Educational settings in relation to special educational needs in mathematics

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This paper focuses on students in need of special education in mathematics (SEM students) and highlights teachers' and principals' reflections upon these students' construction of knowledge in relation to two educational settings: the regular teaching setting and the test setting. The findings indicate that SEM students' knowledge is legitimized only when displayed. However, there appear to be differences according to the specific setting. Different settings imply different knowledge representations, norms, and practices that need to be taken into account when reflecting, planning, and carrying out teaching in mathematics in relation to SEM.

Within special education research, issues related to the epistemic underpinnings within educational settings (i.e., epistemic climate) or the epistemic cognition of teachers and students in need of special education are often left in the background (e.g. Jordan et al., 2009; Kiely et al., 2014). The reason for this might be that when regarding students in need of special education, historically the focus has been on the individual student rather than on the epistemic climate. Epistemic cognition is considered as an inclusive term, which encompasses both the tacit mental representations about the certainty, simplicity, source and justification of knowledge (Hofer & Pintrich, 1997) as well as the higher-order cognitive processes by which individuals think about the forms of knowledge and knowing, together with its criteria and limits (Sinatra, 2016). That is, "how people acquire, understand, justify, change, and use knowledge in formal and informal contexts" (Greene et al., 2016, p. 1). These types of issues may play a crucial role for SEM students' construction of knowledge as well as for their teachers' pedagogical choices, willingness to promote

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inclusive education. Also what kind of discourse the teachers foster in different educational settings, such as a regular teaching setting and a test setting, play a crucial role (Greene et al., 2016; Maggioni & Parkinson, 2008; Silverman, 2007). For instance, teachers' understanding and knowledge of special needs education in mathematics (SEM), and SEM students, are both central aspects for the support given in the education (Scherer et al., 2016). Another related aspect for the support on an organizational level is the view of SEM and the knowledge of SEM students at the school (Roos, 2015), as well as the school's local interpretation of and realization of the national steering documents connected to mathematics education and special support (Alvunger, 2018). Relating this to a Swedish context, the interpretation of the national steering documents and realization in the Swedish school is largely the responsibility of the school principal. The principal functions as a pedagogical leader, governs and has the overall responsibility for acting upon and realizing the steering documents. This includes supporting all students learning through developing education, securing equity and leading the teachers' learning (Swedish Schools Inspectorate, 2019).

Organizational factors connected to decision making and governing of the school, as well as organizing and planning the teaching activities, both influence how aspects of teaching related to SEM are dealt with in practice. Through this, both the teachers and the principals are central in shaping and affecting the support and education provided for SEM students. Furthermore, how education and support can be developed and carried out is closely connected to the educational setting at hand. That is, school culture, the content and the form of teaching (such as assessment or regular teaching) are all important. Therefore, the overall aim of this study is to uncover teachers' and principals' reflections regarding SEM students' construction of knowledge in relation to the epistemic climates in two different educational settings, the regular teaching setting and the test setting.

The SEM student

The national curriculum in Sweden does not define which students are in need regarding mathematics, and by what measures such needs can be identified and met. However, overarching proclamations and laws, such as the United Nations Convention on the rights of the child (CRC) (Swedish Government, 1990), and the Discrimination act in Swedish law (SFS 2008:567) stress the importance of equal opportunities regardless of whether specific needs are stipulated. Also, the Swedish curricula (Swedish National Agency, 2018) is locally interpreted by schools and teachers regarding what knowledge is and how it can be developed.

Accordingly, while the student in need is in focus, the steering documents are not explicit regarding *what* knowledge is, *how* the students could be supported or *what* the educational needs in mathematics could consist of in the classroom. Instead, it is up to the local schools to define the SEM student and what constitutes knowledge and knowing in mathematics in relation to SEM students. In this paper we refer to SEM as the need for specific educational efforts other than what are offered in ordinary mathematics education, a need for specific education in order to optimize learning (Magne, 2006). Essentially, the need is understood as deriving from the accessibility, prerequisites and demands of the specific situation, implying that the student is *in* need of support, not *with* need (Bagger & Roos, 2015). Here being *in* need is used in relation to SEM in order to emphasize situational and social aspects of the need of support. This implies that a student can be in need regardless if the student struggles to get access to the mathematics presented in the classroom or if the student is in access to the mathematics presented, but needs something else in order to optimize learning (Roos, 2019).

The influence of epistemic climate in an educational setting

How the nature of knowledge and knowing is portrayed in the teaching practice and perceived by the students and the teacher refers to what Muis and Duffy (2013) call the epistemic climate. As such, the epistemic climate unfolds when learning and instruction occurs and affects the behaviors and outcomes of those who interact within this epistemic climate. Broadly, the term "epistemic climate" involves a reciprocal relationship between the epistemic cognition of students and their teachers (i.e., the tacit mental representations about issues related to the nature of knowledge, commonly referred to as epistemic beliefs, and the higher-order cognitive processes of knowing), as well as the epistemic underpinnings of the instruction (e.g. teaching strategies, formative and evaluative tasks, and educational approaches) and the knowledge representations (e.g. contents, as found in textbooks, worksheets, and curriculum). Some of the aspects of an epistemic climate might be implicit and rather embedded as "epistemic messages" in an educational setting. For instance, there might be embedded epistemic messages in the support given to students by teachers and the instructional approach, in teachers talk, or in authority structures in the classroom (Muis et al., 2016). Research shows that teachers' epistemic cognition has an impact on the epistemic climate of their classroom in terms of how they perceive the content knowledge, what instructional approaches they prefer, and how they understand their students as learners which in turn influences students' behaviors, motivation, and learning (Bendixen & Feucht, 2010).

Bricker and Bell (2016) state that, to be a successful student in educational settings, it is of great importance to be able to interpret and maneuver in the underlying epistemic climate of the classroom, which might differ depending on the subject taught or the type of classroom activity. The epistemic climate can therefore be perceived differently in a *regular teaching setting* compared to a *test setting* even though the subject in focus is mathematics. Thus, this may mean that the teacher interprets the student's construction of knowledge differently due to the surrounding context. Establishing and cultivating a positive epistemic climate through teaching is essential because the salient social influence in an epistemic climate has been shown to have great importance for the formation and development of students' epistemic cognition (Chinn et al., 2011; Muis et al., 2016). An over-reliance on the teacher as the authority or viewing an assessment as superordinate everything else might trigger students to engage in less adaptive epistemic cognition processes, which in turn may affect their interpretations of a certain epistemic climate (Muis et al., 2016).

According to Fives et al. (2017), teachers must not only engage in epistemic cognition to determine what they themselves know, but also use their epistemic cognition to assess the knowledge of their students and to understand the dimensions of that knowledge in each aspect of their teaching practice, including assessment, in different educational settings (i.e., an awareness of the epistemic climate and the reciprocal influence between its components). Moreover, teachers' beliefs may facilitate or hinder their teaching practice by serving to filter, frame, and guide their decisions, and actions in relation to their students and the content taught in the classroom context (Fives and Gill 2014). Also, principals' enactments of the steering documents are most likely influenced by their epistemic cognition. This in turn may have an impact on how the epistemic climates unfold in which students and teachers are part of on a daily basis. Moreover, principals have the overall responsibility to govern teachers' work with equity, students learning, and the schools' educational development (Swedish Schools Inspectorate, 2019). Taken together, teachers and principals are strongly contributing to the type of epistemic climate that unfolds, which may play a crucial role for the SEM students learning processes and how they embrace the complexity and evolution of knowledge.

Methodology

In order to understand how teachers and principals reflect upon SEM students' construction of knowledge in relation to the epistemic climates in two different and very common educational settings (the regular

teaching setting and the test setting), we focused on statements related to the nature of knowledge (certainty and simplicity) and the process of knowing (source and justification). Certainty concerns how fixed or fluid knowledge is, while simplicity regards knowledge as an accumulation of isolated facts or highly interrelated concepts. Source refers to where individuals believe knowledge originates and resides (that is, outside the self or actively constructed by oneself), whereas justification refers to how individuals consider a knowledge claim becomes justified knowledge via personal views (that is, what feels right), authorities or through the integration of multiple sources of information (Hofer & Pintrich, 1997).

Selection

The data in this article originated from two projects, which took place in different settings and circled around special educational needs in mathematics in some way. Teachers and principals' opinions and knowledge regarding SEM students and their opportunities to learn and/or display knowledge was considered important in both projects in order to explore the situation for students in need of special support in mathematics. In the first project, inclusion in relation to SEM was investigated at a primary school, Oakdale Primary School. This project investigated inclusion in general mathematics education from a teacher's perspective (Roos, 2015). The second project investigated the implementation of national tests in grade 3 in mathematics and how the tests impacted the students, and especially students in need of support (Bagger, 2015). The selection of data for this article from this project is from two primary schools, Pinewell and Juniper Hill Primary schools. Altogether, the selection of data from both above described projects consists of interviews with eight teachers and three principals from the three schools. The teachers and principals from Oakdale Primary school were interviewed about and accepted to participate in the study regarding the everyday teaching and learning in mathematics in relation to students in need of support. The teachers and principals of Pinewell and Juniper Hill Primary school agreed on and participated in the study that investigated how national tests affected students and especially students in need of support. The study at hand is considered as an extension of the original projects and in line with each project's original purpose. Original data has not been shared between researchers, beyond the anonymized transcripts that were analyzed. One school is located in the south of Sweden and the other two are located in the north of Sweden. The teachers all educate or all work with students in the third and fourth grades. The schools are characteristically different regarding socio-economic living areas.

O*akdale Primary School* is a primary school in the south of Sweden with pupils ranging from preschool class (six-year-olds) up to grade 6 (12-year-olds). At Oakdale Primary school, four teachers and their principal were interviewed individually about the regular teaching setting. School staff who were interviewed were Barbara (a special teacher in mathematics), Jonna (who teaches mostly in upper primary school), Ellie (who teaches in both lower and upper primary school), and Amanda (who teaches in the early years, is an educated primary teacher and has 10 years of experience). Conrad is the school principal.

Pinewell Primary School is a school with grades from preschool class to grade 9 (15-year-old students). Two teachers and their principal were interviewed individually. School staff who were interviewed about the test setting were Anne and Louise, both of whom teach in lower primary. Maria is the principal of this school.

Juniper Hill Primary School is a primary school with grades from preschool class to grade 5 (11-year-old students). At Juniper Hill Primary School, two teachers and their principal were interviewed individually. School staff who were interviewed about the test setting were Lena and Stina, both of whom teach in lower primary, and Kristine, the principal of the school.

Data collection

Conversations guided by focus areas were held with teachers in the two different settings (regular setting of the teaching and the test setting). Four of the teachers were interviewed in connection with their regular teaching, while the other four were interviewed in the context of the national tests. One of the principals was interviewed regarding the everyday teaching and the other two in connection to national tests. Initially, all interviewees were asked to refer to the given setting when answering and the questions that were the same in the two studies are: Who are the students in need? What knowledge do the students have? What do they need in order to develop knowledge? How do students express their knowledge? What may foster and/or hinder SEM students' knowledge? These were open ended questions where the teachers had the opportunity to talk freely, which made their view of SEM students' construction of knowledge available.

Data analysis

A content analysis was conducted after transcribing the interviews verbatim (Neuendorf, 2016). The content analysis focused on SEM students'

construction of knowledge and is explained in detail in table 1 below. Hence, differences in their statements are captured through a systematic exploration of statements related to the nature of knowledge and process of knowing (i.e., Hofer & Pintrich, 1997).

Table 1. *The three steps in the analysis*

Step 1	Step 2	Step 3
An identification of statements related to the construction of knowledge and an explanatory paraphrasing into groups of statements.	A search for concurrence, differences and patterns within and between groups.	Thematic summaries of what was characteristic for how teachers and principals reflected upon SEM students construction of knowledge in relation to the two different educational settings. These summaries are presented as narratives in the result section.
A cross reading of the selected statements was made by two of the authors followed by a discussion amongst the three authors regarding the grouping of statements in relation to theory.	A joint exploration by two of the authors generating thematic summaries were conducted.	The thematic summaries were reviewed by a third author in relation to theory.

The content analysis was performed with inspiration from Feucht and Bendixen (2010), where statements were identified and summarized with no predetermined categories in mind. The emergent themes were generated from the data itself, which means that the analysis was inductive. Initially in this study, a summary of statements relating to the nature of knowledge and process of knowing was made, which means a search for statements expressing the certainty, simplicity, source, and justification of knowledge (Hofer, 2000). In step 1, statements from the same school were kept together and statements from the test vs. the everyday mathematics, separate. It became clear that statements indicating SEM students' construction of knowledge to a greater extent dealt with the process of knowing rather than the nature of knowledge per se. Thereafter, an explication was done in order to reduce and clarify the statements into categories of explicatory paraphrases inductively. Finally, these categories were compared regarding similarities, differences and patterns regarding their internal relations, which resulted in a structure of underlying themes. As shown in table 1, the themes were constructed from statements regarding SEM students' construction of knowledge in relation to the test setting and the regular teaching setting. These two settings imply diverse epistemic climates and therefore influence SEM students' construction of knowledge differently, as well as how teachers

and principals reflect upon and evaluate SEM students' construction of knowledge. An example of this is how teachers in the regular teaching setting talked about how knowledge comes from the student herself, which was shown in talk about when a student remembers and knows by heart. This, together with other statements, ended up in the theme "knowledge resides within the SEM student".

Results and analysis

The thematic summary of characteristic expressions found in the iterative analysis process (step 3) ended up in three themes, which are presented as headlines below: *SEM students' knowledge becomes legitimate and justified when displayed; knowledge resides within the SEM student; and knowledge resides within the learning environment*. These themes were all found in the two settings and in different interviewees answers, hence expressions from both settings are presented in all three themes. All the quotes are from the interview transcriptions of either the test setting, or the regular teaching setting.

SEM students' knowledge becomes legitimate and justified when displayed

This theme was constructed since the analysis contained many statements dealing with the justification of knowledge. Within this theme, all statements concerned the need for SEM students' construction of knowledge to be visual and be made explicit in both settings. From the interviews held in connection to the regular setting of teaching, all four teachers talked about SEM students' knowledge in mathematics as something visible. They talked about how knowledge needs to be justified by accountable measures. What could be measured was referred to either as written or spoken knowledge displayed by the students in the regular teaching setting, or expressions of knowledge in written tests. Barbara, a special teacher in mathematics, said "It shows that she [a SEM student] has passed test 2" and Jonna, a class teacher, said, "They [the SEM students] have difficulty keeping up [in the classroom] and know the foundational knowledge". A form of knowledge was how to handle methods in mathematics – algorithms, for example – which was expressed by the class teacher Ellie: "If she [a SEM student] does algorithms she solves every task". Hence, a form of visual communication of knowledge was important to know what the students know.

The need for visual communication of knowledge was also spoken about in the test setting at both Pinewell and Juniper Hill Primary Schools. Here, issues of responsibility become obvious: the teachers are

responsible for making it possible for the students to display knowledge, and the students have the responsibility to do their best. The teacher appreciates a student who tries his or her best. For example, Stina's experience was as follows: "He [a SEM student] really wants to [pass the test], but he gets it all wrong. He really wants to. There are many circumstances that lead to not having the strength to focus". Another story was when the teacher felt that the student was not trying their best, or could do better: "So, then the individual development plan and the evaluation of his knowledge will show this accordingly. If he does not display knowledge and do not say anything, this is what follows". The teacher is also responsible for setting restrictions and arranging support within the organisation. That is, to allow second-language learners to display knowledge with the help of the second-language teachers, as Anne concluded:

> It is only a limited time we have her [the second-language teacher], only at some of the test occasions she can be there, and many need her. It must fit with the time we actually have the test. But ... when it comes to mathematics and to text and concepts, it would have been perfect to have an interpreter at hand. Much is hindered by language; that is just the way it is ...

Further, it is the principal's responsibility to judge and make decisions based on meta-analyses by special education teachers, on areas in mathematics, and how different groups display knowledge. Testing was highlighted as important and central for education. This kind of approach, where testing is predominant, can lead to students having less adaptive and productive approaches towards knowledge and learning, which makes it harder for them to maneuver different epistemic climates (see Bricker & Bell, 2016; Muis et al., 2016). The importance of knowledge as visible and explicit in order to be counted was also evident in relation to the teacher's knowledge and awareness of students' ability to achieve results, although this still needed to be verified through testing. As the principal Kristine stated: "It is a learning process to get the confirmation as a pedagogue. What I myself perceive and think is reassurance that we are on the right path, that we are teaching the things we should". Maria, the principal at Juniper Hill Primary School, also indicated this, saying: "My most important responsibility comes when we are analysing this, when we know how it went and what we can make of it and what we should have to consider going forward". Maria also pointed towards the endgame of these preceding efforts as managing the next national tests for these students: "Because the goal is that they manage the test in the fifth grade, and what should we then do in between?"

Knowledge resides within the SEM student

This theme was constructed since the analysis revealed statements concerning the source of knowledge as residing in the SEM student, which were apparent in all four teachers' talk about SEM students' construction of knowledge in the regular setting of teaching. This was shown in various ways, such as saying that the student has; "automatized knowledge" (Barbara), "the mathematical vision" (Ellie, Amanda), "internalized the foundational knowledge" (Jonna), and the student "can keep it in memory" (Amanda). In addition, Amanda, Ellie and Jonna all referred to knowledge in mathematics as "levels", both the mathematical level of the individual student (Ellie, Jonna), and not being able to fit the level in the teaching of mathematics to the SEM students (Amanda), indicating a specific path to be followed in the learning.

In the test setting, there is a connection between the SEM student as a source of knowledge and how justification of knowledge is talked about among teachers and principals. The purpose of the test results is according to the principal Maria: "to assess how you [the SEM student] reach the goals and to what extent and how long you [the SEM student] have reached in your development". Interestingly, when students exhibited lower scores than the standards of the test, and teachers had expected so, this generated reflective and critical questions about why the student had achieved such a result. The same did not apply to students who demonstrated higher knowledge than expected in relation to the standards, as Lena concluded:

> When it comes to students who struggle, we already knew ... but some achieved better than we expected ... But if I had been surprised I would have had to act, they were often better than I thought. You got a confirmation of where you have them.

The statement above reveals an ambivalence in relation to the measured achievement of the SEM student regarding the trustworthiness of the test. On the one hand, she relies on the test results when the SEM student shows a higher achievement than expected, while on the other hand she is more critical of the test results when the SEM student shows lower achievement than expected. This example illustrates that students' measured achievement affects how teachers talk about SEM students' construction of knowledge and that the knowledge resides within the student, but it becomes reified when displayed in the test. A student who shows an achievement that is lower than expected, is often talked about as being able to show higher knowledge at other times. Yet, the test results can still be trustworthy. However, when a student shows higher achievement, the measured achievement of knowledge is not questioned.

Knowledge resides within the learning environment

This theme was constructed since the analysis revealed statements about how the source of knowledge resides in the environment. That is, knowledge resided in the materials, the teacher, decision makings, organisation of resources, and so forth within the regular setting of the teaching. For example, in the regular teaching setting Ellie talked about knowledge of methods, and the actual method as a source of knowledge. Similarly, Barbara, the special teacher in mathematics, also referred to a source of knowledge in the environment, in the teacher and in the teaching methods. An interesting issue appeared when looking at the view of the principal, Conrad. He considered the mathematics teacher to be the source of knowledge, just as Barbara referred to it, but also the specific knowledge of SEM residing in the special teacher, and in the special pedagogue. Conrad said: "you have a special pedagogue or a special teacher or another teacher with specific competence in this (the specific mathematical area) who runs a course for students in special needs". Accordingly, the principal talked about the knowledge of the teachers rather than the knowledge of the students.

Statements from interviews in the test setting indicate that, in this setting, the teacher is the predominant source of knowledge. This is the case since the teachers' knowledge provided the prerequisites for the student to be a source of knowledge him/herself while taking the test. One example is how the principal Maria described the impact of teachers' approaches towards students: "You have to have rather high expectations on children. Expectations govern a little ... If you expect that they will reach up to here (measures high with her hand), instead of an approved level ... then they will reach higher". Also, the school's teaching methods and organisation were evaluated, something that all of the interviewees mentioned. For example, the principal Kristine said:

> What we also want to do is to see if we can see any difference from last year, because we had another way of working that year. Above all, we talk about how they organised the teaching, ways of working, methods, books ... not the individual student at first hand.

Thus, the learning environment, as part of the epistemic climate, is emphasized as the mediator of and source of knowledge. In the interviews, this is connected to specific areas in mathematics that have been tested and to the students as a group. As Maria said:

> It is a confirmation that you have been working with the right things. It was obvious when we compiled the results in the district. At one school that had not gone through certain areas, this was

> visible in the results. My teachers then knew that they had done what they should.

In this way, the tests which are considered as knowledge representations in an epistemic climate are superordinate as the valid source about students' knowledge – a source that is relied upon to the extent that it governs and directs the teaching methods, areas and content. At the same time, the tests as the valid source about students' knowledge are questioned: "What does this tell us that differs from what other assessment materials tell us, and suddenly these national tests come and they are the only and sacred way of assessing knowledge?!" (Maria). The tests as a source of SEM students' knowledge govern and regulate decisions of resources and connect these decisions to achievement, as the interviewees indicated. Teachers use test results to stress the urgency of educational actions and principals use the results to re-organize resources. Nevertheless, it is not politically correct to refer to a lack of resources as an explanation for students not reaching goals. This is displayed, for example, by Maria, who stressed that teachers might refer to a lack in organisation as something that makes them less responsible for the results: "Teachers might claim that we need more resources and more teachers, we are too few". In the same breath, Maria stated:

> We have many students who are low-achievers in that group [meaning a specific class]; is it then maybe best to change teachers in the group, put in more teachers, or is it better to give the teachers counsel from the special education teacher in order to be able to move forward?

The conclusions drawn from the tests regarding students' and teachers' knowledge indicates that there might be tensions built into the chain of conclusions drawn from the test as a valid source of SEM students' knowledge and the connection to the quality of the mathematics education.

Summary of results

In sum, the investigation of statements concerning the SEM students' construction of knowledge in relation to two common educational settings with different epistemic climates – the regular setting of the teaching and the test setting – led to a construction of the following themes; *SEM students' knowledge becomes legitimate and justified when displayed; knowledge resides within the SEM student; and knowledge resides in the environment*. Hence, the results reveal similarities and differences regarding how teachers and principals reflect upon SEM students' construction of knowledge in the setting of regular teaching and of tests.

Similarities were shown in the focus of knowing as the observed achievement in both settings, and development of knowing compared to an expected or normal development. A difference between the settings was seen in the statements from both teachers and principals regarding the source of knowledge. In the setting of the test, the teacher as the source of knowledge was talked about as a founding prerequisite in the SEM students' construction of knowledge. In the regular teaching setting this understanding of the teacher as the source of knowledge was uncommon. Instead, expressions that pinpointed the SEM student as the source of knowledge were predominant. A difference between teachers and principals is shown in how they talk about the teacher as the source of knowledge. The principals refer to teachers as the source of knowledge for the SEM students' construction of knowledge to a greater extent, whilst teachers referred to the individual SEM student, the test, materials or methods as the primary source of knowledge in SEM students' construction of knowledge.

Discussion

The themes constructed in the results – *SEM students' knowledge becomes legitimate and justified when displayed; knowledge resides within the SEM student; knowledge resides in the learning environment* – seem to vary depending on the educational setting, indicating different underlying epistemic climates in the two common settings. The variation is seen in how teachers and principals talk about where knowledge resides and how the knowledge must be displayed. Hence, as Feucht (2010) argued, it is plausible to expect that teachers' and principals' thinking of students' construction of knowledge are closely connected to the educational setting, which may imply the need to take into account different knowledge representations (concerning the epistemic messages of educational resources such as curricula, textbooks, evaluation tools, assessments, etc.). Due to the apparent knowledge representations, the instructional approach and support given to students, teachers' talk, and authority structures in the classroom may differ and implicitly create a variety of knowledge norms and practices in an educational setting. In this study, a more fixed approach to SEM students' construction of knowledge is seen in the test setting compared to the regular teaching setting, whereas a more flexible approach could be noted. With a flexible approach in the regular teaching setting, we refer to a more tolerating way of using tools, mediating artefacts etc. in order for SEM students to construct and display knowledge.

Despite differences in statements of SEM students' construction of knowledge in the two educational settings, similarities were also observed. One such similarity is seen in the theme *SEM students' knowledge becomes legitimate and justified when displayed*. It seems that when students show their knowledge explicitly, preferably in writing, the knowledge is more legitimate, justified and "real". Nevertheless, the teachers and principals displayed more of a permissive and flexible view on how knowledge can be displayed in the regular teaching situation. This stands in contrast to the test situation, in which the way that knowledge should be displayed is regulated by test instructions which they are expected to follow. Hence, the epistemic aspects within an educational setting governs what kind of knowledge is legitimate and justified due to the specific educational practice (Chinn et al., 2011; Muis & Duffy, 2013). That is, the interplay between different implicit and explicit aspects of knowledge and knowing within the epistemic climate influences what can be regarded as knowledge.

Another similarity is shown in the descriptions of the learning and achieving of knowledge in mathematics as residing within the individual SEM student. Development is described as a path or a way forward with levels of achievement to aim at. These paths or ways are supposed to be followed and are made visible through assessment. Knowledge is expressed as a kind of destination – something that will be reached by following the path. If the teacher does not make it possible for the student to walk on the path and be able to navigate in the epistemic climate, the student will be "missing out" on knowledge (Bricker & Bell, 2016). One supposition is that this way of viewing knowledge in mathematics derives from the knowledge demands in the national curriculum, which points out what to know and when. Additionally, mathematics textbooks in Sweden are structured in levels and sequences, which, as Feucht and Bendixen (2010) suggested, could be seen as the knowledge representations in an epistemic climate. This in turn may have an impact on the teachers' epistemic cognition, their interpretation of the teaching assignment and how they include and support every student in their teaching. If only focusing on given levels and sequences in for example textbooks and curriculum, the SEM students will most likely not benefit since it promotes labelling and grouping of students (Solomon, 2009) instead of promoting equity by valuing diversity. This kind of approach, where testing and grouping of students is predominant in the governing of education, can lead students to engage in less adaptive and productive approaches towards knowledge and learning, which makes it harder for them to maneuver different epistemic climates (see Bricker & Bell, 2016; Muis et al., 2016).

In both educational settings, when teachers talk about how the source of knowledge resides in the learning environment, the importance of the teacher and the teaching in relation to SEM is highlighted. In the test setting, the source of knowledge is described as residing mainly at an organizational level. Meaning, the way to enhance knowledge is to develop teaching at the school and transfer this to the teachers' practices. In the regular teaching setting, the carrier of knowledge is described as the individual teacher and the methods they use on a classroom level. Hence, the focus is on ways of teaching mathematics to every student in the classroom, with the intention of reaching all students by the same methods and teaching, although this might not always be optimal for the individual SEM student.

The investigation of principals' reflections regarding SEM students' construction of knowledge in the two different educational settings, showed how principals to some extent, thought that the teachers were the source of knowledge for the SEM students' construction of knowledge. This could be due, for example, to how they interpret potential tensions among curriculum goals, national assessment, their expectations for the knowledge students should demonstrate, and how they implicitly consider their own knowledge of the subject matter.

Methodological and theoretical concerns

Since this article includes data originating from two different studies and focuses on two different educational settings in mathematics, the result and the conclusions drawn are obviously affected. The two different studies did not initially have any theories connected to epistemic matters or epistemic climate; instead, discourse theories influenced by ethnographic approaches were used in both studies. This helped us to obtain rich and extensive data, though not pre-designed for the particular aim of this article. While this can be seen as a weakness, it did make it possible to investigate teachers' and principals' reflections regarding SEM students' construction of knowledge within two different educational settings in greater depth and breadth. Both studies focused on the same issue (SEM) and interviewed teachers and principals in primary schools. However, since the study only included 11 interviews conducted at three different schools, there is a limitation to the conclusions that can be drawn. Though, since the findings indicate that different educational settings imply different epistemic climates with a variety of knowledge representations, norms and practices, it can be claimed that these epistemic aspects need to be taken into account to a greater extent when reflecting, planning and carrying out teaching in relation to SEM.

A critical issue is that none of the studies comprised of data that can be compared; instead, the data can give us an idea of how SEM students' construction of knowledge can be considered as setting-specific, in mathematics education. Hence, epistemic climate has been a useful theoretical lens through which we were able to better understand the teachers' and principals' reflection regarding the SEM students' construction of knowledge in the two educational settings. This provides insights into how knowledge norms and settings might influence SEM students' knowledge development in the long turn. Although there is a lack of research into issues related to the epistemic underpinnings within educational settings in relation to SEM, the scarce research that exists (e.g. Jordan et al., 2009) points in the same direction as the result in the present article. That is, from teachers' and principals' perspective, SEM students' possibilities to construction of knowledge are most likely affected and regulated by governing knowledge representations in different educational settings (i.e., epistemic climates).

Conclusions and implications

What insights have we gained from this investigation? We note that there are some differences according to the perceived epistemic aspects of the two educational settings. An understanding of the often–implicit epistemic aspects within an epistemic climate needs to be made more explicit to SEM students in order for them to better navigate in the epistemic climate. Students can be given possibilities to explicitly reflect upon their own and other peers approaches to knowledge and knowing in relation to different mathematical contents, educational settings etc. as a way of promoting productive approaches towards knowledge (Muis et al., 2016). Moreover, as highlighted before, an awareness of the epistemic climates influence on students' learning, as well as on teachers' reflections, planning and carrying out teaching can be considered as especially important when dealing with students in need of support in mathematics. Hence, how teachers and principals in school relate to knowledge and knowing in mathematics in different educational settings is important for how mathematics education is socially fabricated.

Mathematics teaching needs to take diversity of knowledge as a point of departure in teaching (Askew, 2015), and as this study shows, also as a point of departure when reflecting on epistemic aspects in different settings. In other words, we need to move from focusing difference to embracing diversity in educational settings when talking about SEM students construction of knowledge. Consequently, the value and legitimation of knowledge and teaching of SEM students' needs further exploration and problematization.

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