separating *equity of outcome* from *equity of opportunity*, *segregation* and *resilience*.

In mathematics education research, studies on inclusion and counteracting the risks of exclusion often take on the character of reasoning on a theoretical and philosophical level. This highlights a knowledge gap in research about how inclusion and equity are conditioned, shaped, and can be practically implemented (Roos, 2019). How inclusion and equity can be achieved in a didactic sense within the everyday teaching of mathematics remains under-researched. However, as inclusion and equity create conditions for sustainable teaching and learning in the subject (Atweh, 2011; Kollosche et al., 2019), these values must be placed at the centre of mathematics education. The *Mathematics is MInE* project has contributed to this by conducting a practice-oriented and longitudinal investigation into how inclusion and equity are manifested in teaching, what conditions shape them, how they can be mapped, and how they can be sustained across different mathematics primary school classrooms in Sweden (Bagger & Roos, 2024; Roos & Bagger, 2024). Consequently, concepts, methodology and knowledge on moments of inclusion and equity have been generated. In this paper, we further present the context as well as the theoretical and conceptual outcomes of the MInE project. To do so, we first need to provide background on how the project began and the challenges it aimed to address. This is shortly outlined in the following section.

To research and learn from challenges in a challenged practice

The first steps in the project were taken at the Mathematics Education and Society Conference (MES11) in 2021, where we posed the question: *"Developing mathematics education that promotes equity and inclusion—Is it possible?"* (Roos & Bagger, 2021 p. 223). Our motivation for undertaking this work stems from our individual and joint dedication in doing research on inclusive mathematics education, and the reports of students struggling in mathematics and a decline in equity within the subject (for example, OECD, 2014). We recognised the challenge of understanding and developing inclusive mathematics teaching in primary schools and concluded that this work must be grounded in the lived experiences of teachers and students, particularly given the varied and often unhelpful interpretations of inclusion in public and political discourse that risk undermining both inclusion and equity (Bernau, 2011; DePauw & Doll-Tepper, 2000). In response, we initiated the project, *The Mathematics is MInE* (Mathematics for Inclusion and Equity) in 2022. The project is ongoing, ethically vetted (Dnr 2022-02989-01; Dnr 2024-04418-01; Dnr 2025-01378-01), and partly funded by the National FOU-Network for schools with major challenges.

In the project, two lower primary schools participate, both grappling with issues related to inclusion and equity, while also being actively engaged in school development initiatives addressing these themes. Both are situated in working-class communities with structural and socioeconomic challenges. Both schools have experienced frequent changes in school leadership, which have negatively impacted continuity, organisation, resource allocation, support structures, and overall school development. These circumstances have also placed significant strain on individual teachers. At one school, this resulted in four out of five participating teachers taking long-term sick leave, while

at the other school, it led to sense of resignation. Naturally, these challenges also influenced the research process, requiring us as researchers to remain highly flexible while maintaining consistency in research objectives and theoretical framework.

The theoretical framework and methodology of MInE

A well-established and used theoretical framework for working practice-based, but at the same time recognising inclusion and equity as societal and highly discursive phenomena is Ainscows (2020) principles for inclusion and equity in school systems. This theoretical model puts school development at the core of investigation and as the site on which the history, legislation, culture, values and norms of a school system are manifested. This way of understanding and relating to inclusion and equity has guided data collection and analysis in the MInE project and aligns well with prior research on in(ex)clusion and disadvantage in mathematics education (for example Lambert, 2015).

Ainscow's (2020) theoretical model offers a comprehensive framework for examining inclusion and equity at a systemic level, positioning school development as a central mechanism for driving change. It conceptualises inclusion and equity not only as outcomes but also as dynamic forces that shape and are shaped by teaching practices. In doing so, the model highlights the systemic nature of educational challenges while emphasising the importance of school-level strategies and classroom methods that support all learners. Five interrelated components form the foundation of the model: *Inclusion and equity are guiding and governing principles* (1) on a system level. These principles impact and are manifested in three of the other components: *school development* (2), which is placed in the centre and interacting with *administration* (3) and *community involvement* (4). Finally, the fifth component is the *use of evidence* (5), which means using data from multiple sources to guide reflection and support inclusive educational practices. This builds up and informs school development administration and community involvement. A core tenet is the creation of inclusive learning environments that address the diverse needs of all students, moving beyond a narrow focus on supporting only disadvantaged students. The model underscores the influence of societal and administrative contexts on teachers' practices, emphasising the interconnectedness between classrooms and educational systems.

The project is methodologically inspired by an Inclusive Inquiry Approach (IIA), fostering teacher collaboration to try out and evaluate inclusive strategies. IIA can be seen as a way of responding to learner diversity and means that teachers explore and investigate their practices and understanding of inclusion and equity (Messiou & Ainscow, 2020) and use it in their development of inclusive practices. Hence, it can be connected to Ainscow's (2020) *use of evidence*. This method is well-tested in 30 schools across five countries over 30 years (see Messiou & Ainscow, 2020). Thus, IIA can be considered a stable and reliable method for exploring these types of issues. In the MInE project, we have advocated IIA, holding inquiry-based workshops with one team of teachers in each school. The central questions in all the workshops are drawn from IIA; How can inclusion and equity be made visible? What can we learn from diversity in the classroom? How can we adjust teaching practices?

We collaborate with two teams of teachers from the two schools, consisting of five respectively eight teachers teaching in grade F-3 in each team. Since the project started,

we have had 11 exploratory workshops for approximately 100 minutes/workshop with each team of teachers (22 workshops altogether). During the workshops, our interactions with the teachers were guided by the IIA (Messiou & Ainscow, 2020), through which the teachers examined the learning environment with a specific focus on inclusion and equity. Together, the workshops and this methodological stance formed a collaborative effort in the investigation. After each workshop (i.e two workshops, one with each team of teachers), the researchers listened to the collected audio and transcribed it. Then followed a reflexive thematic analysis (Braun & Clarke, 2021) where both researchers discussed the content in the workshops and constructed themes. The themes described different aspects of inclusion and equity based on the broad definition: how teaching affords all students equal opportunities to learn, feel empowered, and have agency in mathematics (Roos & Bagger, 2024). This was returned to the teachers in the following exploratory workshop, signifying that the *use of evidence* formed the foundation of the project's progression, and processes of school development primarily focused on mathematics teaching. Consequently, in the workshops with teachers, the researchers and teachers had a joint focus on the evidence.

Theoretical and conceptual contribution

In this section, we elaborate on the theoretical and conceptual contributions that have evolved over the course of the project. The first elaboration is about *moments of inclusion and equity*, and the second is about *mathematics teaching as the system*.

Moments of inclusion and equity

What we add to Ainscow's (2020) theoretical model and to the IIA (Messiou & Ainscow, 2020), and what marks a theoretical contribution and outcome of our use of evidence during school development of mathematics teaching in primary school, is how inclusion and equity are conceptualised (see Roos & Bagger, 2024). We label the object of inquiry in the IIA as *moments of inclusion and equity.* From this way of viewing inclusion and equity, they are momentary and highly lived, contextual phenomena. Examples of how this is illustrated in our data are when the teachers talk of moments when everything just flows and all students are" a part, talk and participate in the [mathematics] education". Here, they refer to moments that are filled with activity and joy. In addition, we conceptualise inclusion and equity as distinct yet interdependent constructs that, at times, operate in tandem and may even be generated interchangeably (Bagger & Roos, 2023, 2024; Roos & Bagger, 2024). This implies that what is perceived or enacted as inclusion in one context may be perceived as equity in another context. To capture this dynamic relationship, we draw on the metaphor of a Möbius strip, a non-orientable surface, to illustrate the continuous, intertwined nature of inclusion and equity, symbolising their mutual dependence and fluid interchangeability. An illustrative example of this from our data shows how teachers reflect on the importance of being aware of their own assumptions to effectively explain mathematical terms and concepts to all students. This awareness is framed as a means of fostering inclusion in the classroom. However, the discussion also extends to equity, as the teachers also reflect on how inclusive practices can serve as a foundation for equity. One teacher articulated this interchangeability:" Without inclusion, there is no equity. Not everyone

reaches [the goal]. They don't reach the goal that is set, if you don't have inclusion, you don't get equity". This statement encapsulates that the development of inclusive teaching practices is seen not only as a matter of access but as essential to achieving equity in educational outcomes. Hence, moments of inclusion and equity are intertwined, momentary, lived and contextual phenomena.

Mathematics teaching as the system

Drawing on Ainscow's (2020) theory, we have demarcated "the system" to mathematics teaching. Accordingly, we collaborated with teachers in workshops to collect and utilise evidence, focusing on moments where inclusion and equity emerged as central to the dilemmas they encountered and the pedagogical choices they made in their mathematics teaching. These collaborative inquiries also extended to discussions about the broader conditions necessary to sustain and amplify such moments, particularly the roles of the community, administration, and the organisational structures that govern school development. Our findings indicate that the principles underpinning these moments of inclusion and equity emphasise the need for a supportive and adaptable educational environment across multiple levels of governance. Three such principles were identified: *teachers' opportunities and capacity to meet diversity*, *diversified material and teaching strategies,* and *governance and school culture*. These are elaborated in the following sections, followed by a synthesis of key principles for fostering inclusion and equity in mathematics teaching as a systemic endeavour. In this synthesis, we critically examine the roles of administrative structures and community engagement (from Ainscow's model) in shaping and sustaining inclusive school development.

Teachers' opportunities and capacity to meet diversity

How to support a diversity of students emerged as a common theme, in which a principle concerning *the teachers' opportunities and capacity to meet diversity* in the classroom. Examples of this are statements like: "We are different and we must be allowed to be different. [...] You do things differently, so they [the students] need different representations." The teachers also talked about inclusion as "carrying a vision, then you, as a teacher, in your decision-making must constantly embrace diversity among students." One teacher said, "The fascinating thing about diversity is that you are never finished, never fully learned. There is always something more [to learn]." Also, the teachers talked about being able to distribute justice by "hacking the system". This was made at the south school where the teachers felt that they were always alone with the class in mathematics and were begging to have more resources, or at least some time to have half of the group. When this was not recognised by the organisation, they arranged it so that students from grades 8 and 9, who had a free period, came to grade 2 and helped. The teacher in grade 2 said; "this was the best!" The teachers also talked about dilemmas in relation to the need of a supportive and reflexive organization, and the frustration when it was not that; "I can have knowledge, but I don't have the opportunity. […] It reinforces that maybe I don't know how to do it. The ability to do it is what gets hindered". Hence, the principle *teachers' opportunities and capacity to meet diversity* focus on specific teacher knowledge and possible pathways to practice the knowledge to support inclusive and equitable mathematics teaching.

Diversified material and teaching strategies

In relation to this principle, teachers reflected on how to navigate diversity in ways that allowed all students to engage in the same activities, while simultaneously meeting individual learning needs. Tensions or challenges in this area often surfaced as dilemmas. This is exemplified in the following excerpts: "If you [the student] don't get any accommodations, then this dilemma becomes even bigger. Then the teacher will struggle a lot with diversity. "We talk about time and just finding time for them [the students who struggle] because if you take 4 [students], then there are 4 who get nothing. What should you spend the time on?" This dilemma exemplifies struggles when planning teaching strategies. Another example of planning teaching strategies is when teachers talked about rearranging the classroom to help "the students to find their own way so it works". This was articulated as finding dynamic ways of student grouping and having different ways of explaining. One teacher said, "It's about finding the right tools that will help", highlighting the need for diversified material.

Governance and school culture

This principle played a significant role in sustaining moments of inclusion and equity. This was evident in how teachers discussed governance-related issues in relation to teaching mathematics in inclusive and equitable ways. In connection with this principle, the school's routines, visions, and values emerged as important factors. These were reflected in teachers' statements about the values and visions they personally held, or were expected to conform to, regarding inclusion and equity. Such dynamics were closely tied to underlying issues within the school organisation and its teaching culture. Teachers, for instance, talked about municipal and national tests in relation to students ' not being able to take them from an equity perspective. This principle was also talked about in terms of meeting every student by discussing different approaches on a school level. For instance, a teacher said, "I modelled quite a lot [to reach the student]. So, we talked to each other [about how to approach the students]." Another example is when teachers talked about allocating time to promote equity, "then you have to redistribute [time]".

Administration, School Development and Community Involvement

Drawing on Ainscow's model (2020), we now critically examine the role of administration and community involvement in shaping and sustaining inclusive and equitable school development in relation to the principles. The findings underscore that inclusive and equitable mathematics teaching is not only a matter of individual classroom practice but also deeply influenced by broader systemic conditions. One key insight is the importance of collaborative professional learning among teachers. Such collaboration proved central to enhancing teachers' opportunities and capacity to address diverse student needs. This emerged in discussions about collegial support, the use of special education resources, and teachers expressed a need for further competence development. As one teacher reflected: *"*It takes more, I think, if you are to have everyone in the classroom. It requires that you are truly prepared and well-read.*"* Regarding the distribution of special education, the teachers talked about the need to constantly reflect on who, how, what and when to support. An illustrative example is when a teacher said:" I really believe that even more support should be implemented from preschool class up to third grade, when it comes to special [education] to include

even more students at an earlier stage". In relation, another teacher said, "I don't have any special education in my second grade, but I have [an Arabic speaking person as a resource], [and] my boy, he's learned to count in sequence up to 100 now. He's steadily progressing, but [the person] is paid for by the Employment Agency, [implying the person might disappear], she's invaluable, I'd say, for a boy who speaks Arabic and has very significant difficulties". Hence, how the administration caters for a sustainable structure and development at the organisational level for collegial support, and the use of special educational resources influenced the school development. Regarding community involvement, there were struggles for the teachers to get involvement from the parents. This negatively affected the school's development work regarding inclusion and equity in mathematics teaching, as it was perceived that teachers lacked access to students' full experiences and to the community-based factors influencing their learning.

Conclusion and contributions

The principles developed in collaboration with teachers within the system of mathematics teaching, teachers' opportunities and capacities to address diversity, the use of diversified materials and teaching strategies, and the influence of governance and school culture, respond to Roos's (2019) call for research and practice to "connect and interrelate the operationalisation and meanings of inclusion in both society and in mathematics classrooms" (p. 25). Accordingly, this study offers both theoretical and practical contributions to the research field of inclusive mathematics education, and has, as proposed by Lindeskov and Lindhardt (2021), taken teachers' experiences as a point of departure. The principles serve as theoretical constructs that articulate how inclusion and equity are conditioned within mathematics education, while also functioning as practical tools that guide supporting these values across individual, group, and organisational levels, potentially extending beyond the Swedish context. Hence, this study addresses the practice to be able to challenge marginalisation (see Abthai & Planas, 2024). A central concept in our analysis is the notion of "moments," which captures how inclusion and equity are experienced as momentary, fluid and contextual phenomena within the lived realities of mathematics classrooms. These moments illuminate the nuanced and often shifting conditions under which inclusion and equity are either enabled or constrained in everyday teaching practice.

When connecting the principles within the system of mathematics teaching to moments of inclusion in mathematics, the opportunity to promote moments of inclusion in the teaching is influenced by teachers' opportunities and capacities to address diversity. Also, to what extent teachers have the possibility to use diverse materials and teaching strategies influences the opportunity to promote moments of inclusion and equity. Findings from the MInE project illustrate that this, in turn, is conditioned by the governance and school structures within which teachers operate. Our interpretation is that when teachers' professional judgements, needs, and requests are acknowledged and supported by the school organisation, the likelihood of cultivating moments of inclusion and equity in mathematics teaching is substantially enhanced.

In conclusion, this study offers a nuanced understanding of inclusion and equity in mathematics education and proposes principles aimed at bridging the persistent gap between societal discourses and classroom realities. By foregrounding both actionable

and conceptual insights and by emphasising the dynamic and interchangeable nature of inclusion and equity, it seeks to theorise, rethink and advance inclusive mathematics education and support the cultivation of equitable, inclusive, and empowering learning environments.

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