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Students' voices of inclusion in mathematics education

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Abstract
This study foregrounds three students who are regarded by their teachers as being in special educational needs in mathematics (SEM) and these same students voicing what inclusion in mathematics education means to them. In this study, *inclusion* is defined as processes of participation. Discourse analysis was applied when analysing these students' voices of inclusion in mathematics education in two inclusive mathematics classrooms, with both classes aiming to include every student in the mathematics education. The three main Discourses which were identified were the *Discourse of assessment*, the *Discourse of being in a mathematics classroom setting*, and the *Discourse of accessibility in mathematics education*. The analysis of the Discourses indicates that they were affected by wider sociopolitical discourses. Furthermore, when inclusion is regarded as processes of participation in mathematics education, the results indicate that participation becomes more complex. Therefore, in this process, both ideological and societal issues, as well as individual and subject-specific issues, must be considered in the educational endeavour.

Keywords Access · Discourse analysis · Inclusion in mathematics education · Participation · Special educational needs in mathematics · Students' voices

1 Introduction

The notion of inclusion stems from the 1994 World Conference on Special Needs Education in Salamanca, Spain (Ainscow, 2020). Here, inclusive education was defined as a way for schools to serve all children, particularly those defined as having special educational needs (UNESCO, 1994). In 2019, UNESCO refined the definition of inclusion to serve as a principle strengthening equal access to quality learning opportunities for all (Ainscow, 2020). Taking this new definition of inclusion into the context of mathematics education, inclusion in the mathematics classroom is often considered from a teaching perspective, that is, the ambition to develop specific teaching approaches to promote learning for all students (Civil & Planas, 2004), or specific groups of students, such as low attainers (Alderton & Gifford, 2018).

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Students' views of inclusion in mathematics classrooms is seldom considered (Roos, 2019a), with only a few studies treating the issue (e.g. Lange, 2009; Murray, 2011; Tereshchenko et al., 2019). Listening to the voices of students in mathematics education can be seen as a way of investigating how the students negotiate schooling, in which we as researchers "are able to view the mathematics classroom as more than a site for enculturation or social reproduction" (Gutiérrez, 2013, p. 51). Hence, listening to students' voices in mathematics education regarding inclusion can provide us with new insights on access to learning, alternative ways of teaching, and what mathematics can be. In this article, I aim to provide new insights about inclusion in mathematics education by foregrounding students' voices. It focuses primarily on students considered by the teachers to be in special educational needs in mathematics (SEM) and these students' experience of inclusive mathematics classrooms in a lower-secondary school in Sweden. Inclusive classrooms imply no level grouping, and the education meets a diversity of students in a variety of individual, social, and cultural circumstances.

2 Inclusion in mathematics education

Inclusion is a concept that has many uses and definitions in mathematics education research. Most often, inclusion is used to describe an ideological stance, meaning issues of participation from an overall societal and critical perspective (Roos, 2019a). From the critical perspective, inclusion is seen as important, but aspects of it are also contested. For instance, there is criticism of the expression "mathematics for all", with the concern that, instead of producing inclusion, this may actually produce exclusion (e.g. Chronaki, 2018). This implies a struggle for how inclusion is interpreted and operated as a practice (Skovsmose, 2019). Another criticism concerns inclusion as a narrative of salvation (Popkewitz, 2004). From a sociopolitical perspective, this can be regarded as the exclusion of individuals and "nations not geared for participation in a global, competitive economy" (Valero, 2017, p. 1). Thus, when working for inclusion, processes of exclusion are always present, and issues of power are connected to what is considered desirable in society. In the process of in(ex)clusion, exclusion is generated by "the effects of defining the norms of inclusion" (Valero, 2017, p.2). Another criticism is the potential danger for the research to be reduced to involve simply procedures and techniques when using the notion of inclusion as a fixed theory for social justice (Straehler-Pohl, et al., 2017). In contrast to procedures and techniques, Skovsmose (2019) suggests inclusion be considered an inclusive landscape of investigation, where the landscape is not predetermined but rather depends on the participants, their participation in the classroom, and the mathematics to be explored. At its core, the landscape is inviting, accessible to everybody, and open for facilitating collaboration (Skovsmose, 2019).

Inclusion is also used in research to describe a way of working in mathematics (Roos, 2019a) to provide "a meaningful education for all" (Florian et al., 2017, p. 14). For example, inclusion is used as a way of working while considering every student's opportunity to participate in mathematical activities (e.g. Secher Schmidt, 2016). In line with this, research highlights the importance of taking diversity as a point of departure in inclusive classrooms (e.g. Sullivan, 2015) and promoting equity in the form of equitable relations (Boaler, 2008). In this context, equity can be defined as creating a fair distribution of opportunities to learn mathematics (Esmonde, 2009), which can be connected to issues of power and in(ex)clusion in terms of who is valued as a receiver of these opportunities.

Hence, how teachers think and act matters for students' "achievement, persistence, and processes of positioning and identification" (Esmonde, 2009, p.1032). This shows that the teacher and her awareness of issues of power—as in, who is valued—and students' prerequisites are key aspects of inclusion. When the teaching is student-centred, evidence supports that students will respond positively to mathematics (Noyes, 2012). One way to work in a student-centred manner is to create a classroom conducive to learning, with appropriate instructional material and proficient teachers who know their students (Ingram, 2009). This is important, as studies have found evidence that students' negative perceptions of mathematics have an adverse influence on how engaged they are (Andersson et al., 2015; Lewis, 2013; Murray, 2011). Students' mathematical engagement is also influenced by the teacher's choice of tasks and ways of interacting with them (Sullivan et al., 2003). Consequently, a classroom conducive to learning, with good teacher awareness, well-chosen tasks, and positive social interactions between students and teachers, is crucial for inclusion in mathematics. Another key aspect is the students' sense of belonging (Rose & Shevlin, 2017). However, it is also important to consider the opposite—when students feel they do not belong (Civil & Planas, 2004)—and how this can be a learning obstacle promoting exclusion and perpetuating and reproducing social patterns of (dis)advantage (Alderton & Gifford, 2018).

At the core of inclusion in mathematics education is participation and access to mathematics learning (Roos, 2019b). Here, participation is seen as a process of taking part in the mathematics "and also to the relations with others that reflect this process" (Wenger, 1998, p. 55). Access is about equity, in terms of fairness (Gutiérrez, 2012) for every student. Therefore, in this article, I choose to embrace both of these directions: inclusion as an ideological stance and inclusion as a way of working in mathematics. Accordingly, I regard inclusion as processes of participation in mathematics education that every student can access. I see it as a dynamic, context-dependent phenomenon influenced by power relations.

3 Special educational needs in mathematics (SEM)

Research on SEM covers teaching, achievement, and every student's learning (Bagger et al., 2020). It is a complex field, comprising aspects such as physical and cognitive disabilities (e.g. Tan et al., 2022) and social and environmental factors, as well as considering what it means to fail in education (Scherer et al., 2016). When discussing SEM, the students in mind are often those who struggle to gain access to the mathematics presented in the classroom, which consequently inhibits their access to learning (Roos, 2019b). These students are often referred to as those with mathematics difficulties (Scherer et al., 2016), low achievers (Skilling et al., 2021), or with special educational needs (Darragh & Valoyes-Chávez, 2019). Other notions used to describe this group are students with learning disabilities (Rojo et al., 2021), struggling mathematical learners (Lannin et al., 2013), or children who find it difficult to learn mathematics (Lange, 2009). It can be argued that all these notions describe students *in* special educational needs in mathematics (SEM)[1] because they need something other than what is offered to gain access to learning mathematics (Bagger

[1] In this research, being *in* SEM is used to emphasise social and situational aspects.

& Roos, 2015). In the Swedish context, it is argued that this group of students comprises over 9% of the student population (Karlsson, 2019).

Despite having access to the mathematics offered, a high achiever can be in SEM because she may need specific educational strategies to *access and enhance learning* (Roos, 2019b). For example, such a student can experience anxiety, thus leading to disengagement (Skilling et al., 2021) and a negative view of learning. Deriving from this, SEM can be defined as specific educational support differing from what is usually offered in mathematics education in order to *enhance learning* (Magne, 2006).

In this article, SEM is defined as a need for specific educational support to *enhance learning* in mathematics situated in time and space. In Sweden, SEM most often is related to the low achievement of national curriculum goals. This stems from a governing school law that stipulates that a school must investigate when a student is at risk of not reaching the curriculum goals (Swedish School Law 2010:800 2016, chapter 3, 5§). However, to highlight inclusion, SEM in this article refers to both high and low achievers.

3.1 Students' voices on being in SEM

Research on students' perceptions of SEM shows that students often perceive mathematics as a boring subject, which affects their participation negatively (Ingram, 2011; Murray, 2011). The reason for this may be that SEM students are usually grouped by ability, which constrains their identity of being (un)able mathematics learners (Tereshchenko et al., 2019). This might lead to mathematics anxiety, which is a common explanation for mathematical difficulties (Karlsson, 2019). Other explanations from a student perspective are unfavourable classrooms (Karlsson, 2019)—as in, classrooms that are not attentive to the students' needs—instrumental understanding, tenuous motivational factors (Ingram, 2011), and lack of agency (Lange, 2009). Therefore, how the mathematics classroom is organised and how the education is planned and executed, with a focus on students' access and participation, are of importance for SEM students' learning.

Following from this, two research questions emerge: What discourses can be construed from SEM students' talk of inclusion in inclusive mathematics classrooms? In terms of Discourses, what influences SEM students' talk regarding inclusion in inclusive mathematics classrooms? In order to answer these research questions, discourse analysis was used and is described in more detail in the following section.

4 Theoretical approach

To investigate students' voices of inclusion in mathematics, discourse analysis (DA) was applied. DA is a theoretical and methodological approach that has been developed to try to go beyond attitudes and behaviour to be able to see social structures (Potter & Wetherell, 1987). It concerns the study of language in use and examines patterns of language beyond its use in sentences (Trappes-Lomax, 2004). Hence, DA is a social way of identifying *how students talk* and *what they talk about* regarding participation in learning and teaching.

The DA perspective of Gee (2014a, 2014b) was adopted for this study, as it fits the aim of describing students' voices. Gee uses the concepts of "big" and "small" discourses as theoretical concepts of DA. Henceforth, "Discourse" with a capital D refers to big discourses, and "discourse" with a lowercase d refers to the small discourses. (d)iscourses (with a lowercase d) focus on spoken and written language, the flow, and connections

across this flow in the language in use—the small conversations evident in the investigated stories (Gee, 2014a). Hence, discourse (with a lowercase d) is about the patterns in the language produced within the context of Discourse (with a capital D) (Gee, 2015). In turn, Discourses (with a capital D) illustrate social and political contexts. The social contexts concern social goods constructed by social groups, and the politics concern a perspective on social goods. Discourses (with a capital D) comprise language plus actions, interactions, values, beliefs, symbols, objects, tools, and places (Gee, 2014a). According to Gee (2012), Discourses can be both large- and small-scaled on different levels and with different ranges.

Moreover, Gee (2012) discusses primary and secondary Discourses. The primary Discourse is established early in life and sets the foundation for everyday language. Secondary Discourses are established later in life in a wider community visible at the institutional level (Gee, 2012), for instance, in schools. In this study, secondary Discourses are in focus and used as small-scale Discourses to investigate students' voices of inclusion in mathematics education.

The key distinction between Discourse and discourse is that discourse is seen at the text level as describing issues tightly connected to the students' voices, and Discourse is seen on a social and political level, describing factors that influence students' inclusion in inclusive mathematics classrooms.

5 The study and its methodology

This study is a collective case study (Stake, 1995), as it involves three students' voices. The study's aim is to contribute to more understanding of inclusion in mathematics education from a SEM perspective.

5.1 The Swedish setting

In Sweden, compulsory school starts the year students turn six, starting with preschool, and ends the year they turn sixteen. After compulsory school, most students enter a national programme at an upper-secondary school. The teaching of mathematics starts in preschool class. In both preschool and primary school, the teacher usually teaches mathematics in combination with other subjects. However, in lower- and upper-secondary schools, mathematics teachers are usually specialised solely in mathematics education. Many schools have a special needs teacher in SEM, who, in addition to a teaching degree, has a year and a half of training in SEM in a special needs teacher programme.

5.2 The school

This study focuses on a public lower-secondary school in Sweden with approximately 550 students and 15 classes (ages 12–16). The catchment area is both urban and suburban, and there is cultural and social diversity. The school set out to work inclusively, meaning that it aimed to include all students, including those with SEM, as well as those in special education in the ordinary classroom teaching. There were no special educational groups that involved ability grouping the students or requiring students to leave class to receive specific instruction. This understanding of inclusion has ideological underpinnings: no students should be segregated and thus possibly alienated.

Hence, the teachers were expected to provide special education in mathematics in the regular mathematics education classroom and respond to the diversity of students by providing them with appropriate learning opportunities. Here, the organisation of the mathematics teaching followed the overall inclusive plan at the school, where all students were physically present in the same classroom and with two teachers at every lesson: a mathematics teacher and a special needs teacher in mathematics. The two teachers often started the lesson together with an introduction that involved solving one or two tasks concerning the specific mathematical content to be worked with. Thereafter, with the students working individually or discussing in groups, the teachers circulated the classroom and helped them. Sometimes, the special needs teacher left the classroom with a few students to go to a small adjacent room, and from there, work in a small group. The overall teaching was guided by a textbook, and the students were given regular written tests.

5.3 Participants

An ethics board was consulted before the students for the interviews were recommended by the mathematics teachers. The teachers recommended students who they regarded as being in SEM in some way or other: either those struggling to access learning in the mathematics presented in the classroom or those needing more challenging mathematics to access learning. The teachers were vigilant in their choice and chose candidate students that they thought were able to manage being in an interview study. After the student and guardian(s) consented, seven students were invited to participate in the study. This study focuses on three of them, Veronica in Grade 7, and Ronaldo and Edward, both in the same Grade 8 class. The criteria for selection were that the students all struggled to access learning in mathematics but did not have social issues in terms of troubles at home, with peers, or with the surrounding society.

Veronica is a student from a working-class family, with few possibilities for academic support at home. Veronica remarked, “Math is pretty hard”, and “I don’t like math”. Ronaldo is a student from a working-class family with a high level of academic support at home. After the data collection, Ronaldo was diagnosed with ADD.[2] Ronaldo explained, “I have difficulties in all subjects, and it’s like [with] concentration and all that.” He also added, “I don’t remember – I have to repeat a lot.” The third student, Edward, is a student from a middle-class family with a high level of academic support at home. Edward said that mathematics “automatically” makes sense to him and that he “already knows” most of the mathematics presented in the lessons. The mathematics teachers refer to Veronica and Ronaldo as struggling to access the mathematics presented in class and as students with low self-confidence in the subject, whereas they describe Edward as having access to the mathematics presented in class, but he needs to be challenged.

[2] ADD (attention deficit disorder). According to the American Psychological Association dictionary of psychology (2021), ADD is “characterized by the persistent presence of six or more symptoms involving inattention (e.g., failure to complete tasks or listen carefully, difficulty in concentrating, distractibility) or impulsivity or hyperactivity (e.g., blurting out answers; impatience; restlessness; fidgeting; difficulty in organising work, taking turns, or staying seated; excessive talking; running about; climbing on things)”.

5.4 The data

The study involved both observations and interviews conducted during one semester in a Grade 7 and a Grade 8 class. Observation notes were made, and interviews were audio-recorded. At least one mathematics lesson per week in each class was observed, and student interviews followed the observations. The interviews took place in a small room familiar to the students. Eleven classroom observations (averaging 50 min) and seventeen interviews (averaging 17 min) were analysed: Veronica was interviewed five times, Ronaldo six times, and Edward six times. Before the first and last interviews, the students completed a questionnaire (see Appendix 1), which was used on both occasions. The questionnaire was designed with a focus on the students' reflections of their mathematical knowledge, participation, and learning situations in order to grasp their voices. However, given that the questions focused on these issues, this limited the possible answers. The other interviews were based on the observations as well as an open interview guide that included the following questions: How was your last mathematics lesson? Was something good? Why was it good? Was something bad, and why? Was anything particularly easy/hard? How did you understand what you did in the mathematics lesson? Specific questions were asked about the content of the last mathematics lesson; for instance, What do you think about the task introduced on the whiteboard? Each interview ended with the questions "When do you learn mathematics best?" (e.g. When? What tasks? What manipulatives?) and "Do you have something to add?" These questions aimed at finding situations where the students felt that they participated in the mathematics education and when they did not, and what influenced these situations.

5.5 Data analysis

In this study, students' talk is analysed using DA and the specific theoretical notions of Discourse and discourse (Gee, 2014b). At the core of DA is the analysis of spoken and written language. Gee (2014b) provides analytical questions that open the text for investigation and expose what is beyond the text in terms of D(d)iscourses. In this article, this implies what is beyond the students' talk regarding processes of participation in inclusive classrooms. Some questions are at a linguistic level, staying close to the text and its context, while others give access to the interpretive level and are closer to the "big picture" of what is happening. For example, "What sort of words are being used?" is a linguistic question contributing to understanding the style of the communication and the purpose of the speaker. An interpretative example question, "What Discourse is this language a part of?" can contribute to socially recognisable activities (Gee, 2014b). A full list of the questions used in the analysis is provided in the Appendix 2.

5.5.1 The analytical process

In the first phase, all the interviews were transcribed by the author and read several times. In the reading, the focus was on students' expressions of participation. When students communicated what enhanced or hindered their participation, this was highlighted. In the second phase, the highlighted passages were analysed using Gee's

(2014b) questions and then sorted into a table. Here, tentative topics were identified. In the third phase, comparisons within an interview and between the interviews were made for each student to identify topics; for example, the topics of tests and grades were identified in a number of interviews with the same student. The fourth phase involved comparing the students' topics. When students addressed the same topics in several interviews, discourses were construed. For example, from the topics of tests and grades, a discourse about testing and grades was construed. In the fifth phase, the construed discourses were thoroughly examined along with the observation notes to identify actions, interactions, values, beliefs, objects, tools, technologies, and environments. In the sixth phase, when the same issues appeared in the discourses and the observation notes, Discourses were construed that involved larger social and political contexts. One such Discourse was about assessment. The Discourse was construed when social goods were visible in relation to students' processes of participation in inclusive mathematics classrooms. Hence, the D(d)iscourses describe students' voices of inclusion in inclusive mathematics classrooms available to the SEM students (discourses) and what influences the voices (Discourses).

6 Results

The results present the voices of the students regarding inclusion and are organised in line with the research questions: What discourses can be construed from SEM students' talk of inclusion in inclusive mathematics classrooms? And in terms of Discourses, what influences SEM students' talk regarding inclusion in inclusive mathematics classrooms?

6.1 SEM students' voices of inclusion

This section presents seven interrelated discourses (with a lowercase d) construed from the SEM students' talk: *discourse about classroom organisation*, *discourse about being in a small group*, *discourse about testing and grades*, *discourse about tasks*, *discourse about the importance of the teacher*, *discourse about (not) being valued*, and *discourse about dislike*.

6.1.1 The discourse about classroom organisation

This discourse comprises students' voices of organisational aspects in the mathematics classroom. In almost every interview, all three students referred to classroom organisation and how it affected their participation and access. In this discourse, the topics included the use of textbooks, discussions, working with peers, "going-through"[3] and teaching approaches. All these topics relate to how the mathematics education was organised and how the organisation played a role in students' participation.

[3] In Swedish mathematics education, the lesson commonly starts or ends with a "going-through" (*genomgång*). Andrews and Nosrati (2018) identified three kinds of going-through: when teachers tell the students what to work on, the presentation of new models, and demonstrating solutions to problems that students find difficult.

This was seen in the talk about the textbook. The observation notes record that the textbook was used in almost every observed lesson. For example, Ronaldo talked about the textbook as hindering his participation in terms of what they consider the overuse of the textbook: "It gets so bloody trite, or like really boring in the end". Edward also referred to the overuse of the textbook: "When you are doing more practical stuff, then it is fun, instead of having your nose in the textbook all the time".

How the classroom organisation plays a role for students' inclusion was also seen in the talk about in-class discussions and working with peers. The observation notes show that discussion and working with peers was a commonly used method in the classrooms. Veronica said, "Well, I have always been, like, afraid that if I raise my hand, I will be wrong, and everybody will think, like … that you are … like … I get unsure of myself, if I am right or wrong, and don't dare". She added, "I have trouble with explaining […]. I don't know what to say so they [the peers] get it". For Edward, with which classmate to discuss things was more the issue: "It's not super easy … because often I have gone a lot further, so I must explain things to them … it never happens that I discuss. I mean, with somebody else, that we discuss like that … It depends on who I sit next to". This shows that Edward often felt that he was not having meaningful discussions enhance his participation, although it depended on with whom he was speaking. Ronaldo referred to in-class discussions as "uncomfortable" but to discussions with peers as often helping him, "so you get it more".

The observation notes indicate that almost every lesson started with a going-through by the teachers. Veronica spoke of this when she talked about how she learns best: "I think it is during the going-through … It's just nice when he stands there and talks, demonstrates and explains". Seemingly, the going-through enhanced her participation. This was not the case for Ronaldo, who reported the going-through as hindering his participation: "There is so bloody much going-through now. It is so boring – I can't stand listening" and "going-through does not matter that much, I think", thus indicating frustration. Edward reported that they had a lot of going-through, but it was not always good and too basic. However, he conceded: "It was good when we had that secondary teacher [as a substitute]; then I learned a lot in the going-through". Consequently, the going-through both hindered and enhanced Edward's participation.

Regarding the topic of teaching approaches, Veronica talked about the need for auditive techniques, which seemed to enhance her participation: "It's good to listen […] I always learn a little more". In Ronaldo's case, teaching approaches needed to be varied: "Not just sit down and work, but, like, be more active also. You might do some math outdoors or, like, do math games or something, not just sit down with the textbook all the time – it gets so bloody trite, or like really boring in the end. Vary things". Ronaldo's statement, "vary things", not only indicates a desire for variation but also shows his frustration with monotonous work, which seemed to hinder his participation. Edward alluded to teaching approaches regarding using "those whiteboards in front of you and sit and sketch and experiment, because then it's much faster. I want to spend the time on the math". For Edward, he would like more innovative ways of doing the math to enhance his participation. To summarise, how the education used textbooks, discussions, working with peers, "going-through",[4] and teaching

[4] In Swedish mathematics education, the lesson commonly starts or ends with a "going-through" (*genomgång*). Andrews and Nosrati (2018) identified three kinds of going-through: when teachers tell the students what to work on, the presentation of new models, and demonstrating solutions to problems that students find difficult.

approaches played a role in the students' processes of participation and inclusion in the inclusive mathematics classroom.

6.1.2 The discourse about being in a small group

This discourse encompasses being outside the classroom in a small group. Interestingly, although the school profiled itself as an inclusive school with no fixed special educational groups removed from the classrooms, the observation notes record that the special needs teacher often went with a few students into a small adjacent room. The small group was mentioned mostly by Ronaldo and Veronica. An example is when Veronica was asked if she gets support outside the classroom, to which she answered, "Yes, God yes! [*laughing*]. …You get help right away and don't have to sit and wait as long … It is an extra session, so if you haven't got it when Oliver [the mathematics teacher] did the going-through, you get it once more". Accordingly, Veronica appreciated being in the small group: "It feels nice – there are fewer people. It's like just three or four people". Ronaldo added, "I dare to say stuff too. It feels like I am developing more. … It has become a lot better now. We have started to go out [of the classroom] in small groups, which we didn't do before, and it is much better now. I concentrate better, and it is peaceful and quiet. … If I feel unsure or a bit insecure like I don't really know, then I go [to the small group]". For Ronaldo, being in a small group enhanced his participation because it was linked to feeling secure about the mathematical content. Edward referred to a small group differently. When talking about it he said: "I don't think I would get anything out of it, I don't". To summarise, being outside the classroom in a small group played a role in the students' processes of participation and could be seen as sometimes enhancing inclusion in the inclusive mathematics education.

6.1.3 The discourse about testing and grades

This discourse encompasses testing, which was a recurring topic in the interviews even though it was not focused on in the interview questions. Testing influenced the students' participation in mathematics education, but in different ways. Veronica talked about testing and anxiety: "I always get stressed out when I sit with the others in the class [during tests] … because I always get stressed out when I see everybody leave, and then I, like, hurry, and then I make mistakes". Thus, the tests seemed to create anxiety, so Veronica joined a small group to handle that anxiety. Another example is how Ronaldo talked about taking tests: "Well, it always feels pretty good when I take tests, but then … it becomes a little, like, when you get the result, and I think it will get better next time. Like struggling, like struggling more and more". Edward referred to calculations when taking tests: "Well, it mostly takes place in my head, but then when it's a test, you write everything out". When explaining why he writes everything out, he said, "Otherwise … you cannot be assessed on what you have done, but when I do the calculations in my notebook, then it is mostly mental calculations". Edward further explains,

> You must do it on the tests because otherwise you will not pass, but in the textbook, I don't do it … but it's the writing out that takes such a long time on the tests. … It's just that you must do it [i.e., write out the steps] … Really, it's just

> a burden to do that [*laughing*]. To do and write all that because it takes such a [long] time. … Otherwise, I just do it really quickly … I would have done it in very few calculations.

He continues, "Because I have to sit out the entire time [when taking tests], to **have time**[5] to write everything out … I mean, purely physically". Thus, Edward thinks that he must do mathematics differently in different situations, which hinders his access and participation.

Both Ronaldo and Edward discussed grades along with testing or when they referred to the difficulty of tasks in relation to their participation. The observation notes shows that the grades A, C, and E were written next to tasks presented on the whiteboard and highlighted by the teachers. When Ronaldo answered a question about how the test was, he said, "Well, I was one point from getting a D … I have a passing grade in any case". Hence, Ronaldo answered in terms of grades, but he did not talk about the mathematics in the test or his knowledge. The topic of grades was also present when Edward discussed how teachers presented examples on the whiteboard:

> *Edward*: On the whiteboard, they do different E, C, and A tasks. Or not [A tasks], but they do C [tasks] on the whiteboard anyway. […] it's too complicated to pick up an A task on the whiteboard because it's so much to write, and often, it's problem-solving.

When referring to an A task, he does not say that he wants an A task on the whiteboard, but he indirectly says that he wants a more difficult task to enhance his participation.

To summarise, testing hindered Edward's participation in terms of how to write solutions to tasks to receive good grades. Ronaldo expressed that passing tests with good grades was valued in mathematics education, and hence influenced his participation. Ronaldo also expressed a struggle in relation to tests. Veronica had negative feelings in terms of anxiety about tests, which seems to hinder her access to mathematics learning. Consequently, the mathematics appeared to be cloaked by testing and grades and can thus hinder inclusion in the inclusive mathematics classroom.

6.1.4 The discourse about tasks

This discourse encompasses mathematics tasks, which all three students talked about in almost every interview. The observations showed that the tasks used in mathematics education usually came from the textbook and were often word problems. The interesting thing is *how* they spoke of tasks. An example is when Veronica referred to the topic of reading tasks, specifically, word problems: "It's just that sometimes you don't understand how they are wording the question". She also found it difficult to choose a method for problem-solving tasks: "It has always been a little hard doing that – that is, I kind of don't know how to think when choosing [a method]". Edward talked about the tasks presented on the whiteboard: "If you have something a little, little harder, then you can learn from it. Then you can sit down and begin to think". This indicates that Edward needed harder tasks to be presented in order for him to access learning. Ronaldo refers to tasks when talking about difficulties remembering procedures, for example, solving $5x = 4x + 8$: "No, but I think … [*hesitates*] I don't

[5] Boldface text indicates emphasis by the student.

remember. First, you sort of take minus five and change signs … minus four maybe, ah [*sighs*] … minus four … hell, I don't know." Ronaldo described a difficult task as "Problem-solving and text [i.e., word problems] … it is often those kinds of tasks I fail at on tests". "Those kinds" refers to tasks written out in word form.

To summarise, the students talked about participation and access to mathematics tasks in both similar and different ways. Veronica and Ronaldo shared similarities: their participation seemed to be hindered by word problems and not knowing what strategy to use when encountering tasks. Important for Edward's participation was the challenge of tasks that would grant him access to learning in the inclusive mathematics classroom.

6.1.5 The discourse about the importance of the teacher

This discourse encompasses the importance of the mathematics teacher, referred to by all three students. Veronica stressed, "In the beginning, I did [feel insecure]. I didn't know her [the special needs teacher] that well, so that's why. But now [that] I know her better, I feel secure". She also pointed out the expertise of the special needs teacher: "I actually think it is a bit nicer because then you kind of get your own help. They explain more – that is, they explain more specifically since they are special needs teachers … Well, you get more help, and they develop it so that you understand more". Similarly, Ronaldo talked about getting help from the special needs teacher: "Karen [the special needs teacher] also helps me quite well". He added, "She [the special needs teacher] does it really slowly and methodically. … Sometimes they [the teachers] speak a little too fast". … They need "to take it nice and easy, so I usually ask after the lesson if we could repeat it once more if they have the time". Edward highlighted the importance of the teacher: "I have never liked math. No, I don't think it is fun – I think it is quite easy. It depends a little on the teacher – you can have a boring teacher. … They could tell a joke sometimes, not be so serious". He commented further:

> When we had a substitute teacher who was a secondary school teacher, I thought that was great. I learned a lot because it was kind of on another level. It felt like it was on a much higher level than … with the regular teachers. Because we dealt with stuff, I **think** the ordinary teachers wouldn't have chosen.

Here, Edward described how the secondary school teacher enhanced his participation by giving him access to a higher level of mathematical content and, thereby, learning.

To summarise, the teacher's awareness of what mathematics to present and how to present it was important for Edward's participation. For Ronaldo and Veronica, the relation with the teacher and the teacher's pace and method of teaching were crucial for their participation, as was obtaining targeted support from a special needs teacher. Hence, the SEM students' talk indicates the importance of the teacher when aiming for inclusion in inclusive mathematics classrooms.

6.1.6 The discourse about (not) being valued

This discourse encompasses (not) being valued as students in SEM in mathematics education. This is related to the discourse, *the importance of the teacher*, which involves how and what the teacher presents in mathematics education and how the

teacher acknowledges the students. This is exemplified by Veronica: "Oliver [the mathematics teacher] asked if I wanted to do it [a test] in a small room with only three people, and I wanted to do it because I always get stressed out when I see everybody leave". Hence, Veronica stressed the importance of being valued as a SEM student with specific needs. Another example is shown by Ronaldo: "It has become a lot better now, as we have started to go outside [the classroom] in small groups, which we didn't do before, and it is much better now. I concentrate better, and it is peaceful and quiet. … [In the small group] I dare to say stuff too. It feels like I am developing more". Hence, Ronaldo needed to be valued as a SEM student with a specific need to be in a calm space. Yet another example is when Edward talked about how he is sometimes not valued. This was evident when Edward initiated the following topic when asked if he had anything to add:

> Well, it could be that if you raise your hand during the going-through, it could happen, it often happens, that they let the ones who have difficulties answer because they know … well, they know that he [himself] probably knows the answer. So … yeah … sometimes you get a little frustrated when you are not allowed to say anything.

In another interview, Edward said, "I think it might be that I didn't get to answer one single time. … It was a little so-so … Yeah, well, it wasn't the best math lesson". Edward added that the way the school worked with inclusive classrooms hindered his participation since "you get hindered by others [peers], and then suddenly they can get angry after [a test] if someone did good, and the classroom environment can get a bit prickly".

To summarise, in both Veronica's and Ronaldo's cases, their voice of inclusion in mathematics education was influenced by how they were valued as students in SEM. This was realised through adaptions being made to meet their specific needs, thereby enhancing their participation. In Edward's case, he was influenced by not being valued, which hindered his participation. As a result, to be valued can enhance participation and access in mathematics education, whereas to be unvalued can hinder these aspects.

6.1.7 The discourse about dislike

All three students talked about dislike of mathematics in some way as a hindering issue for inclusion. One example is from Veronica: "I don't like math". This, she explained, has always been the case: "I kind of always had difficulties in math, so I think that's why I don't like it". Veronica's use of the expression "difficulties in math" is connected to why she does not like math. Another example is when Ronaldo talked about the setup: "It gets so bloody tedious or, like, as boring as hell in the end. Vary things. … Not just going-through for half an hour and then work in the textbook until the end. Some lessons can be like that, but it's kind of like that all the time. … It gets so boring at the end, and you can't cope when it is too boring". Hence, the lack of variation was boring for Ronaldo, a topic he raised in several interviews. Edward referred to mathematics as "the most boring subject; because when we are going to math class, it feels like you are just digging yourself down into the sand. You want it to finish, so you can get out of there". He added, "I don't think it is fun. … Math is more like staple food – without math, you get nowhere, but you can develop math in different areas".

To summarise, Veronica's, Edward's, and Ronaldo's participation in the inclusive mathematics classroom were challenged by the fact that they disliked their mathematics education or found it boring.

6.2 Influences of the SEM students' voices regarding inclusion

The discourses described in the above sections are, at the textual level, describing issues tightly connected to the students' talk of inclusion. This section takes off from these discourses, and together with the observation data, three interrelated Discourses are construed: *The Discourse of mathematics classroom settings*, *the Discourse of assessment,* and *the Discourse of accessibility.* These Discourses describe influencing factors seen on a social and political level for students' inclusion in inclusive mathematics classrooms and respond to the research question: in terms of Discourses, what influences SEM students' talk regarding inclusion in inclusive mathematics classrooms?

6.2.1 The Discourse of mathematics classroom settings

In the analysis, it was shown how the classroom setting either enhanced or hindered the students' participation and access in mathematics education. The observation data and the discourses of *classroom organisation* and *being in a small group* highlighted the students' voices regarding how the classroom was set up and construed the Discourse of *mathematics classroom setting*. This Discourse displays a social understanding of how a mathematics classroom is organised and how to act as a student within this organisation.

6.2.2 The Discourse of assessment

In the analysis, it was shown that the students talked about assessment in terms of mostly hindering their participation and access. This was seen in the *discourse of testing and grades*. When adding observation data, the Discourse of assessment was construed. This Discourse displays how sociopolitical understandings of assessment of mathematical knowledge influenced students' voices of inclusion in mathematics education.

6.2.3 The Discourse of accessibility

In the analysis, it was shown that the students talked about issues of gaining access to the mathematics education, and thereby learning in mathematics. Four discourses focused on access: the discourses of *tasks*, *the importance of the teacher*, *(not) being valued*, and *dislike*. The observation data and the discourses construed a Discourse of accessibility. This Discourse showed how aspects of accessibility influenced the students' voices of inclusion. A joint understanding of the relationship between the teacher and the students as influencing inclusion was visible in the statements as well as a joint understanding of mathematics as a boring subject.

7 Discussion

The aim of this study was to describe three SEM students' voices regarding inclusion in mathematics education in the Swedish context of two inclusive classrooms. The results show SEM students' voices in terms of seven interrelated discourses: *the discourse about classroom organisation*, *the discourse about being in a small group*, *the discourse about testing and grades*, *the discourse about tasks*, *the discourse about the importance of the teacher*, *the discourse about (not) being valued*, and *the discourse about dislike*. These discourses offer a way to interpret students' voices of inclusion in mathematics education in terms of participation and access.

The results also indicate what influences the students' voices in terms of three Discourses: The Discourses of *mathematics classroom setting*, *assessment*, and *accessibility.* These Discourses offer a rationale of sociopolitical underpinnings and a context to the discourses. The three Discourses explain and limit the students' inclusion in mathematics education, for instance, in the Discourse of mathematics classroom settings, where being physically included in the classroom was sometimes a limitation. Neither Veronica nor Ronaldo was keen on being in the classroom all the time because doing so made them sometimes feel self-conscious: for them, being in the small group was less threatening. This can be seen as an expression of exclusion and stigmatization, in which the label "special needs students" creates obstacles for participation. This falls in line with the results of Civil and Planas' (2004) study, which found that special needs students identified with certain forms of participation. Though being in a small group outside the classroom can be seen as stigmatizing and excluding, this study shows how it can also be an expression of inclusion in mathematics education. Therefore, being in a small group can both limit and enhance inclusion, depending on the student, the situation, and the mathematical content. This implies inclusion is highly dependent on the teaching and pedagogical practice enacted in the students' mathematics classrooms. As Boaler (2008) points out, alternative approaches can remove the need for specific educational strategies to enhance individual access and learning in mathematics. On the one hand, this alternative approach to inclusion in which a student decides to be in a small group, and how this may be important for inclusion, could be viewed as being at odds with the core of inclusion. On the other hand, it may be interpreted as an indication of inclusion, given that it reconsiders the social and academic needs of the students. This study delves into this way of defining inclusion from a student perspective; for example, both Ronaldo and Veronica emphasized the *possibility* to be in a small group. Therefore, this was not an *externally dictated decision*. Hence, their freedom to decide for themselves when to use the small group and seeing it as an *offer* may enhance their inclusion. This offer and the possibility to choose could be an educational response to the critique that inclusion sometimes actually produces exclusion (e.g. Chronaki, 2018). However, being critical to this way of working for inclusion could also generate processes of exclusion, like it did for Edward, who did not have access to getting support in a small group. A way of making a small group more inclusive could be to extend the aim of support to cover the needs of students like Edward. Hence, how inclusion is lived in practice is a constant process rethinking inclusion for every students' access, and it depends on the participants and the mathematics to be explored (Skovsmose, 2019).

In the Discourse of assessment, the students' talked about issues influencing their participation in similar, yet different, ways. An example of this is with tests. For Veronica, taking tests caused anxiety; for Ronaldo, it entailed struggle; and for Edward, it entailed a tension between writing solutions for himself and others. Although there were some similarities when they talked about tests, there was a difference in how they talked. Overall, the Discourse of assessment influenced the students' inclusion in mathematics education in a rather negative way. This Discourse of assessment is most likely a result of political tides of assessment in Swedish society, where numerous macro-level assessment reforms have led to a decreased desire for students to participate and learn (Hirsh, 2020). Therefore, this study adds to the critique of the negative role assessment plays on inclusion and equity (e.g. Baldino & Cabral, 2006; Bagger 2017).

In the Discourse of accessibility, another example of a similar, yet different, way of talking about issues influencing the students' participation is found when the students talked about (not) being valued. Here, the notion that both Veronica and Ronaldo were valued as SEM students seems to enhance their inclusion, whereas the notion that Edward was not valued seems to hinder his. It should be noted that the ideological way of using inclusion at the school to some extent generated Edward's exclusion, which may be a result of the immense focus in school on ensuring that every student passes. It is thus is possible to connect this to a focus on success (in terms of statistics) of the number of students with a passing grade as human capital for the society, as Valero (2017) puts it when discussing in(ex)clusion in relation to achievement. Consequently, issues of power in decisions of who is valued and why can come to the fore. This is important to consider in relation to inequality in school (Esmonde, 2009).

Also, in the Discourse of accessibility, it unfolded that the dislike of mathematics challenged Veronica's, Edward's, and Ronaldo's participation. Prior research has also found dislike to be a negative indicator of student participation (e.g. Lewis, 2013; Murray, 2011). This study adds to this research by identifying classroom factors related to dislike: testing and grades, classroom organisation, tasks, the importance of the teacher, and (not) being valued. Thus, an implication for both research and practice in mathematics education is to address these issues in depth, both on a classroom level and on a societal level, with the aim to change the negative understanding of mathematics.

Looking at the application of theory in this study, Discourses are used as secondary and small-scaled, thus implying social understandings close to the students. This can be regarded as a methodological contribution using DA, which shows how Discourses can be small-scaled and even show social and political underpinnings.

To conclude, although the voices of inclusion in mathematics education of the three students in this study are, to some extent, known features in education, they can tell us something about students' inclusion and important issues to address in mathematics education. The Discourses seem to have a gatekeeping function, which, to some extent, can be addressed by investigating the discourses. This study shows that students' access to mathematics is connected to participation, which makes participation and access inevitably interconnected by the idea of inclusion. Inclusion in mathematics education is not easily described or attained. The analyses indicate that inclusion is a complex process of participation where both ideological and societal issues, as well as individual and subject-specific issues, must be considered in the educational endeavour. Therefore, the study offers details that are missing in previous research. Following Skovsmose (2019), I call for specific considerations in the educational endeavour into students' voices concerning being invited, concerning access, and concerning how to facilitate collaboration.

Appendix 1 Self-assessment form

SELF-ASSESSMENT
Name:

Grade:

How do you feel in the following situations:

WHEN:	SURE	PRETTY SURE	UNSURE	VERY UNSURE
Answer a question you think you know from the teacher during going-through				
Tell the teacher how you have solved a task				
Tell a peer how you have solved a task				
Show the teacher how you have solved a task in writing in your notebook				
Discuss solutions of tasks in mathematics with your peers				
Use mental arithmetic				
Choose a method to solve a mathematical task				
Use a calculator				
Determine if an answer is reasonable				
Get help from the special needs teacher in mathematics				
Go out of the classroom with the special needs teacher				
Describe what is meant by 1/8				
Describe what is meant by a 'mean value'				
Describe what is meant by 'perimeter'				

Appendix 2

Table 1 Analytical questions

Linguistic questions	Interpretative questions
How are deictics being used to tie what is said to context? For example, "It was nice"	What needs to be filled in to achieve clarity in the students' talk? What is not being said explicitly but is assumed to be known (*it*)?
How does the student organise information in terms of subject and predicates?	Why has the student chosen the particular subject for the conversation?
How does the students' intonation contour contribute to the meaning of utterances? (In the transcripts, emphasised words are in bold)	Can I find out any more about the context the students talk about and refer to, and in that case, does it change the analysis? (Here, the observation notes are used along with the text analysed)
	What would someone find strange if that person did not share the knowledge and assumptions of the students? Hence, what is taken for granted by the students?
What sort of words are being used, and how does the distribution of words function to mark the communication of the student in terms of style?	What is the student talking trying to do (with the use of words)?
How do stanzas cluster into larger blocks of information?	What is the topic and theme for each clause? What theme is a set of clauses? When the theme was not the topic and deviated from the usual choice, why was it chosen?
	Why does the student build and design grammar in this way, and not in some other way?
How are words and grammatical devices used to build up or lessen significance for certain things and not others?	How is what the student is saying helping to create or shape relevant context? How is what the speaker is saying helping to reproduce context and the significance?
How are words and grammatical devices used to quote, refer to, or allude to other texts or other styles of social language?	
How are the words and grammar being used to privilege or de-privilege specific sign systems (e.g. everyday or scientific mathematical concepts) or different ways of knowing and believing?	
What are the topics of all the main clauses, and how are these topics linked to each other (or not) to create a chain?	
How are words and grammatical devices used to quote, refer to or allude to other text or other styles of social language? (Here the observation notes are used together with the text analysed)	What situated meaning does the communication have? (Here, the observation notes are used along with the text analysed)
	What figured worlds are the words and communication assuming and inviting listeners to assume? (Here, the observation notes are used along with the text analysed)
	What Discourse is this language a part of? What sort of actions, interactions, values, beliefs, and objects, tools, technologies, and environments are associated with this sort of language within a particular discourse? (Here, the observation notes are used along with the text analysed)

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Ethics approval An ethical review at the local ethical review board (Etikkommittén Sydost, ref. EPK 289–2015) was conducted in line with the Swedish Ethical Review Law, which stipulates that all research concerning human beings shall be ethically reviewed.

Consent to participate All participants in this study consented to participation.

Consent for publication All participants consented to publication.

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