

When does a difference make a difference? Teaching about language diversity in mathematics teacher education

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There has been little attention in mathematics education research about how to include issues to do with language diversity in teacher education. This paper describes the process used by two teacher educators to examine their own practices of linking multilingual perspectives to mathematics education in their work with preservice teachers. By systematically analysing their discussion about a three-hour, mathematics-teacher-education workshop on proportional thinking, the teacher educators were able to identify a series of Discourses. They considered that these Discourses underlay their decision making about how language diversity could be raised with preservice teachers. The results highlight the complexity connected to raising language diversity issues in mathematics teacher education. For example, deciding what challenging content should be provided to preservice teachers is affected by the need to develop relationships with them as well as managing their learning. Joint reflection by the teacher educators was needed to ensure that the aim of challenging preservice teachers about how to deal with language diversity issues in mathematics classrooms could be achieved.

Learning mathematics through a language, which may or may not be the students' first language, has been a research concern in mathematics education since the 1970s (see for example, Austin & Howson, 1979). In Norway, many classrooms include students who speak a range of languages (Burner & Biseth, 2016; Thomassen, 2016). Yet Burner and Biseth (2016) found that Norwegian teachers enacted practices that did not reflect how they considered language diversity should be supported. Although Thomassen (2016) found that preservice teachers were critical of the teaching provided to students with language diverse backgrounds, they "did not necessarily have the system knowledge needed to

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implement alternative strategies. Students also state that they have not encountered this topic enough in teacher education, either in discipline education or in practice” (p. 15, own translation).

World-wide, there has been a recognition that teacher education programmes need to include understandings about how to work with language diversity in mathematics classrooms (see McLeman, Fernandes & McNulty, 2012; Aguirre et al., 2013; Essien, Chitera & Planas, 2016; Thompson, Kersaint, Vorster & Webb, 2016). However, research, both within mathematics education and in general education, over the last twenty years indicates that it is difficult to provide mathematics teacher education that situates language diversity as a resource and challenges preservice teachers’ views about language diverse students (Taylor & Sobel, 2001; McLeman et al., 2012; de Araujo, Smith & Sakow, 2015). In an auto-ethnographic study, Meaney (2013) identified the contextual factors that supported her to discuss interculturality in mathematics teacher education in three different countries. She identified that she had to pay attention to: societal context for dealing with inequities; knowledge about resources; relationships with local schools; and relationships with preservice teachers. This work validates the claim that “learning of teaching about teaching needs to extend beyond personal knowledge construction” (Loughrun, 2005, p. 13) and be seen as both influencing and being influenced by wider societal discourses.

Gee (2011) labelled wider societal discourses as “Big D” Discourses which are represented through language and social practices, such as ways of thinking, evaluating, acting, and interacting. As Parks and Wager (2015) stated, “the more often we see an idea reiterated in the discourse, the more likely the idea is to be taken-as-true by members of the discourse community” (p. 127). In regard to teacher practices, Discourses are the understandings about what should be the case, that teacher [educators] “accepted, adapted, called on and refracted” (Baker & Johnson, 1998, p. 232) and as “such Discourses are sense-making resources with which the teachers could talk professionally about their work” (p. 233). Understanding what impedes teacher educators making changes to their practices requires an understanding of the Discourse that they use to justify those practices.

The complexity of navigating between competing Discourses can make it difficult to adapt teacher education to include language diversity issues in meaningful ways. Essien et al.’s (2016) research indicated that teacher educators, even when they were aware of language diversity issues, did not change their teaching to utilise the language resources of the preservice teachers, nor discuss with them how to work in multilingual classrooms.

The studies in the three countries have shown that the mathematics teacher educators' practices do not focus on the practices that would induct mathematics student teachers into teaching mathematics in multilingual contexts. Further, these studies have shown that being aware of the multilingual context does not necessarily imply the adoption of multilingual practices in the classrooms. For example, all the mathematics teacher educators are aware of the multilingual nature of their classrooms, but their practices do not include systematic responsive practices such as harnessing the diverse students' languages. (Essien et al., p. 116)

It, thus, seems that even when teacher educators are aware that they could raise issues of language diversity with their mathematics preservice teachers, they did not do so. We wanted, therefore, to identify how the societal Discourses, that we seemed to have adopted as common sense understandings about how the world should be, affected our practices and find ways to challenge them. Consequently, we wanted to research our own teaching about language diversity issues in mathematics teacher education courses in order to identify what hindered our adoption of practices to achieve our aims. We wanted to find out "when does a difference make a difference" in regard to understanding our own work. Our research question is:

- How do Discourses affect mathematics teacher educators' decision making about raising issues about language diversity with preservice teachers?

Teacher education and language diverse mathematics classrooms

We use Zaslavsky and Leikin's (2004) version of the teaching triad, representing the nested nature of mathematics teacher educators' work (figure 1) to frame our investigation about how Discourses affected our decision making. The teaching triad had three components: managing mathematics teachers' learning; sensitivity to mathematics teachers; and providing challenging content to mathematics teachers. Adapting the original teaching triad of Jaworski (1992), Zaslavsky and Leikin (2004) highlighted the need to provide challenging content to mathematics teachers in order to improve their management of the three components of teaching in school classrooms. To provide this challenging content, mathematics teacher educators had to manage the mathematics teachers' learning, by determining how the learning should be organised and by making decisions about what to teach when, as well as "classroom values and expectations" (Jaworski, 1992). To do this, teacher educators need

knowledge of the needs of preservice teachers. Zaslavsky and Leikin (2004) went on to further develop the teaching triad in regard to offering more challenging mathematics problems to school students. However, as our aim was to explore the Discourses that affected our decision making, we chose to use their initial version of the teaching triad of mathematics teacher educators (see figure 1).

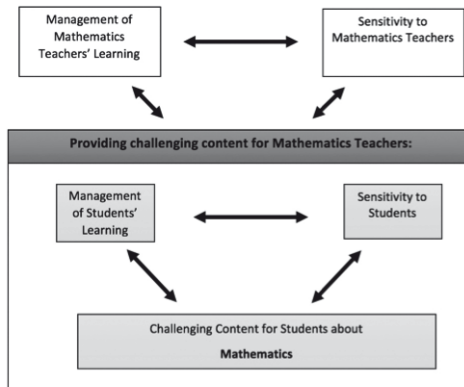


Figure 1. *The teaching triad of mathematics teacher educators (adapted from Zaslavsky & Leikin, 2004, p. 8)*

In our study, we consider challenging content to be language diversity issues in mathematics classrooms. One of the decisions we, as teacher educators, had to make was about what constitutes relevant knowledge and skills about language diversity in mathematics classrooms. Previously, Thompson et al. (2016) had focused on aspects of language learning in mathematics classrooms, while Meaney, Trinick and Fairhall (2011) used the ideas about pedagogical content knowledge (Ball, 2001), to identify the knowledge that mathematics teachers need about language learning. Meaney et al. (2011, p. 211) suggested that teachers needed:

- Knowledge of mathematical language (mathematics register)
- Knowledge about students' mathematical language (which includes the development of mathematical language)
- Knowledge about teaching mathematical language

In these examples, the focus is on how to respond to school students' language issues in learning mathematics. This kind of research normalises, as a Discourse, that teaching, both at the teacher education level

and at the school level, should focus on multilingual students because they are the ones with language problems, which must be fixed. Such a Discourse contributes to the construction of the "deficient multilingual child" (Halai, Muzaffar & Valero, 2016) and through focusing on what these children cannot do "the intention of helping diversity also has the effect of undermining its very existence" (p. 281). Rather than supporting multilingual children to participate in mathematics classrooms, this Discourse situates these children as not having appropriate resources to contribute to their learning of mathematics. Therefore, there is a need to problematize Discourses, which allow privilege to operate so that linguistic diverse students are excluded from mathematical learning opportunities (Thomassen, 2016). If equity and social justice are to be improved in mathematics education, there is a need for teacher educators to better understand how their decision making is affected by Discourses that lead to social injustice rather than justice.

In contrast to approaches which focus on deficiencies, Aguirre et al. (2013) described a project in which they worked with preservice teachers to identify how "the knowledge, skills, and experiences found in students' homes and communities – can support their mathematical learning" (p. 179). Aguirre, et al. (2013) suggested that the need to respect mathematics learners' backgrounds and to be sensitive to students has arisen only recently from the joining of discussions about equity in mathematics classrooms and engaging students in deep mathematics (see also Meaney, 2018). They found that students' out-of-school experiences could be used as a resource in mathematics teaching, but preservice teachers needed support to identify possible experiences and to develop them in meaningful ways. Thus, we considered the challenging content knowledge that preservice teachers needed had to include a broader perspective on what language diversity issues were and how they should be tackled.

Background

The data came from an audio-recorded discussion between the two authors about a 3-hour video of a mathematics workshop on proportional thinking in a course for preservice teachers, who wanted to work in the first seven years of Norwegian schools. The course, but not the workshop, was compulsory.

The workshop, in April, 2015, was filmed by Andrea who recorded Tamsin's work with the preservice teachers. At the time, Tamsin had been in Norway for just over 6 months and was not fluent in Norwegian and so taught the workshop in English. Although none of the preservice teachers had been taught mathematics previously in English, they had chosen English as their main teaching subject and so could be considered

fluent in English. As she had done throughout the course, Tamsin chose activities to raise awareness of different aspects of teaching in language diverse classrooms. The activities for this workshop were designed so that they promoted discussion and critique of the contexts used for teaching proportional reasoning and how resources, such as pictures, could be used to support mathematical understanding of students, learning Norwegian as a second language. Giants, from the fairy story Jack and the Bean Stalk, were the context for discussing proportional reasoning. The preservice teachers began by calculating the height of a giant from a handprint¹. Crocodiles with different growth patterns, described as living on the giant's crocodile farm, were used to compare rates of change². Language diversity issues were raised in regard to whether images of fairy stories always represented giants with dark skin. During Tamsin and Andrea's discussion of the workshop, the question – when does a difference make a difference? – was used to critique aspects of the video and to identify alternative opportunities for raising language diversity issues.

Methodology

A year after the workshop, Tamsin and Andrea used the video as a starting point for a 3-hour discussion, which included Andrea's reflections on her own teaching practice. We then analysed Andrea's initial notes of 25 points made in the discussion. Each point marked a chronological topic of conversation. Sometimes similar topics were raised several times during the discussion, however they were noted as individual points. As the analysis progressed, the audio-recording of the discussion was listened to again and the 25 points elaborated in a closer transcription.

Discourses are embedded into the taken-for-granted understandings of the world, making them difficult to identify. Therefore, we chose to use a three-step analytical process (see figure 2), to identify the Discourses that we seemed to have unconsciously adopted as beliefs about mathematics teacher education and which affected our decision making. We began by classifying the 25 points into the three components of Baker and Johnson's (1998) framework for interview talk. From this classification, we identified several themes. After further discussion and reflection, we considered that the themes reflected contextual features, such as teacher education. We then re-read and discussed again what seemed to be driving our decision making about these contextual factors. This process supported us to identify the taken-for-granted Discourses, which affected our possibilities for providing more challenging content to our preservice teachers on language diversity issues.

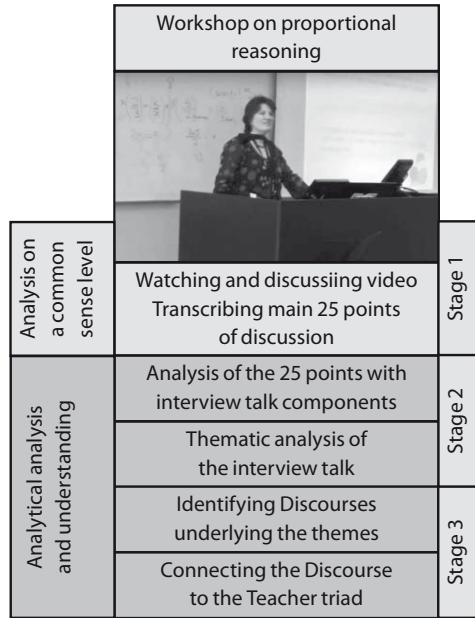


Figure 2. *Three-step analytical process for identifying Discourses*

The 25 points (Pt) from the discussion of the video were first categorised using the three components of interview talk (Baker & Johnson, 1998). We used interview talk because it allowed both of us to contribute perspectives about our own practices to the discussion, "in talking about practice, interviewer and interviewee can deconstruct and prospectively, imaginatively, reconstruct the grounds of professional activity" (Baker & Johnson, 1998, p. 239).

Interview talk has three components: *metacommentary*, *practices of accounting* and *action in pedagogical space*. *Metacommentary* is about making sense of practices, without necessarily changing them. *Practices of accounting* appear when participants offer reasons, justifications, motivations and outcomes of their actions. Baker and Johnson (1998) suggested that teachers account for their professional practice, due to the moral responsibility connected to their assumed duty of care towards students. They exemplify that a change in Discourse occurs when the moral responsibility in practices of accounting move from personal responsibility to external frames. *Action in pedagogical space* is identifiable when the interview talk becomes an explicit form of practicing professional knowledge by discussing alternative practices. Baker and

Johnson (1998) stated, "talking about teaching was action in pedagogical space: a place for reformulation, renewal and recasting subject English as it could be enacted" (p. 233). In our study, the subject English is replaced by "mathematics teacher education about language diversity". Our discussion included proposing alternative actions or teaching practices for preservice teachers to challenge their ideas about language diversity in mathematics classrooms.

Using the categorisation of metacommentary, practices of accounting and action in pedagogical space (Baker & Johnson, 1998), we re-ordered aspects of the 25 points so that themes that ran across the interview talk categories were clearer. The themes that came up in the discussions were: teacher educator; mathematics teaching; contexts for learning mathematics; raising issues to do with diversity; and language for teaching/learning/using mathematics. Table 1 provides an example from the theme Teacher educator.

Table 1. *Table of initial analysis of discussion points*

Themes	Metacommentary	Accounting	Pedagogical Space
Teacher educator	Pt15 Andrea: I don't know if the three components in your classroom model: pedagogy, mathematics and the critical perspective – which is something that you really need, I don't know if that is part of every classroom here. In teacher education in Norway in general ... is that a point? Tamsin: it is an important part of who I am as a teacher educator. I need to do this, if we take equity issues seriously.	Pt13 (The video showed a discussion between Tamsin and the pre-service teachers about fairy stories and gender) Tamsin: Here we talk about who is normal? An understanding of diversity. A point with the metadiscussion, why use fairy stories. It allows for other types of critical discussions. You don't have to be explicit. I did try to take that up.	Pt25 I need to do more of that, maybe it's because I am apprehensive about forcing that issue.

We then discussed the themes again in order to identify what seemed to drive our decisions about them. For example, we considered that the taken-for-granted understandings about the role of teacher educators that can be seen in Table 1 was to do with teacher educators needing to raise critical issues about diversity as part of their roles. In the comment connected to pedagogical space, sensitivity to preservice mathematics teachers could be a hindrance to raising these issues.

When we could identify a particular taken-for-granted understanding in more than one theme, we labelled it a Discourse, as we presumed that they did not reflect our own idiosyncratic beliefs but rather wider

societal understandings about mathematics teacher education. The Discourses that we identified were: *mathematics teacher educators should raise critical issues*, including those of language diversity, with preservice teachers; *the importance of knowing mathematics*; *mathematics teaching should support students with diverse backgrounds*, including diverse language backgrounds; *the need to respect mathematics learners' backgrounds*; and *the importance of teacher educators reflecting on their practices*. Table 2 shows how the themes and discourses were related. Understandings about *mathematics teacher educators should raise critical issues* appeared in only one theme, that of teacher education. However, it appeared so often in this theme that we decided that it should also be labelled a Discourse.

Table 2. *Relationship between themes and Discourses*

Themes	Discourses				
	Mathematics teacher educators should raise critical issues	The importance of knowing mathematics	Mathematics teaching should support students with diverse backgrounds	The need to respect mathematics learners' backgrounds	The importance of teacher educators reflecting on their practices
Teacher educator	X	X			X
Mathematics teaching		X	X		X
Contexts for learning mathematics		X	X	X	X
Rising issues to do with diversity				X	
Language for teaching/learning/using mathematics		X	X		

The final stage of our analysis involved considering how the Discourses were linked to the different components of the teacher triad. This enabled us to see how different Discourses interacted and in some cases impeded our aims of providing preservice teachers with challenging content about language diversity in mathematics classrooms.

Results

In this section, we discuss each of the Discourses and their relationship to the Teaching triad of mathematics teacher educators. In the Conclusion, we discuss how the intertwining of the Discourses affected our decision making.

Mathematics teacher educators should raise critical issues

As noted in the example earlier, this Discourse reflected our taken-for-granted understandings about what a teacher educator should do. In Pt15, Tamsin indicated that mathematics teacher educator had three foci of which raising critical issues with preservice teachers was one and this was part of her internalised ideology. This extract was classified as a metacommentary (Baker & Johnson, 1998).

Andrea: I don't know if the three components in your classroom model: pedagogy, mathematics and the critical perspective – which is something that you really need, I don't know if that is part of every classroom here. In teacher education in Norway in general, is that a point?

Tamsin: It is an important part of who I am as a teacher educator. I need to do this, if we take equity issues seriously.

Andrea: Preservice teachers say they learn more pedagogy from mathematics because they have to be so critical. If we could trust that they could learn mathematics, we could really come to the bottom of the problems.

Tamsin: [...] We couldn't have had the discussion unless you could do those proportional reasoning calculations. We have to connect it to the fundamental work of being a teacher. Solutions? This takes time to do. We need to say that as a teacher I need to reflect on my practice. As a teacher educator, I can't do that in an attic by myself. It has to happen with others.

In this discussion, Tamsin and Andrea highlighted how the emphasis on mathematics in mathematics teacher education sometimes reduced the possibility of seeing where a critical perspective could be included. Similarly, in their investigation of programmes in three countries, Essien et al. (2016) also highlighted that, "emphasis is mostly given to understanding of mathematical notions and constructing an identity as a mathematics teacher" (p. 116), reducing possibilities for raising issues to do with language diversity.

Awareness of this taken-for-granted view on the role of teacher educators provided opportunities for querying why it did not seem to occur at different points in the workshop. For example, in Pt5, Tamsin and Andrea discussed the use of Jack and the Beanstalk as a stimulus for mathematics learning about proportional thinking. Andrea challenged Tamsin by asking "this was about multiculturalism, why didn't you take an unfamiliar story or fairy tale from a culture that they wouldn't possibly know?" In Pt5, Tamsin first accounted for her choices (Baker & Johanson, 1998), before making a pedagogical space comment about what she would do differently in the future and why.

Choosing a story from a culture which they might not have heard, where we could do a similar task, ... which makes sense within that context, allows us to have a discussion about how to be respectful. It also allows us to discuss and critique the tokenism. If you're going to do it, you have to do it with respect for the story, because otherwise you're just using it as a token.

Here alternative teaching practices were discussed and connected to raising issues of respect and tokenism. Awareness of this Discourse provided opportunities to discuss why we did not operate in alignment with it and how we could reconceptualise future opportunities to provide preservice teachers with challenging content about language diversity in mathematics classrooms.

As well as being about providing challenging content to preservice teachers, we considered that this Discourse was about managing the preservice teachers' learning in the Teaching triad (Zaslavsky & Leikin, 2004) as it was to do with how to raise these issues in meaningful ways. It became clear from comments classified as metacommentary that aiming to provide challenging content did not always eventuate. In comments classified as accounting for practice managing the preservice teachers' learning seemed to inhibited us from achieving this aim, partly because of the need to be seen as supporting the preservice teachers' knowledge of mathematics.

The importance of knowing mathematics

A Discourse that seemed to hinder providing challenging content about language diversity issues was one about learners knowing mathematics. Although the need for classroom interaction in order to learn mathematics is well-established (see for example, Prediger, Quasthoff, Vogler & Heller, 2015), this knowledge did not support us to open up discussions about social justice aspects of language diversity. Instead, the Discourse about *the importance of knowing mathematics* seemed to have two effects on our discussion and consequentially probably on our teaching. The first was that preservice teachers often lost their identities as teachers and instead came to be situated only as mathematics learners, similar to school mathematics learners. The second effect was the reduction in opportunities to discuss linguistic diversity issues. Unlike with the previous Discourse, the Discourse about *the importance of knowing mathematics* did not lead to an explicit discussion of alternative practices, identified by an absence of many extracts categorised as action in pedagogical space. This contradiction between our stated aims and the reality that the need to teach mathematics was given more prominence implies that Discourses

can be ingrained to the point that they affect decision making without us being conscious of how this happens.

For example, in Pt11, Tamsin related a story about what she had said to a group of preservice teachers that justifications, as a genre of mathematical language (Meaney, Trinick & Fairhall, 2012), were essential in doing mathematics. Although this could have led to a re-imagining of alternative practices about how to support preservice teachers to consider the needs of school students who had Norwegian as an additional language to gain this genre, this did not occur. Rather this point did not progress beyond a practice of accounting (Baker & Johnson, 1998).

Tamsin: We did this very open ended statistics project, and one preservice teacher said "I just want the right answer" and I said "no your assumptions, on which you build this, are always going to give you different answers. Your role is to be able to justify it mathematically, what you did and why you did it. And if you can do that, you don't need me to tell you if it's the right answer. It should be clear. You may be uncertain about some things, but then you need to talk about it and justify it with others. But that is to help your thinking, not for me to judge your thinking."

Andrea: I think in the tradition that you meet in school for the first 13 years, you get a focus on the right answer, so when they go to this very open context, they will meet themselves at the door. And they will be doubtful of their own mathematics skills.

In regard to the Teaching triad (Zaslavsky & Leikin, 2004), we considered this to be about management of mathematics preservice teachers' learning, specifically their learning of mathematics, because of the focus on the content of what should be learnt.

Even in the few occasions when comments were classified as action in a pedagogical space, the discussion did not make connections to issues of language diversity. Pt16 was about the difficulties that the preservice teachers had with the rates of growth of two crocodiles who started at different lengths but who both grew 3 metres over five years. The preservice teachers struggled with seeing this as a multiplicative problem, rather working on it as though it was additive.

Andrea: Could you have used your brilliant question again? Is there a difference that makes a difference?

Tamsin: Yes I could have.

Andrea: It would have solved it, the difference is not in the 3 metres.

Tamsin: It would have solved it really well ...

Andrea/Tamsin: AHA!

Tamsin: We want children to see it [the multiplicative aspect of the problem]. We don't want them to trust the procedure.

In this discussion, the learners are explicitly labelled as children. In regard to the Teaching triad (Zaslavsky & Leikin, 2004), this comment could be considered to be about teacher educators making preservice teachers aware of the mathematical challenging content that they needed to provide to school students, in regard to managing student learning. Yet, it was preservice teachers who struggled with the problem which indicates that we had situated them as the mathematical learners and equated them with being school children.

Focusing on the importance of preservice teachers learning mathematics seemed to restrict possibilities to discuss the language learning needs of school students. Opportunities to discuss the need for students who did not have Norwegian as a first language to learn how to provide mathematical justifications did not occur, neither in the workshop nor in the discussion of it. It was only when we analysed the discussion, that we became aware of missed opportunities and how the Discourse, *the importance of knowing mathematics*, affected our decision making. As an alternative taken-for-granted understanding about what mathematics teacher educators should focus on, it negated the impact of the previous Discourse, *mathematics teacher educators should raise critical issues* including language diversity with preservice teachers.

Teaching should support students with diverse backgrounds

On some occasions, the Discourse about *the importance of knowing mathematics* was interwoven into comments which also seemed to reflect a Discourse about *mathematics teaching should support students with diverse backgrounds*, including diverse language backgrounds. For example, in Pt18, Tamsin and Andrea continued to discuss the difficulties the preservice teachers had with the rate of change problem about the crocodiles' growth. Their focus in this point was how the pictures contributed to the preservice teachers' difficulties. These difficulties were then connected to working in language diverse mathematics classrooms.

Tamsin: Using the pictures, as a first language [learner] this is ok. As a second language [learner] it might be confusing.

Andrea: The pictures are not the best starting point.

Tamsin: I could bring it [the teaching] back to the discussion about supporting second language learners. The picture is only helpful if it adds meaning to the context. This didn't. This is a pedagogical point, in respect to language diversity. The problems they had with solving the problems actually helped that discussion! If they didn't have a problem with the mathematics, they wouldn't discover the problem with the pictures, and that they didn't give any clues.

The preservice teachers' confusion from looking at the pictures of crocodiles when trying to determine the rate of change, raised a reflection point. In discussing the issue, Tamsin and Andrea's reflections allowed them to envision alternative strategies for engaging preservice teachers about working in language diverse classrooms. Hence, these comments were classified as action in pedagogical space (Baker & Johnson, 1998). The Discourse that *mathematics teaching should support students with diverse backgrounds* underlay this discussion, but it also seemed to be connected to the Discourse about *the importance of knowing mathematics* and the Discourse about *mathematics teacher educators should raise critical issues* with preservice teachers.

In Pt4, Tamsin reflected on how she introduced the term "cross-multiplication", and then realised that the preservice teacher did not know the English term and its relationship to proportional thinking. Moving the discussion into action in pedagogical space (Baker & Johnson, 1998), Andrea challenged her on what she could have done differently.

Andrea: Should you as a teacher have found the equivalent word before the lesson? Is it enough to explain it during? I don't know if they can understand the difference between prediction and inference from that single episode.

Tamsin: I don't know. It's a point worth thinking about. What would they do in their classrooms with the children? If the children don't have Norwegian as their first language, do they then ... Do I set up the expectations that they go and find out; how do you say that in Somali, in Fasi, in Arabic, or how do you say that in whatever languages are in your classroom. To some extent teaching, this way brings into their awareness what it's like to be a second language learner of mathematics in a classroom, even though their English would be much better than many of the students that they will have that have newly arrived in Norway and what their Norwegian would be.

Although this did produce a discussion about language diversity, the focus remained on a missed opportunity to raise communication issues. In the video, the focus on ensuring that the preservice teachers understood the mathematical ideas seemed to restrict Tamsin's awareness of alternative discussions that she could have had about language diversity with the preservice teachers.

In regard to the Teaching triad (Zaslavsky & Leikin, 2004), we considered the Discourse about *mathematics teaching should support students with diverse backgrounds* was connected to the challenging content needed by preservice mathematics, as it was about choosing the challenging content for mathematics students in classrooms.

The need to respect mathematics learners' backgrounds

This Discourse focused on student learning rather than on mathematics teaching and resonates with the work of Aguirre et al. (2013), who also noted the importance of paying attention to school students' backgrounds. The Discourse about *the need to respect mathematics learners' backgrounds* and be sensitive to students seemed to underlie Pt20, which was classified as a metacommentary (Baker & Johanson, 1998). The point was about how teachers, rather than teacher educators, should use contexts in order to be respectful of students' backgrounds.

Tamsin: If the context only has a value in mathematics, and not in in the culture, but just to learn mathematics, it's disrespectful to the culture. [They need to be] Equally valued. I want them to understand that. You think that you're doing good by connecting this and that to the students' backgrounds, but if you don't do it in a respectful manner it is disrespectful.

Andrea: It's both the mathematics and the culture.

Tamsin: Interdisciplinarity is so important when doing this.

In this quote, Tamsin seemed to have accepted this Discourse as a taken-for-granted understanding about what teachers needed to do to be respectful of students' backgrounds. For her, preservice teachers, "them" in the middle of the third line of extract, needed to understand that using students' cultural contexts may be disrespected if only the mathematics was highlighted as important.

In contrast to the view that school students' backgrounds were useful for teaching mathematics, we also discussed when the teacher's interest could provide a context for learning mathematics. In Pt24, we discussed the use of knitting in mathematics classrooms, which arose from having the preservice teachers watch a video of Year 5 students, many of whom were second language learners of English. Tamsin had chosen knitting as a context, because many of the preservice teachers were knitters.

Tamsin: The children's background wasn't important, it was the teacher's passion for knitting. ... Getting children's engagement with it is. Background is one thing, but sometimes it's teacher's enthusiasm. We can have discussions about one minute vs one hour. It allows for real world contexts. Knitting fast is not easy to keep up. In the diverse classroom, they can enjoy knitting even if it's not done at home. ...

Andrea: Again it's you saying it, not them.

Tamsin: I allow them to do discussion together, over time I have let them talk about the mathematics and the pedagogy, maybe I need to make them talk more about the critical perspective. I need to do more of that, maybe it's because I am apprehensive about forcing that issue. When

the refugee crossings were at their peak, we looked at some mathematics within a context. We talked about the pros and cons of being a mathematics teacher using that context. That was a case where I could let go.

Andrea challenged Tamsin that it was she and not the preservice teachers who talked about this issue. Tamsin's response was classified as a practice of accounting (Baker & Johnson, 1998). However, in raising another example of how she had worked with preservice teachers, Tamsin seemed to focus on finding out what the circumstances were which encouraged her to let the preservice teachers have control of the discussion. She suggested that it was her sensitivity about what she could force the preservice teachers to discuss which made her reluctant to have them talk about being sensitive to their own students' backgrounds.

The need to be aware of the importance of being respectful of students' backgrounds suggested that this Discourse was connected to the challenging content that preservice teachers needed about mathematics and to sensitivity to students in the Teaching triad (Zaslavsky & Leikin, 2004).

The importance of teacher educators reflecting on their practices

As well as the need to raise critical incidents about diversity with preservice teachers and the importance of knowing mathematics, Tamsin and Andrea seemed to have a taken-for-granted understanding about *the importance of teacher educators reflecting on their own practices*. This is not surprising given that much previous work in mathematics education has highlighted this aspect of being a teacher. For example, Bonner (2008) noted that reflection is important for teacher learning. Nevertheless, Smith (2011) highlighted the myriad of priorities that teacher educators in Norway must attend to, making the requirement to engage in reflection difficult to achieve. In Pt15, Tamsin showed awareness of this mix of priorities:

Research work is presumed to be one box in our lives and teaching is another. Where is the reflection around practice? Where does it say it in our job description? Everything I know comes from experiences and it comes from discussing with my preservice teachers. I know what is important for me as a teacher educator. But I see, while watching this video, there might be alternatives. I could have achieved my outcomes more effectively and more efficiently. But we don't take the time to reflect on our practices ... actually stopping and reflecting on it, to push on this discussion about equity is important.

This comment was classified as metacommentary as it involved discussing what is needed to be a teacher educator. Tamsin is quite clear that earlier reflections on her practices have contributed to her awareness of what she considered a teacher educator should be. The process of working with Andrea reinforced the value of researching her own teaching.

In Pt17, this Discourse underlay another discussion about missed opportunities for focussing preservice teachers on issues of language diversity:

- Andrea: I don't think you have to excuse anything.
- Tamsin: No, but it was a clear desire to focus this lesson on multicultural [issues]. Yet there are places I simply don't do it. Why don't I?
- Andrea: Is it possible?
- Tamsin: I don't know but it is a reflection point.
- Andrea: Isn't it part of what we're doing now, recognizing that it isn't possible in that context, to do all of that. But it is crucial that you go through it after?
- Tamsin: Exactly! What were the missed opportunities and why did they matter?

Watching the video forced Tamsin to realise that she could have made more links to language diversity issues. Although Andrea asked whether it would have been possible to have actually achieve this in the workshop, Tamsin conceded that she was unsure but it was something that she should have reflected on earlier. To some extent, Andrea's questions situate the teacher talk as a practice of accounting (Baker & Johnson, 1998), by suggesting that reflection should be highlighted, rather than the lost opportunities.

The comments connected to this Discourse were difficult to link to the teaching triad of mathematics teacher educators (Zaslavsky & Leikin, 2004) as they were not explicitly about issues to do with preservice teachers. Although preservice teachers are mentioned in Pt15, the reference is to what Tamsin learnt from discussing with them. This indirectly refers to managing their learning as it is about how to support preservice teachers by listening to them and reflecting on what is heard.

Conclusion

Our research question for this paper was: How do Discourses affect mathematics teacher educators' decision making about raising issues about language diversity with preservice teachers? The analysis of the

data indicated that there were five main Discourses that seemed to affect our decision making. Figure 3 shows how we considered that the Discourses were related to different aspects of the teaching triad of mathematics teacher educators (Zaslavsky & Leikin, 2004). We have used three different lines to indicate the strength of the connection between the Discourse and the component of the teacher triad. For example the Discourse, *mathematics teaching should support students with diverse backgrounds* is considered to be about managing school students' learning as part of the challenging content that preservice teachers needed to know. It is shown with a solid line. On the other hand, the Discourse about *the importance of teacher educators reflecting on their own practices* is only indirectly seen as being connected to management of mathematics preservice teachers' learning and so is represented by a dotted line in figure 3. The Discourse about *mathematics teacher educators raising critical issues* has a solid link to management of students' learning and also connections to management of mathematics preservice teachers' learning and to sensitivity to preservice mathematics teachers. However these last two connections are not as strong as the first one so is represented with a thinner solid line.

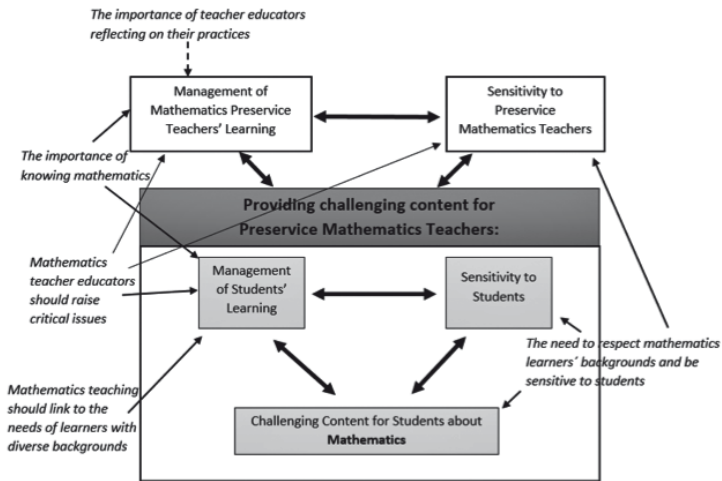


Figure 3. Discourses connected to different aspects of the Teaching triad of mathematics teacher educators (adapted from Zaslavsky & Leikin, 2004, p. 8)

At times, the different Discourses seemed to contradict each other, resulting in decisions about teaching practices that restricted the raising

of issues to do with language diversity with preservice teachers. For example, we could see how focusing on the mathematical content seemed to limit the possibilities for discussing language diversity in the classroom and move the discussion away from having preservice teachers reflect on being teachers to focussing on being learners of mathematics. As was discussed in the methodology section, we also found that Tamsin limited her own teaching practice as a result of her sensitivity to her preservice teacher students, making her reluctant to have them engage in conversations focused on how they would work with the complexities found in linguistically-diverse mathematics classrooms.

Analysing the discussion of the video lesson using the framework on teacher talk (Baker & Johanson, 1998) provided opportunities for understanding the practice of mathematics teacher educators by identifying what were the ideals (metacommentary), what had actually happened (practices of accounting) and what could be done differently in the future (pedagogical space). As our analysis shows, reflection between teacher educators at several levels, including extended discussions about initial reflections, is needed. This is because moving into actions for pedagogical space is not something one can do easily by oneself, as it needs to go beyond personal knowledge construction (Loughrun, 2005). In particular, by critically reflecting on the workshop, we recognized how the question "is there a difference that makes a difference" could be used to rethink both the what and the how of learning opportunity which should be provided to preservice teachers.

We consider that an analysis at several levels, such as the one we have done on this one episode, is necessary if changes are to occur that lead to social justice rather than injustice being achieved in Norwegian classrooms. Our analysis and discussion over several weeks allow us to identify the Discourses about mathematics teacher education and then how they interacted to result in particular practices in the workshop. We anticipate that as we continue to discuss our teacher education practices together that our awareness of what to pay attention to will become more nuanced. Teaching at any level is complex but if we want a difference in teaching to make a difference, then we must take the time as part of our professional practice to do the necessary research on it.

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Notes

- 1 <https://nbinstructionalresources.wikispaces.com/file/view/Hands%20on%20the%20Giant.pdf/297126438/Hands%20on%20the%20Giant.pdf>
- 2 <http://www.proportionalreasoning.com/and-multiplicative-thinking.html>

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