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CHALLENGES AT THE BORDER OF NORMALITY STUDENTS IN SPECIAL EDUCATIONAL NEEDS IN AN INCLUSIVE MATHEMATICS CLASSROOM

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This research describes how 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, are challenged in their participation in mathematics education. Discourse analysis is used as a tool and a theory to construe discourses from students own stories of participation in an inclusive mathematics classroom. Distinguishing between (d)iscourse as stories in texts, and (D)iscourses as social and political recognisable units, the result shows the same, yet different, discourses; tasks, the importance of the teacher, to be (un)valued and math is boring, all indicating a Discourse of accessibility in mathematics education. The accessibility is challenged in two ways, the students are challenged in their participation since they do not fit into the 'normal' education, and the mathematics education is challenged to meet every students' need to promote equity.

INTRODUCTION

This research takes off in the intersection of two research paradigms, mathematics education and special education. In this intersection issues of diversity, equity, participation and normalisation in terms of mathematics (not) for all becomes visible and is often framed by the notion of inclusion (Roos, accepted). Inclusion is used in many different ways in educational research, and have different directions, towards rights and ethics, efficiency, politics or pragmatic use in practice (Dyson, 1999). In this paper inclusion is seen as a process of participation in the mathematics education with a direction towards both rights and ethics and use in practice. In mathematics education inclusion is often connected to special educational needs in mathematics (SEM) (Secher-Schmidt, 2016), meaning the education needs to pay attention to specific needs of the students, and provide solutions within the education in order to include all students in the mathematics. This in order to make the mathematics accessible for the individual student. Often the student in mind when talking about SEM is a low achiever, struggling to get access to mathematics. Nevertheless, even a high achiever can be in SEM even though she or he is in access to mathematics, because she or he might need specific solutions in the mathematics education in order to get included and have optimal opportunities to learn. Consequently, the notion of SEM can be seen as a spectra, showing a diversity in access to mathematics. Inclusion in mathematics for both ends of the SEM-spectra can be provided through the construction of learning situations to promote participation with focus on teaching practices and intervention strategies enhancing learning, where the learning situations permit meetings among differences (Scherer et al., 2016). How do we design these teaching practices promoting participation within an inclusive classroom, where we find SEM-student in both ends of the spectra? And, most importantly, how do the students perceive their participation in the inclusive mathematics classroom? Hence, the aim of this paper is to describe how students perceived as being in SEM, either as students in access to mathematics, or in struggle to get access, perceive inclusion in mathematics education.

PROCESSES OF NORMALISATION IN RELATION TO DIVERSITY AND EQUITY

People want to be included in the societal discourse. To be included, there is an amount of mathematical knowledge needed to be able to have a critical agency (Greer, 2009) and to be included in society at large (Valero, 2012). Consequently, the mathematics education in every society needs to respond to the knowledge needed, and educate as such to meet this need and to develop mathematics education engaging every student. This kind of education is often referred to as inclusive education

(e.g. Sullivan, 2015a) and is about how to get students to be active participants in mathematics classrooms (Roos, accepted). When inclusive mathematics education is mentioned, the challenges to this kind of education is often highlighted, such as diversity and equity (Askew, 2015). If looking into research focusing on mathematics education and diversity, there is a commonly strive to challenge the current views in educational policies initiatives, which rather perpetuate diversity as something difficult than use diversity as an asset. The core message in the research is that by embracing diversity and take it as a point of departure, we can actually enhance learning for all. This can be done by looking at classrooms as learning communities and instead of having individuals as the learning unit in the classroom, considering the group as the learning unit (Askew, 2015). This does not imply neglecting differences, but rather see them as natural and not define them as deficiencies (Moschkovich, 2007 discusses this in relation to bilingual learners). However, this is challenged by the traditional way of western-mathematics teaching, where one teacher is supposed to have a one-size-fits-all education which “turns diversity into a problem” (Askew, 2015, p. 129).

Not seldom the issue of equity is being discussed in relation to diversity (e.g Nasir & Cobb, 2007). Though, here the point of departure often is on the societal level investigating different aspects of society from an (in)equity and access perspective (Bishop & Forgas, 2007). Gutiérrez (2007) discusses the importance of taking a critical perspective embracing equity in research. Also Valero (2011) discusses equity in mathematics education and how it is strongly connected to “larger processes of inclusion and exclusion in society”. This implies issues of equity in mathematics education gets political and some researchers highlight this by using terms like social justice and democratic access (Pais & Valero, 2011). A focus on how ideological views of equity transcend into mathematics education in school is hereby implied. Under the surface of both diversity and equity, processes of normalisation become visible. This because there are national curriculum to be followed, and in them there is a direction towards what is normal to know in mathematics at a certain age. It also becomes visible by the fact that researchers have identified diversity and (in)equity as important factors for inclusion. Hence, the researchers implicitly (and sometimes explicitly) make processes of normalisations visible. Someone, or something (policy makers, scholars, mathematics teachers, the community), sets the agenda for what is normal in mathematics learning and teaching. Not seldom processes of normalisation clashes with equity and processes of inclusion sets out of play. This suggests inclusion is enhanced by identifying processes of normalisation, and move beyond them by seeing diversity as natural. Accordingly, in order to address the process of normalisation in relation to diversity in the inclusive mathematics classroom and issues of equity, there are challenges in the mathematics education (research) to find ways to get every student to be an active participant in the mathematics classroom.

THEORETICAL AND METHODOLOGICAL APPROACH

The aim of this study is to describe how students identified as being in SEM perceive inclusion in mathematics education. To investigate this, students’ stories of participation in mathematics education needs to be identified. This identification is made by using Discourse Analysis (DA). The focus of DA is the study of language and text, what we actually can hear, read and see *and* particularly what is beyond the text. That is, DA helps construing discourses by analysing the use of a certain type of language in a certain type of situation. Thereby you can say something about the social world (in terms of discourses). In this study, when going beyond the text, this something becomes visible in construed discourses of what influences student participation in mathematics education. DA is chosen because of the explanatory power of social contexts and meaning making. In this research, the perspective of Gee (2014a, 2014b) is used, since this focus on DA is descriptive, and I intend to describe how students perceive their participation in an inclusive mathematics classroom to be able to have optimal opportunities to learn.

Gee (2014a, 2014b) use two theoretical notions when explaining DA, *big and small discourses* (henceforth Discourse with capital D and discourse with lowercase d), where Discourse is looking at a wider context, social and political. Discourses are always embedded in many various social institutions at the same time, involving various sorts of properties and objects. For example, a Discourse can be “assessment in mathematics.” Discourses are always language *plus* other stuff, such as actions, interactions, values, beliefs, symbols, objects, tools and places. Small d discourse is focused on language in use, what *stretches of languages* we can see in the conversations or stories we investigate (Gee, 2014a) meaning what small conversations appear within the greater story. In this research, big and small discourses will be the theoretical perspective. Gee provides tools for analysing different forms of interaction, both spoken and written. These tools focus communication and ask questions in order to go beyond the text. In this research the tools are used methodologically and has been adopted according to the aim. For example, tools that has been used is the *Topic and theme tool* with the questions: what is the topic and theme for each part in the students texts? When the theme is not the topic and has deviated from the first choice, why was it chosen? *The topic flow, topic chaining tool* has been used with the questions: how are the topics linked to each other to create (or not) a chain creating an overall topic of coherent sense? Similarly is the *Big “D” discourse tool* has been used with the questions: what Discourse is this language a part of? What sort of values, beliefs, objects, tools, and environments are associated with this language within this Discourse?

To conclude, DA is used both as a theory and a tool and provides a set of methodological and theoretical lenses in this study.

Setting the scene

During one semester (January to June 2016) I observed two classes (grade 7 and 8) at a public lower secondary school in an urban area in the south of Sweden that has set out to implement inclusive work as a way of teaching (implemented by the principal). After each observation student interviews were made. I observed at least one mathematics lesson each week for each class. Since both ethical and organisational issues had to be taken into consideration, the selection of students for the interviews were made in cooperation with the teachers, students and parents. The special teacher in mathematics and the mathematics teachers suggested students they perceived as being in some kind of SEM and if the students and parents gave their consent they were selected to take part in the study. The interviews were conducted when the students had time, and the teachers and students allowed it (they did not want interruptions of the ordinary lessons). The interviews took place in a room next to the classroom when the students had “class time” once a week. The interviews were based on close in time observations. I asked questions about situations and tasks and showed photos of tasks on the blackboard. We also looked at tasks in their textbooks. The first and the last interview were based on a questionnaire about how they perceived their mathematics education and their own mathematical knowledge. In this paper the focus is on two students in the same class in grade 8, Ronaldo, who struggles to get access to mathematics, and Edward, who is in access to mathematics. Both students attend this school because it is the one closest to their home. Ronaldo describes himself as a student with learning difficulties “I have difficulties within all subject, and it’s like concentration and all that.” He perceives himself as someone in more difficulties than others and as easy distracted “if someone drops a pen I focus on that immediately”. He experiences that he keep forgetting stuff “I don’t remember, I have to repeat a lot”. Edward describes himself as a person that thinks mathematics is easy and don’t need much help at all. He does not have to put in any effort, mathematics works “automatically” for him and he “already knows” most of what they are doing in math class. This is described by Edward: “I see it in front of me, and then just ... buzzz... (points a finger to the head

and spins it) the answer just comes, basically”. Remembering is easy and “everybody says I am good at maths, but I don’t like it”.

Data analysis

In this paper twelve interviews, six with Edward and six with Ronaldo, and four observations have been used in the analysis. The observations were used as contextualisation for the interviews as well as for supporting construction of big Discourses. When analysing the data by asking questions to the text, both small and big discourses appeared. That is, the questions were asked to the text and the answers made stretches of language(s) visible, signalling for small discourses. When adding analysis of the data from the observations, such as text on the blackboard and the actions of the teachers, big Discourses could be construed. In the analysis three Discourses were construed, the discourse of assessment (described in Roos, 2018), the Discourse of mathematics classroom setting and the Discourse of accessibility in mathematics education. In this paper I will focus and describe one of the three Discourses, the Discourse of accessibility in mathematics education.

THE DISCOURSE OF ACCESSIBILITY IN MATHEMATICS EDUCATION

In the analysis, stretches of languages concerning access in relation to participation of the students in the mathematics education were visible. From the stretches of language, four (d)iscourses were construed, indicating a (D)iscourse of accessibility. The discourses are described below.

The discourse of tasks

Both Edward and Ronaldo talked about tasks and implicitly how the tasks influence their participation in the mathematics education.

Edward talks about not understanding a task during a mathematics lesson: “It’s not really that often that occur, I dare to say. Often I already know it, it feels like a lot of repetition, what we do.” He also talks about how the tasks on the black board do not challenge him:

- Edward: Yea, well, it might be that they (the teachers) don’t do super challenging tasks on the black board. They don’t. You can figure it out before...
- Interviewer: Would you like more challenging tasks on the blackboard?
- Edward: Yes, yes.. then you can learn something from it. If you have something a little little harder, then you can learn from it. Then you can sit down and begin to think.

Here Edward describes the tasks used as examples by the teacher in the introductions¹ as easy, and he does not get any stimulation to think, get challenged and learn by the tasks.

When Edward describes his feelings when working with tasks in the textbook he says: “It is just painful .. almost boring. [...] But then it also [depends on] what kind of task it is, some of them just sucks, yea!” [...] “Some of them just **doesn’t**² work.” Here he describes how the tasks influence his participation. When he describes tasks that are fun he connects it to calculate the resistance.

- Edward: I think it is exciting, an exciting area to see how much resistance, to find out the answer.
- Interviewer: So it is not the calculation?

¹ In Swedish mathematics classrooms it is very common that each lesson starts with an introduction, called “genomgång”. These introductions can even occur in the middle or in the end of the lesson.

² Bold text indicate an emphasize by the informant.

Edward: No, the calculation is just a tool and a way. It is fun to calculate with power and stuff like that, it's fun.
Interviewer: Why do you think that is fun, and not math's overall?
Edward: Yea, no but it because I am interested of [it], to calculate it. I am kind of not that super interested to calculate how much the water-park earns. It pushes [me] more.

Here Edward explains why the theme of the task is important, he needs to be engaged in the subject to an active participant.

Ronaldo talks about tasks as often complicated: "Some are more complicated. Like calculate the percentage of and then calculate, the percentage of, like, a number. No, well, I don't know, I think percentage is difficult, and to calculate the percentage." Also algebra tasks are challenging for Ronaldo, for instance when he attempts to solve $5x = 4X+8$:

Ronaldo: I would start by looking at what side has the most X:es.
Interviewer: Yea, and where is that?
Ronaldo: The five.
Interviewer: You can scabble if you want to.
Ronaldo: No, but I think.. I don't remember, first you sort of take minus five and change signs... minus four maybe ah... minus four... hell, I don't know...

Ronaldo tries to remember a procedure to solve the equation. When he doesn't remember he gets frustrated. He also talks about algebra tasks as boring, "with X and Y and everything". When Ronaldo describes his feelings when working with tasks, insecurity about how to approach the task is an issue: "when getting a task, to find out when to use multiplication or minus or plus or such - I feel insecure". Ronaldo describes hard tasks as: "Problem-solving and text. Then I usually get help by talking to the peer next to me about how to do it, and, in any case Edward, he is really good at math, and then I like to sit next to him also." Ronaldo gets teaching in reading comprehension to help him with those type of tasks since "it is often those kind of tasks I fail at, at tests."

Here Ronaldo expresses insecurity in how to approach tasks. He also describes how hard it is for him to comprehend problem-solving tasks involving text. Then he usually uses a peer to help him out. Edward is a peer he likes to get help from. The observations show that the tasks used in the education is most often tasks from the text-book.

The discourse of importance of the teacher

Both Edward and Ronaldo talk about the importance of the mathematics teacher and how the teacher can enhance or diminish their participation in the mathematics education.

Edward states that "it does!" make a difference what mathematics teacher you have. "I think the whole class thought that when we had another [math teacher]." Edward describes that his feelings about mathematics to some extent depends on the teacher: "I have never liked math's. 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."

Edward also talks about the importance of the teacher in order to challenge him at the mathematics lesson: "Then the lesson gets somewhat different, like when we had a substitute teacher who was a secondary teacher, I think that was great. [...] 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. [...] Because, we entered stuff I

think the ordinary teachers wouldn't have picked up, because it was easy to go one step further, because it was a little higher maths, which I don't think we had gone through." He felt that he learned a lot from the secondary teacher: "I thought it was good when we had that secondary teacher, then I learned a lot in the introductions." When he talks about his ordinary mathematics teachers he says;

Edward: They present a little too basic stuff I think.

Interviewer: But you want it more difficult?

Edward: Well a little more challenge, so you learn something from it.

Ronaldo describes the importance of the pace of the teacher for his possibility to participate: "if they take it nice and easy, like this. Sometimes they speak a little too fast and stuff like that." For him, in order to understand, it is important "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." He likes it when "she [the special teacher] does it really slow and methodical."

For Ronaldo to participate it is also of importance to get help from the teacher with reading. "Karen [the special teacher] also helps me quite good [with the reading]."

Also, for Ronaldo, it is important that the teacher listens to the students, what they want regarding tasks and ways to work. "because she [the math teacher] took us outside and did something called active math, then you are outside and do math's instead [...] it should be better if we were out sometimes ... it would be more fun. [...] She [the math teacher] was more like more like she understood what everybody said, really good. It was a lot of us who wanted to go out and have active maths like this, and then she did it.

The discourse to be (un)valued

In both Edward and Ronaldo's interviews stretches of languages of how they are valued. In Edwards case it is about how he perceives himself as sometimes not valued. This is visible when Edward in the end of two different interviews says the following:

Interviewer: Anything to add?

Edward: Well, it could be, that if you raise your hand in the introduction it can happen, it often happens that they [the teachers] let the ones that have difficulties answer, because they know... well, they know that he [meaning himself] probably knows the answer, so.. yea.. Sometimes you get a little frustrated when you are not allowed to say anything, but often it's okay. But then, when it is always the same person that raises the hand, it gets tedious.

Interviewer: Is it something special you thought of during maths today?

Edward: I think it may be that I didn't get to answer one single time

Interviewer: You didn't [get to answer]?

Edward: No, I didn't.

Interviewer: How did that feel?

Edward: It was a little so so... [...] Yea, well, it wasn't the best maths lesson.

To be unvalued is also visible when he reflects on when he answers a question in the classroom, what does he do? "well, then I answer it. But it's not that often they [the teachers] throw a question.. to me.. because, well they often throw it to the ones that do not listen." The observations support that during the lessons Edward often raise his hand, but do not get to respond often.

In Ronaldo's case it is not about being unvalued, it is about being valued and feel secure, which he doesn't feel in the classroom. "I am kind of nervous to say the wrong thing, - that somebody giggles kind of all the time or stuff like that" But in the small group he sometimes attends he feels secure and "dare to says stuff to, it feels like I am developing more [in the small group]". Hence, Ronaldo wants to be valued as a SEM-student and get special education in a smaller group sometimes. "It has become a lot better now, we have started to walk out in small groups [outside the classroom], which we didn't do before, and it is much better now. I concentrate better, and it is peaceful and quiet. "He feels valued and gets the support he wants, but sometimes he would like more guidance about when to participate in the small group.

Interviewer: Do you think it is good or bad to go out of the classroom with the special teacher?

Ronaldo: Good

Interviewer: Do you do it often?

Ronaldo: The times we can do it... no, but when I feel really secure I stay [in the classroom]. But if I feel in between, or a bit insecure, like don't really know, then I go

Interviewer: Do you decide by yourself? [if you should go away or stay]

Ronaldo: Yes

Interviewer: And how do you feel about that, that you decide on your own?

Ronaldo: Both good and bad. Sometimes maybe they know better how much I am able to do and such...

Interviewer: Yea, right, do you listen to them when they say something about it?

Ronaldo: They usually don't say anything about it.

Although, sometimes he does not get to decide by himself, like during test taking. "It is just decided that I do it in another room, mum and the others have decided that I shall go to another room because I concentrate better", and sometimes he gets "tips about when to join [the small group] or not". The observation notes show that during the semester it becomes more common that the special teacher has a little group in a small room next to the ordinary classroom during mathematics lessons.

The discourse of math is boring

Both Edward and Ronaldo talk about mathematics as something boring. Edward has quite negative feelings towards the subject and describes mathematics as "the most boring subject, because when we are going to math's class, then it feels like you just dig yourself down into the sand. You want it to pass. So you can get out of there". So, even though he finds mathematics "quite easy" he has "never liked math" and "don't think it is fun". For him, "math is more like staple food, without math you get nowhere, but then you can develop math in different areas." Meaning he uses math to find out other, for him more interesting stuff in for example physics. If he gets an excuse for leaving he is happy. "like now for instance, I got excited because I got away". A clue for why he thinks mathematics is boring can be seen in his answer to the question what is fun in math. "I think that when you are doing more practical stuff, then it is fun, instead of having the nose in the text book all the time." Also in his description of his ideal mathematics lesson. "Then you would have those whiteboards in front of you, and been sitting and sketching and experimenting. Because then it's much faster. Instead of keep turning pages, draw lines and write the number of the task and all that, these things take such a long time. I want to spend the time on math." Hence, to administrate mathematics challenges Edwards participation in the mathematics education.

Ronaldo expresses boredom in relation to listen for a long time.

Ronaldo: It was just a blank in my head.

Interviewer: It was a blank in the head? Does it happen a lot?

Ronaldo: Yes, it is so bloody much of introductions now. It is so boring, so you can't stand listening.

From Ronaldo's description of how he wants a lesson to be we can get a clue of what is boring.

Ronaldo: An introduction when you start a new [content], so, you should have an introduction starting something new, then when you come ([the next time] you work with that instead of having an introduction each lesson.

Interviewer: What happens when they always have introductions? [...]

Ronaldo: I listen, but it's hard, it is introductions all the time.

Interviewer: What is hard?

Ronaldo: Like listen...

Interviewer: Is it hard to understand?

Ronaldo: Yea, well not that much, but it just becomes messy when they have all these introductions all the time.

Interviewer: Do you think that you mix stuff, or what is it that becomes messy?

Ronaldo: No, but it is just that, it gets too much!

What Ronaldo is saying is supported by the observation notes where his body language (with a lowered head) and oral expressions with swear words and sighs signals that he is discontent.

When Ronaldo describes how he learns mathematics best, he contrasts it with when he doesn't learn.

Ronaldo: mmm... well like... 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 tedious or like boring like hell in the end. So vary things. [...]

Ronaldo: So, not just an introduction for half an hour and then work in the text book until the end [of the lesson]. Some lessons can be like that, but it's kind of like that all the time...

Interviewer: Is it your experience, that it is too much [of that]?

Ronaldo: Yes, yes... It gets so boring at the end, that you don't cope when it is too boring.

Thus, Edward and Ronaldo's participation is challenged by the fact that they perceive the mathematics education and how it is set up boring.

DISCUSSION – CHALLENGES AT THE BORDER OF NORMALITY

What is it about the four above described discourses (the discourse of tasks, the discourse of the teacher, the discourse to be (un)valued and the discourse of boring) which calls for a Discourse of accessibility in mathematics education? Well, all the construed discourses pinpoints issues in the education creating obstructions for participation of the SEM-students, implying obstructions also for access, or enhanced access, to mathematics. Hence, these students are challenged since they somehow are on the border of normal in the inclusive mathematics classroom.

The discourse of tasks show that the students are hindered by the choice of tasks, but in different ways. In Edward's case, the tasks do not challenge him, which hinders him from enhancing his learning in mathematics and doing unchallenging tasks is almost painful for him. Tasks that he values are tasks involving other subjects such as physics and tasks that are on a higher mathematical level. In Ronaldo's case he struggles to try to remember a procedure, and it seems the tasks do not help him to understand concepts. He also expresses insecurity in how to approach tasks and how tasks

involving text hinder him in his struggle to get access. Tasks that are valued by Ronaldo are tasks that are not too difficult for him and tasks that involves prior knowledge he is familiar with. The discourse of importance of the teacher highlights how vital the teacher is in the mathematics classroom. To be able to see every student as a human being, to engage them to participate and to make them feel as parts of something they create together. This is seen in how Edward wants something more of the teacher than the teaching, he wants the teacher to “tell a joke sometime” suggesting there is something else important than just the teaching. Edward also sees how different teachers can challenge him in different ways, for him it is important to be challenged. For Ronaldo it is important that the teacher listens to him and is vigilant about what he wants regarding tasks and ways to work. Also, that the teacher is “really slow and methodical”. The discourse to be (un)valued highlight the fact that Edward perceives himself unvalued in the classroom and feels discontent. He is not challenged, and he is not valued, which seem to create frustration. This might also be a reason for his negative feelings for mathematics. In Ronaldo’s case it is not about being unvalued, but the importance of being valued as a SEM-student, getting special education in a smaller group sometimes. He needs to feel secure when doing mathematics. This security is hard for him to get in the ordinary mathematics classroom, and he sees the small group as an opportunity and a secure calm space. The discourse of math is boring is partly explained by the three other discourses. If you as a student often get tasks that doesn’t challenge you, or challenge you to much, it gets boring. If you have a teacher who doesn’t see you as a whole person, but just as a student passing by, it gets boring. If you feel unvalued, or constantly have to struggle to be valued, it gets boring. For Edward one of the boring things is to never be challenged, and to spend the time on doing stuff he does not learn from, which can be seen in his statement “I want to spend my time on maths”. For Ronaldo it is to never really fully understand.

These discourses together paint a picture of challenges for accessibility for the SEM-students on the boarder of normality, which is manifested in Ronaldo and Edwards texts. The western way of teaching mathematics, the “one-size-fits-all”-education (Askew, 2015) does not fit these SEM-students, hence diversity is not embraced even though the school is set out to work inclusively. It seems that there are important issues to address regarding; the choice of tasks; the relations between teacher and students; the valuing of students voices in the classroom and the attitudes towards mathematics, to be able to enhance accessibility in mathematics education. This implies that it is not only the participation of the SEM-students who is challenged, also the actual mathematics education at the school is challenged. Meaning, in order to include every students in the mathematics education, and to promote equity, the education needs to address these challenges.

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