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# **I just don't like math, or I think it is interesting, but difficult ...**

## **Mathematics classroom setting influencing inclusion**

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*This research reports on a study investigating how three students perceived as being in special educational needs in mathematics (SEM), either as students in access to mathematics or as students in struggle to get access, talk about participation in mathematics education. Discourse analysis is used as a theory and a tool to investigate the students' own stories of learning and teaching in an inclusive mathematics classroom. The results show that students' participation in mathematics education is influenced by how the mathematics education is set up. That is, how the organisation of the mathematics classroom and students being in a small group influence students' participation. The results also show that even though the same issues of the organisation influence the three students, there is a diversity within the issues, calling for a critical question, is the inclusive classroom setting really inclusive in terms of participation and access to mathematics?*

*Keywords: Discourse analysis, inclusion, participation, special educational needs in mathematics.*

### **Introduction**

How to set up mathematics lessons to facilitate participation for every student within an inclusive classroom is not an easy task. Nevertheless, it is a particularly important educational task in order to promote an equitable mathematics education and create opportunities for every student to learn (Moschkovich, 2013; Askew, 2015). The setup of the mathematics classroom, including didactical choices of the mathematics teacher(s), is influenced by many different aspects. For example, Askew (2015) identifies a Western way of teaching mathematics with a one-size-fits-all approach, influencing the setting of the mathematics classroom. Hence, the set-up of the mathematics education is not in full an actual choice of the teacher, but a choice of the school, or even a choice of the society. This implies there are cultural, social, and institutional factors, such as social patterns, strongly impacting mathematics education settings. For example, patterns of advantage and disadvantage (Civil & Planas, 2004). Then, the awareness and the ability of the teacher to know how to act and care in the moment in order to promote learning of every student (Mason & Spence, 1999) becomes even more of importance. This implies, the awareness of factors, external of the actual classroom interaction, influencing the mathematics education, the set up, and enactment of the teaching inside the classroom is of importance to promote participation and learning. So, if defining inclusion in mathematics as processes of participation for every student (Roos, 2015), inclusion is strongly connected to the promotion of equitable mathematics education in terms of how the mathematics education is set up (Moschkovich, 2013). Moreover, since inclusive mathematics classrooms are diverse in terms of students' backgrounds (gender, ethnicity, culture, achievement etc.), the mathematics education needs to provide a diverse education (Roos, 2017). This suggests a diverse setting of the mathematics classroom considering every students' needs. Within the research field of mathematics education, the notion of inclusion is often connected to special educational needs in mathematics (SEM) (Roos, 2019a). Often when discussing SEM, the

student in mind is a low achiever, struggling to get access to mathematics education. However, a high achiever can also be in SEM even though she or he has access to the mathematics education, because she or he might need specific solutions in order to have optimal opportunities to learn. Accordingly, the notion of SEM can work in two directions, one direction towards mathematics difficulties, and one direction towards mathematics facility, showing differences in access to mathematics education. Inclusion in mathematics education for both ends of the SEM-continuum can be provided by the promotion of participation focusing on teaching practices and intervention strategies taking off from learning situations enabling meetings among differences (Scherer, Beswick, DeBlois, Healy, & Moser Opitz, 2016). Hence, setting up teaching promoting participation becomes an important challenge. To take on this challenge, we need to know the meaning(s) of students regarding participation in the inclusive mathematics classroom. Hence, the aim of this paper is to describe SEM-students meaning(s) of inclusion in their talk about learning and teaching in an inclusive mathematics classroom to have the best opportunities to learn.

## **Methodology**

In this section the site and the participants of the study are described, as well as the theoretical and analytical approach and the data analysis.

### **The site and participants**

A lower secondary school in an urban area in Sweden that has set out to implement inclusive work was chosen for this investigation. The inclusive work at the school aims at including all students in the ordinary teaching in every school subject, and integrate the special education into the ordinary teaching. A grade 7 and a grade 8 classroom at the school were observed during one semester. At least one approximately 50 minutes long mathematics lesson each week for each class was observed. After each observation student interviews were carried out. The selection of students for the interviews was made in cooperation with the students, parents and teachers and took ethical and organisational issues into consideration. The mathematics teachers suggested students they perceived as being in some kind of SEM. Thereafter, if the students and parents gave their consent, they were offered to take part in this study. Six students took part in the study. The interviews were conducted when the organisation and students allowed it. The interviews took place in a small room familiar to the students once a week and were based on the observations made the same week. Hence, open questions about situations and content of the mathematics education were asked in a discussion type of manor. This paper focuses on three students: Veronica in grade 7, Ronaldo and Edward in grade 8. Veronica says that “math is pretty hard” and she states “I don’t like math”. The mathematics teachers perceive her as a student who struggles to get access to mathematics. Ronaldo describes himself as a student with learning difficulties “I have difficulties within all subjects, and it’s like concentration and all that.” He also experiences that he forgets stuff “I don’t remember, I have to repeat a lot”. The mathematics teachers perceive him as a student who struggles to get access to mathematics. Both Veronica and Ronaldo have just about a passing grade. Edward describes himself as a person that thinks mathematics is really easy and does not need much help at all. He does not have to make any effort, mathematics works “automatically” for him and he “already knows” most of what they are doing in math class. The mathematics teachers perceive him

as a student with access to mathematics, and he has the highest grade possible in mathematics (grade A<sup>1</sup>).

### **Theoretical and analytical approach**

When investigating students' stories of their own participation in mathematics education, there is a need to identify critical aspects of learning and teaching in the stories. In this research this identification is made by using Discourse Analysis (DA). DA is a helpful tool since the focus of DA is the study beyond text, and because DA has an explanatory power of social contexts. Thus, by analysing the use of language in a certain type of situation we can say something about the social world. When going beyond the text in this particular study, construed discourses of what influences students' participation in mathematics education makes it possible to describe the social world from the students' perspective. In this study, the perspective of Gee (2014a, 2014b) is used, since Gee's focus on DA is descriptive and this study aims at describing students' view of participation in an inclusive mathematics classroom to have optimal opportunities to learn.

Big and small discourses (henceforth Discourse with capital D and discourse with lowercase d) are used by Gee (2014a, 2014b) as theoretical notions in the use of DA. Here Discourse(s) are describing a social and political context and are always embedded in many various social institutions at the same time. For example, a Discourse can be "school mathematics". Discourses are language plus "other stuff" (Gee, 2014a, p. 52), such as actions, interactions, values, beliefs, symbols, objects, tools and places. Small d discourse has a focus on written and spoken language in use, what stretches of languages are visible in the stories we investigate (Gee, 2014a). Stretches of languages is Gee's notion to describe small conversations within the stories. In this study, big and small discourses will be the theoretical perspective. Gee provides a toolkit for analysing different forms of language, both spoken and written. These tools highlight the communication and pose questions to the text to investigate what is beyond the text in terms of Discourses and discourses. In this paper, the toolkit is used as a methodological tool and is exemplified in the section data analysis. Summarising, DA is used both as a theory and an analytical tool and provides a set of theoretical lenses in this study.

### **Data analysis**

In this paper seventeen interviews, five with Veronica, six with Ronaldo and six with Edward and eight classroom observations have been analysed. The observations were used as contextualisation for the interviews as well as for supporting construction of Discourse(s). The analysis of the data was guided by questions asked to the text. These questions were adapted from Gee's (2014b) toolkit, and with their help both small and big discourses could be constructed. That is, the questions were posed to the text and the answers made stretches of language(s) visible, indicating small discourses. When adding analysis of the data from the observations, such as text on the blackboard and events in the classroom, big Discourses could be construed. The analysis opened up

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<sup>1</sup> In the Swedish grading system A is the highest grade, then B, C, D, E and F. E is the lowest acceptable grade and F is the grade you get when you don't pass.

for the construction of three Discourses, the Discourse of assessment (described in Roos, 2018), the Discourse of accessibility (described in Roos, 2019b) in mathematics education and the Discourse of mathematics classroom setting. In this paper the Discourse of mathematics classroom setting is in focus.

## **The Discourse of mathematics classroom setting**

From the stretches of language identified in the texts from interviews with Ronaldo, Edward and Veronica, three (d)iscourses were construed, indicating a (D)iscourse of mathematics classroom setting influencing the students' participation. The three small discourses are described below.

### **The discourse of classroom organisation**

This discourse is construed by stretches of language where the students highlight how the organisation of the education influences their participation.

A topic visible in the talk of all three of the students was the use of the textbooks. The textbook used in mathematics in both classes has six chapters divided into sections with specific mathematical areas. Each section has four levels, where "level one is easy tasks and level four gives real challenges". Veronica says "I start at level one or two [in the textbook]. Well, it is easier to start, so that you don't start with something difficult right away, that you don't master. Because it is a little easier. So, I don't make mistakes later on. I usually work by myself". She mentions the textbook in relation to preparing for tests "Before a test, we have the mixed tasks that sum up what we have done in the whole chapter." Also how to write in her notebook "well, it's like these small squares in it, so I usually try to write in them, so it doesn't get too big so you have space". Even Ronaldo mentions the notebook, and it seems like he struggles with the writing of the tasks "well it gets, if I write it often gets bloody smudgy, it gets so bloody messy [in the notebook]". Edward mentions the textbook as the one deciding the severity "It is the book that chooses what level you want". He also talks about the levels in the book. "I skip it [skip the first out of four levels in each chapter of the text book], it is too easy (laughing). To have a soft start in the specific area [he starts with level two]". For Edward the textbook also guides him in solving tasks, this is visible when he says that "I look in the key first, or I test first, then I look in the key and then I can see how it should be". Even Edward talks about the notebook in terms of what he doesn't write "when I just calculate ordinary in my book, in the textbook, then it's mostly mental calculations". [...] "It is more convenient not to write everything down". In the observation notes it is visible that teaching by the textbook, where the students sit and work separately or in pairs, is the most common way the mathematics education is organised in both classes. Ronaldo talks about the textbook in terms of sections he feels secure or insecure of as well as levels in the textbook: "Well, I start, I think that number one has become easier now [level one in the textbook], because it feels like I have become better at math now, so I sort of starting with number two.

Another topic regarding organisation influencing the students' participation being visible in the talk of all three students was to talk, discuss and work with peers in the classroom. Veronica talks about this as a hinder in her participation "Well, I have always been like afraid of that if I raise the hand, I am wrong and everybody thinks like.. that you are.. like... [...] I get unsure of myself, if I am right or wrong, and don't dare..." She also feels insecure when having discussions with peers in the

classroom “Well, I have trouble with explaining... I don’t know why. I don’t know what to say, so they (the peers) get it. Ronaldo sees discussions both as a hinder and as a help for his participation. When he talks about discussion, he says that he can discuss “in groups, but not as much in the whole class. Or I can, but I don’t want to.” He says that the reason is that he is uncomfortable, but in a group situation he perceives it as a help “I like to cooperate. It is fun to be with others, like Edward or Leo, because they are really good at math and they can explain really well. So you get it more”. Though, it depends on whom he cooperates with, “I feel comfortable with everybody in the group sort of ... well some I can trust, or I know better than others. So it depends on whom you have in the group”. Also for Edward it’s an issue of with whom to discuss. “It’s not super easy... because often I have come a lot further, so I have to explain to them ... it never happens that I discuss ... I mean with somebody else, that we discuss like that.. [...] It depends on whom I sit next to”. When Edward gets the question if there is somebody in the class that he feels that can challenge him, he says that there are two, but he does not sit next to them, but he would like to “I think I would get more out of it”.

Going through<sup>2</sup> was yet another topic all of the three students discussed. Veronica reflected on when she thinks she learns the best by saying “I think it is when it is going through and when I work by myself actually”. Describing what’s good with going through, she says that “I don’t really know (laughs), it’s just nice when he [the teacher] stands there and talks, shows and explains”. Ronaldo talks about going through in relation to him forgetting and implies that others think he should have more going through by saying: “I was supposed to have an extra going through like this, it is just as well, so that I don’t forget that, too”. He refers to going through in a negative way “it is so bloody much of going through now. It is so boring, you can’t stand listening” and he says that “going through does not matter that much I think”. Although, he thinks that “sometimes it [going through] can be good, but well, if you are entering a new area, you are supposed to work with, it’s good to have a going through. But then, like we have now, a going through each lesson, about the same thing. It is ... well I do know it’s just to repeat and all that, but it is so damn hard”. This implies going through is a challenge for Ronaldo’s participation. Edward says that he listens and learns from going through, but not always. He thinks they have a lot of going through, but that they aren’t always good, and when they interfere with his previous way of solving, it gets messy. “I think it gets messy when you have to mix in a lot of stuff to think, because I have my own way of thinking, so it only gets messy to mix in something else”. He also thinks the tasks in the going through are basic “it is not really that advanced up on the blackboard, but, well, it’s enough that I get the basics, then I can work from there” implying he would like more challenges, and that he is left alone to work further. Edward mentions that he liked the going through of a substitute teacher “I thought it was good when we had that secondary teacher, then I learned a lot in the going through.

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<sup>2</sup> In Swedish mathematics education, it is common for the lesson to start or end with a “going-through” (in Swedish, *genomgång*). Andrews and Nosrati (2018) point out three instances of what can be considered “going-through”: when the teachers inform the students of what to work with, when presenting new models, and when demonstrating solutions to problems the students find difficult.

[...] I learned a lot, because it was kind of on another level. It feels like it was a much higher level than the regular teachers”.

Yet another topic talked about by all the students was teaching approaches. Veronica talks about the need of hearing stuff, “it is good to listen [to the teacher], like I always learn a little more when we have going through”. She likes it when the teachers “talk”. She also states that when she is working by herself, she learns the best. Also, she likes problem solving, because “you can choose what you want to use, and, like which way you [can] think. [...] It is really fun!” Ronaldo on the other hand talks about problem solving as something he “despises more than anything” as he finds it hard to “connect the text to the task, it is too much”. When asked how the mathematics education could be more fun for him, he says that he doesn’t know and “I just don’t like math, or I think it’s interesting, but difficult”. When he elaborates on teaching approaches he likes, he says “[...] you should have more math games or something”. In another interview he elaborates on how he learns best and says “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 text book all the time, it gets so bloody trite, or like really boring in the end. So, vary things”. Here, Ronaldo indicates that he would like variations of ways of working to enhance his participation. This is emphasized in another interview when Ronaldo contrasts variations with working in the textbook. “It is a bloody lot of [work in the textbook] ... you could play more math games or stuff like that”. Even Edward highlights this contrast when he states “when you are doing more practical stuff, then it is fun, instead of having the nose in the textbook all the time.” “Instead of keeping turning pages, drawing lines and writing the number of the task and all that, these things takes such a long time”, he would like “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”. Hence, Edward thinks that the work with the textbook and notebook hinders him from spending time on math, consequently it hinders him from participation.

### **The discourse of being in a small group outside the classroom**

This discourse focuses students’ talk about being outside the classroom in a small group. This is mostly mentioned by the students struggling to get access in mathematics, Ronaldo and Veronica. Both Veronica and Ronaldo address feelings when they talk about being in a small group sometimes.

When Veronica was asked if she has been outside the classroom during lessons, she answers “Yes, god yes!” and laughs. Veronica often talks about being in a small group outside the classroom and often says that it “feels good”, and that she feels secure in the small group. The reason why she feels good is that “you get help right away and doesn’t have to sit and wait (for help) so long” and “it is an extra time, so if you didn’t get it when Oliver [the ordinary mathematics teacher] did the going through, you get it [the going through] once more”, “It’s like you get an extra occasion. If you don’t get it the first time, you can get one more time”. Also she says that she feels good because “It’s less people, it like just three or four persons”. Ronaldo says that “I dare to say stuff to, it feels like I am developing more” and “when you are in smaller groups, you dare to say more”, when he talks about being outside the classroom. He contrasts it with the way it was before and says that “it has become a lot better now, we have started to be outside [the classroom] in small group, which we

didn't do before, and it is much better now. I concentrate better and it is peaceful and quiet". This implies he needs a place where he can feel secure and a place where it is calm to be able to concentrate. Also, he connects being in a small group to the level of security in relation to the mathematical content "But if I feel in between [of being sure or unsure], or a bit insecure like don't really know, then I go [to the small group]". Even Edward talks about the small group, but in a different way. When he gets the question if he is in the small group sometimes, he laughs and says "No, but she [the special teacher] takes the ones who wants to go through the basics, she usually takes [them] with her and does some going through and stuff like that. [...] I don't think I would get something out of it, I don't." Here Edward talks about "them", as the ones who want to go through the basics" and he does not include himself in that group. The observation notes show that on several occasions the special teacher brings a few students with her out into a small room beside the classroom. Often it is Ronaldo and Veronica.

## **Discussion**

The Discourse of mathematics classroom setting pinpoints critical issues for the three students' participation in the mathematics education in terms of the organisation and being in a small group. It seems like the Western way of teaching with a one-size-fits-all mathematics education (Askew, 2015) influences the setting of the mathematics classroom, which is visible in the students' description of the use of the textbook, the mathematical discussions and the going through. This certainly "turns diversity into a problem" (Askew, 2015, p. 129), since there seem to be contradictions in the students' stories, even though they talk about the same issue, it's not in the same way. For instance, Veronica thinks she learns best when listening at going through, but Ronaldo seems mostly frustrated, and Edward thinks they are too basic. Also, when Ronaldo talks about going through in relation to him forgetting, he is placing the struggle getting access to mathematics within himself, creating frustration. Hence, how to realize going through in the classroom is a critical issue. The "problem with diversity" is also seen in the way the students describe discussions. Veronica feels insecure and does not know how to explain her thinking to her peers. Ronaldo on one hand feels the same as Veronica, insecurity when it comes to whole class discussions, but on the other hand he really likes discussions with peers, mostly because they can explain well to him. Hence, it is not him discussing, but using the peers, for instance Edward, as tutors. Edward recognises this, that he has "to explain to them", and he feels that most often he does not get any challenges in the discussions. In this study, textbooks and the work the students do in the notebooks, seem to govern the mathematics education, and is an important factor for participation. This can be seen in the way the students describe how the different levels in the textbook affect their participation, and how they are supposed to write in the notebooks. Thus, it is not just the decisions of the teachers influencing the setting, but also the textbook and the mathematical norms that are established, play a crucial role. This makes the textbook, how it is organized and how it provides access to knowledge, as well as how to write in the notebook important factors to consider, which is also seen internationally (Fan, Zhu, & Miao, 2013). Is being in a small group outside the classroom including or excluding the students? Both students struggling to get access talk about the small group as a secure space and the classroom as an insecure space. Edward on the other hand laughs and does not think he would gain anything from



the small group. Veronica answers “Yes, god yes!” and laughs when she is asked if she has gone out of the classroom sometimes. The laughter can be an indication of roles taken by the students as either students in access or in struggle to get access, and the roles seem to influence the students’ participation. This is indicated by the fact that the struggling students feel insecure in the classroom situation. This is in line with the finding of Civil and Planas (2004), that participation is influenced by organizational structures. Consequently, the result in this study calls for a critical question: Is the inclusive classroom really inclusive for the students in terms of participation and access to mathematics?

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