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The lack of discursive opportunities when becoming a mathematics teacher

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Abstract: In this paper, we attempt to open a discussion about mathematics teacher education settings constraining prospective teachers' discursive opportunities, a phenomenon noted in our respective doctoral dissertations. These two doctoral dissertations represent two different types of prospective teachers from three countries. Prospective primary school teachers who had positive experiences and interest in mathematics on the one hand, and prospective teachers who struggled with mathematics and were insecure about their future mathematics teaching on the other. In the discussion, we speculate about the implications of discursive opportunities for prospective teachers' process of becoming a mathematics teacher and highlight the need to place effort to offer sufficient discursive opportunities to prospective teachers.

Keywords: discursive opportunities, identity, mathematics, mathematics teacher education

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1 Introduction

In this paper, we attempt to open a discussion about mathematics teacher education settings constraining prospective teachers' discursive opportunities, a phenomenon noted in both Ebbelind (2020) and Lutovac (2014). Discursive opportunities are to be understood in terms of how a prospective teacher has the possibility, implicit or explicit, to transform past and present experiences into the present situation and transform utterances from one social practice to another (Fairclough, 2010). Transform relates to how experiences and use of language from past situations are used as "building blocks" when participating in other situations (Gee, 2011). These two doctoral dissertations, Ebbelind (2020) and Lutovac (2014) represent two different types of prospective teachers. First, prospective primary school teachers who were committed, had positive experiences, and had an interest in mathematics and mathematics education. On the other side, prospective primary school teachers who struggled with mathematics, perceived their mathematics ability as low and were insecure regarding their future mathematics teaching. Together, these two doctoral dissertations represent prospective teachers from three countries: Sweden, Finland, and Slovenia.

1.1 The study of Ebbelind

In attempting to open a discussion, we bring forth an example of the discourses prospective primary school teachers used in Ebbelind's (2020) study. The study centred around prospective primary teachers in the early stages of a teacher education program in Sweden, specifically focusing on a 20-week mathematics education course.

Ebbelind utilised a multi-sited ethnographic approach, closely following two primary prospective teachers for two and a half years during their teacher education. The choice of prospective teachers was based on the indicated research gap related to the need for more research on primary prospective teachers interested in mathematics, mathematics teaching, and mathematics learning. The ethnographic approach implies using multiple methods for gathering information, including field notes, interviews and other text material. Ebbelind draws on two primary theoretical sources: symbolic interactionism and social practice theory. In both symbolic interactionism and social practice theory, the notion of identity is central. Prospective teachers' evolving identities result from shifted participation in educational or non-educational situations. In line with Holland et al. (1998), identity in this study was conceptualised as the imaginings of self in [imagined] worlds of action. The prospective teachers in Ebbelind's study were committed, had positive experiences, and were interested in mathematics and mathematics education. They saw themselves as proficient in mathematics. The study's objective was to provide a deeper understanding of the extent to which experience gained from a teacher education program and other relevant social practices impact how prospective generalist teachers perceive themselves as future primary mathematics teachers.

Ebbelind's (2020) work also problematised teacher education, pointing to an interesting phenomenon that caught our attention. Ebbelind (2020) noted that prospective teachers engaged discursively very differently in relation to different discursive arenas, for example, when talking about teaching and learning mathematics during a student-teaching internship or the mathematics education course. While attending discursive arenas "outside" the mathematics education course, the prospective teachers use a variety of past and present experiences in their use of language. However, these various past and present experiences are not used when attending mathematics teacher education settings. Ebbelind (2020) writes that "there is a "proper" way of engaging discursively while attending the course in mathematics education that the prospective teachers both sense and pick up" (p. 185). In our discussions and writing of this paper, we recognised that this might be a more complex and crucial phenomenon than it appears.

1.2 The study of Lutovac

From a narrative research tradition perspective, Lutovac (2014) observed a similar phenomenon in her research with prospective primary school teachers who struggled with mathematics. With an aim to explore prospective teachers' identity work in the context of mathematics and understand the role of educational contexts in that identity work, Lutovac conducted a narrative study examining 19 prospective teachers' negative experiences with mathematics in two cultural settings, Finnish and Slovenian.

In the study, Ricoeur's (1991) notion of narrative identity was used to conceptualise identity as prospective teachers' mathematical (auto)biography wherein prospective teachers' remembered and anticipated experiences become their stories, i.e. identities. The study also drew on research traditions of beliefs, emotions, attitudes, and view of mathematics which were seen as constructs featuring in prospective teachers' narratives, thereby central to understanding their identities too. By analysing in-depth interviews centred around prospective teachers' school time experiences with mathematics as well their meaningful experiences during teacher education studies, Lutovac concluded that prospective teachers' experiences resembled to a great extent in the sense that they were portrayed via talk of learning difficulties, math inability, strong negative emotions towards mathematics, and a great deal of insecurity regarding how they perceived themselves as mathematics learners and teachers. Further on in the study, employing the theory of possible selves (Markus & Nurius, 1986) and some aspects of linguistic and rhetorical analysis (e.g., Tannen, 1979) to analyse the form of prospective teachers' narratives, Lutovac examined these prospective teachers' future-oriented talk and observed that one group of prospective teachers' talk shifted and became more positive and decisive in relation to their future as mathematics teachers. In contrast, the other group's talk remained negative, anxious and irresolute.

Lutovac (2014) concluded that it is the opportunities for reflection upon and discussions around personal experiences granted by the teacher education setting of one group that made them shift their talk so significantly, and it may be precisely the lack of such opportunities that constrained the talk of another group (see also, Lutovac & Kaasila, 2014). Lutovac, therefore, warned against limited opportunities to talk about personal experiences as they appear to be further challenging prospective teachers' process of learning to teach as well as confidence and willingness to teach mathematics. This somewhat resembles Ebbelind's (2020) observations of the distinction between the discourses prospective teachers use in the mathematics education course and those outside of it. This raises speculations about whether it may be that the mathematics educations course in Ebbelind's study resembled a setting in which the personal experiences of prospective teachers are not necessarily welcomed or intentionally brought up, leaving prospective teachers with the perception that discursive arenas of their personal experiences have no place "inside" the mathematics education course.

2 Drawing on a discursive research tradition

We situate this paper in discursive research, attempting to open a discussion about the lack of discursive opportunities when becoming a mathematics teacher. This discussion can be interpreted to be present in much discursive research about teacher education but has, in our view, not earned sufficient recognition within the field of mathematics education. To this end, we look at the literature related to the phenomenon of mathematics education courses affording or constraining certain discursive arenas. As noted, we also draw on our respective PhD theses wherein multiple sources of data, such as interviews, observations, documents, reports and archival material, were employed. In addition, we use our own experiences as teacher educators and researchers in the field when

exploring the phenomenon of our joint interest. In the discussion, we will speculate what the lack of discursive opportunities means for prospective teachers' becoming mathematics teachers.

2.1 Discourses in and about mathematics teacher education

Through discursive research, Ebbelind (2020) and Player-Koro (2011) both highlighted that despite mathematics teacher educators' attempts to promote a different view on teaching mathematics, prospective teachers' school mathematics experiences were reproduced through a performative mathematics discourse. This performative discourse of mathematics learning may constrain the development of other critical professional skills (Beach & Player-Koro, 2012; Ebbelind, 2020; Skog, 2014). Another Swedish longitudinal study concerning mathematics teacher education (Persson, 2009) concluded that prospective teachers implied that university-based education, including lectures, literature studies, and group discussions, provided them with a consistent discourse, they learned the language of mathematics and mathematics education and teaching and learning in primary school. However, Persson (2009) also identified several mathematics-related discourses among prospective teachers, including a fear of insufficient knowledge of mathematics, leading to concerns about explaining mathematical content adequately. Even though students felt secure talking about mathematics teaching and learning, they felt unprepared regarding teaching strategies and lacked confidence in applying theoretical and didactical knowledge in real classroom settings. This phenomenon is also identified in Ebbelind (2020). Both Ebbelind (2020) and Persson (2009) concluded that work-integrated education portrayed a different discourse of mathematics teaching in schools, resulting in the perception of two different teaching practices. As a result, students felt uncertain about their future roles as teachers. Despite this, the students did not encounter any support from teachers they encountered at teacher education.

2.2 Discourses of truths

From a socio-political perspective, Skog (2014) followed prospective mathematics teachers for two years. She concluded that the mathematics education discourse and the mathematics discourse enable empowerment and disempowerment, pending the position one has concerning mathematics. Like Ebbelind (2020), she also concludes that language discourse is limited, and these limitations affect the students' opportunities to position themselves. A phenomenon that, in Skog's opinion, can lead to the core of education, mathematics and mathematics education, being obscured by discourses of "truths" that are not allowed to be challenged.

Prospective teachers engage in conflicting demands both in terms of mathematical knowledge (Player-Koro, 2011) and mathematical practices (Nolan, 2011). Nolan (2011) brings forward the idea of prospective teachers' dialogue and reflection while experiencing these conflicting demands. Teacher education needs to open up arenas that allow exploring what Nolan calls habitus-field (mis)fits to reconceptualise mathematics teacher education. Being confined to certain pedagogical structures for learning mathematical

knowledge and the associated teaching methods limit students' ability to reposition themselves and, by doing so, get the opportunity to frame their future teaching differently (Brown, 2010).

2.3 Discourses of mathematics

The discourses in and about mathematics teacher education need to be situated within the broader discourses about mathematics as a subject discipline. These discourses portray mathematics, unlike other subject disciplines, as difficult, special, powerful and intimidating (Black et al., 2009; Brodie, 2011), often positioning mathematics as an elite subject (e.g., Boaler, 2015) and insinuating only some are "math people" and that not all can "understand mathematics in-depth" (Hossain et al., 2013). For example, school mathematics, as noted by Brodie (2011), allow no space "for knowing and not knowing simultaneously and for being seen and valued regardless of whether one is right or wrong" (p. 239). University-level mathematics, as Bartholomew et al. (2011) suggested, can be seen as an elitist, exclusionary "math club" whose members are both proficient at mathematics and "study mathematics purely for the love" (p. 923). Due to the exclusive nature of the math club, members often fear that they will lose their status. Moreover, on a school and societal level, it is often suggested that mathematics is of greater importance than other subject disciplines and as a gate-keeper (Stinson, 2004), "keeping the powerful in power" (Williams & Choudry, 2016, p. 3). These discourses, Gutierrez et al, (2023) suggest, originate in the stories of mathematicians "through the ways they do their work, communicate to their field, and come to collective agreements about the nature of mathematics" (p. 1) and are then reproduced without the interrogation by the society at large, including teacher educators and prospective teachers.

3 Opening up the discussion

So far in this paper, we outlined research on discourses in and about mathematics teacher education, including our own, that in some way proposes that teacher education might be a restricted discursive arena constraining prospective teachers' discursive opportunities. We also situated this restricted discursive arena within the broader discourses about mathematics as a subject discipline, which appear restricted, but also restrictive. We now speculate further on these observations and what this might mean for prospective teachers' process of becoming mathematics teachers.

3.1 Theoretical standpoints

From a theoretical standpoint, social practice theories (Giddens, 1984; Holland et al., 1998), discursive theories (Gee, 2011; Wetherell, 2006), and theories about identity (Lutovac & Kaasila, 2014; Skott, 2019; Wenger, 1998) emphasise that social practices, discursive engagement and identities are structured across time and space, that is, we use experience from past and present social practices and cultural meaning as building

blocks in immediate social interaction (Gee, 2011). What is particularly noteworthy concerning these theories is their emphasis on the idea that individuals come to understand themselves and the world around them through engaging with various social practices, both past and present, mainly through language. We need to allow prospective teachers to use experience from a wide range of discursive arenas “inside” mathematics education courses (Ebbelind, 2019).

All the perspectives above assume that language is functional in each and every situation shaping the social practice one attends, but the social practices also dynamically shape language (Wetherell, 2001). Halliday (1978) describes this as" [t]he context plays a part in determining what we say; and what we say plays a part in determining the context" (s. 3). Holland and Eisenhart (1990) then highlight culture as a medium used when interpreting the world. Therefore, it is not only language and context that contribute to our understanding of the world but also the circulation of cultural meaning is shaping how we use language and then view the world (Anderson & Holloway, 2020) as meaning circulating affects both the language we use and social practice we attend. One can conclude that any disruption to the process described above restricts prospective teachers' discursive engagements and, thus, their understanding of the world around them.

3.2 What matters for the prospective teacher

According to several researchers, student-teaching internships are considered a significant part of developing one's teacher identity (Bjuland et al., 2012), surpassing the impact of teacher education courses in mathematics education (Jong, 2016). Solomon et al. (2015) suggest that student-teaching internships provide valuable opportunities for prospective teachers to engage in discussions on educational topics, highlighting that prospective teachers often do not rely on teacher education to comprehend the relationship between theory and practice. Instead, prospective teachers turn to experienced teachers during student-teaching internships or seek guidance from other sources, such as family and friends (Ebbelind, 2015), to shape their vision of future teaching, as emphasised by Scott (2005). Interestingly, prospective teachers are more receptive to advice from these alternative sources than teacher educators. Similarly, Lutovac (2014) and Ebbelind (2020) observed that some prospective teachers in their study prioritized the knowledge gained from experienced teachers to the extent that experienced teachers’ narratives greatly shaped prospective teachers’ language about teaching and learning and their teacher identities. It is worth noting that prospective teachers navigate two different social practices, as Solomon et al. (2015) described, where teacher education is accorded the lowest priority and legitimacy (Scott, 2005). What we try to address here is the why question. Why do prospective teachers not turn their educational concerns to teacher education? What restricts them from engaging in discussion with us as teacher educators that they can have in other social practices? In this paper, we conclude that this matter needs to be explored further, as one can only wonder why it is so.

In addition, broader discourses about mathematics as a subject discipline (Bartholomew et al., 2011; Hossain et al., 2013; Williams & Choudry, 2016) argued by Gutierrez et al. (2023), lead to a situation where “many people continue to experience mathematics

as a cold, disconnected field, free of culture, or real meaning in their everyday lives." (p. 1). We speculate that the lack of discursive opportunities given to prospective teachers in mathematics education may come down to the word mathematics, what it means and how being in a setting with that word makes prospective teachers participate in a different way than they would in another setting. In a "cold" and "free of culture" mathematics education setting, a prospective teacher would not be inclined to engage discursively around their personal experiences, which in the process of becoming a teacher are often emotional and therefore significantly different from the expectations that the word mathematics raises.

4 Conclusion

The lack of discursive opportunities, arguably, is a two-fold problem in teacher education. First, it is obvious that the lack of discursive opportunities restricts the process of becoming a mathematics teacher and, consequently, available mathematics teacher identities prospective teachers can "try on" during their studies. For example, suppose certain prospective teachers' experiences are seen as having no place in the "cold" and "free of culture" mathematics education setting. In that case, there is a danger that the outcome of the process of becoming a mathematics teacher is, in fact, a mathematics teacher who uses the language that essentially aligns with these mathematics discourses. Second, the lack of discursive opportunities also limits teacher educators in assisting the processes of becoming a mathematics teacher as they may be unaware of prospective teachers' experiences and concerns.

We conclude that teacher educators need to place effort into recognizing when sufficient discursive opportunities or lack thereof are offered to prospective teachers. In line with prior research, it follows that the opportunities for reflection and discussions around personal experiences (de Freitas, 2008; Hossain et al., 2013; Lutovac, 2014; Lutovac & Kaasila, 2014), as well as exploration and interrogation of discourses surrounding mathematics (e.g., Gutierrez et al., 2023), may afford prospective teachers with engaging in a wide range of discursive arenas "inside" of mathematics education courses as a foundation in the process of becoming a teacher. So now we ask ourselves the question: If re-imagining a teacher education where prospective teachers are afforded to engage in a wide range of discursive arenas, what would that teacher education look like?

Research ethics

Author contributions

A.E.: conceptualization, investigation, methodology, writing—original draft preparation, writing—review and editing

S.L.: conceptualization, investigation, methodology, writing—original draft preparation, writing—review and editing

All authors have read and agreed to the published version of the manuscript.

Artificial intelligence

Grammarly has been used when re-writing this paper.

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Informed consent statement

Informed consent was obtained from all research participants.

Conflicts of Interest

The authors declare no conflicts of interest.

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