Understanding student teachers' professional development by looking beyond mathematics teacher education

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The empirical material in this paper is from a multiple case study exploring the role, if any, that social practices related to teacher education and beyond teacher education play in primary student teachers' tales of themselves as teachers-to-be. The case of Lisa is used as an example to illustrates how different past and present social practices influence how she talks about competitive teaching during different phases of her teacher education. Of particular influence is her past school-related experiences as they in turn influence how she interprets other social practices. Thus, the case of Lisa illustrates the importance of widening our research interest beyond teacher education if we want to understand the process of becoming mathematics teachers.

Keywords: Professional development, teacher education, social practices.

Introduction

Student teachers' professional development is by many researchers considered as a rather complex process (Skott, Mosvold & Sakonidis, 2018). One concern is how student teachers' school-related experiences influence how they perceive teacher education and how they view their future profession. According to Forgasz and Leder (2008) prior experience impact student teachers becoming as teachers more than undergoing teacher education. To this, Scott (2005) concludes that student teachers are less sceptical to advise from others, "outside" teacher education, than from teacher educators in mathematics. Student teachers use educated teachers at the internship or from other settings or family and friends instead of teacher educators to conclude their vision of future teaching. For example, internship, which is often part of teacher education, is said to frame how student teachers perceive the content in mathematics education courses. Thus, the teaching of the internship supervisor during internship becomes important in student teachers' professional development (Mosvold & Bjuland, 2016).

To widen the perspective of the "outside" this paper reports parts of a multiple case study with the aim of contributing with insights about how experience from teacher education and other past and present social practices play for generalist student teachers' tales of themselves as primary mathematics teachers-to-be. This is in line with Morgan (2012) and Skott (2018) that mentions that we need to look outside the immediate social practice [teacher education in this case] if we want to view what the [student] teachers bring into the situation. To be interested in any data "that point to any practice […] that appear to orient the [student] teachers' action or meaning making as they relate to the profession (Skott, 2018, p. 615)".

Thus, this paper aims to illustrate how different past and present social practices play for a primary generalist student teacher, tales as primary mathematics teacher-to-be. The empirical material used relate to how a student teacher, whom I will refer to as Lisa, talks about competitive teaching during different phases of her teacher education.

The process of becoming a mathematics teacher

To enter teacher education and become a teacher is in this paper regarded as an emerging learning process. To follow the process of developing into a teacher is partly to follow how student teachers negotiate and re-negotiate their mathematical and pedagogical knowledge. In this process Hodges and Hodge (2017) recognise student teachers bringing together different perspectives on teaching and learning mathematics, often conflicting while creating their idea of teaching mathematics. While bringing different perspectives together student teachers can, for example, position themselves in relation to future pupils, relate their participation to different educational models, expand educational models through new experience and develop a critical positioning to either the teaching at internship or the pedagogy taught and used at teacher education (Bjuland, Cestari, & Borgersen, 2012).

Jong (2016), as an example, illustrate that teacher education in different ways impact student teachers' professional development. However, attention is on to the characteristics of their participation that draw on ideas from past teaching experience and their cultural, socioeconomically and linguistically background. Jong concludes that becoming a teacher starts the day when children enter school for the first time and meet different educational models. These models influence the idea of teaching that student teachers have. The main result in Jong's study is that any social practices related to teaching and learning mathematics might be critical in professional development, this because social practices, past and present, are used to negotiate and re-negotiate the meaning of teaching mathematics.

The conceptual framework Patterns of Participation

The overall study and this paper start with an interest in professional development, a construct that elaborates within the conceptual framework of Patterns of Participation (PoP). Professional development can be viewed as "a process of flexibility, autonomy, and adaptation to the teaching context" (Hošpesová, Carrillo & Santos, 2018, p. 181). Learning and thus becoming a teacher is therefore considered from a situated perspective. Thus a perspective, that considers learning as participation in social practices take social, cultural and historical systems as well as prior experiences and present participation into consideration when studying professional development. A social practice as a collective way of being with a common endeavour where entities interact and reconcile/ mould together.

PoP "seeks to understand how a [student] teacher's interpretations of and contributions to immediate social interaction relate dynamically to her prior engagement in a range of other social practices" (Skott, 2013, p. 549). Skott makes an important move, according to Lerman (2013), when focusing on the emergence of the situation, the process. "This dynamic process is studied through eliciting the teacher's interpretation of what she does in classrooms and how that relates to her prior engagement in other social practices (p. 625)". The intention with PoP is to disentangle shifts of participation in different social practices, and by doing so shed light on the role of the student teacher in the practices that emerge.

Through the conceptual framework Patterns of Participation, Skott tries to accomplish three things. First, he tries to reduce the emphasis on objectification in research about student teachers and

teachers. Secondly, he tries to re-centre the student teacher and teacher in research. Finally, he tries to re-conceptualise what is known as beliefs, knowledge, and identity in participatory terms. In this quest Skott (2018) point out that the conceptual framework PoP focuses on the pre-reified processes that precede, give rise to, what others term beliefs, knowledge, and identity.

Patterns of Participation draw on two main theoretical sources, symbolic interactionism and social practice theory. Symbolic interactionism views humans as actors and reactors in situations, and position meaning as something that one engages in when experiencing things in the situation, on the spot. Humans respond to the situation by interacting with others and with the self, and by taking [interpreting] the role of others (Skott, 2018). Social practice theory views social practices as ordered across time and space. They are linked historically to other social practices (Wenger, 1998). Social practices are stratified. Most important is that social practice theory stress that it is through the engagement with different or using different social practices within communication that individuals understand the world around them when they, for example, emerge into the teaching profession.

By considering that social practices are ordered, stratified, in time and space allow researching complex patterns in multiple social practices. To make visible and describe this plurality of relations lies in the core of PoP but also to make visible how these pluralities of relations change over time.

The overall study

The overall study adopts a multi-sited ethnographic approach. Two primary student teachers were followed for two and a half years as cases during their teacher education with a focus on their education in mathematics. Often student teachers at primary school level are generalists with no specialisation or interest to the teaching of mathematics. However, that was not the case in this study. The student teachers in this study related strongly to the teaching of mathematics in the interview before entering teacher education and they were selected as critical cases (Flyvbjerg 2006) based on their commitment, their mathematical knowledge and interest. The choice of critical cases was based on the indicated research gap related to the lack of research related to primary student teachers that are interested in mathematics, mathematics teaching, mathematics learning and regard themselves as knowledgeable/proficient in mathematics.

In Sweden, the combined course in mathematics and mathematics education for primary school student teachers is a 30 ECTS point course in the four-year teacher education programme (240 ECTS). ECTS means European Credit Transfer System, where one year of studies is 60 ECTS (40 weeks). Student teachers have four internship periods, five weeks each, during their teacher education. Teacher education in Sweden does not have any pre-requisite of university studies before entering the education.

In this paper, only one of the student teachers is used as an example, Lisa. Lisa, who is in her early 20s, started teacher education directly after high school. Lisa’s positive experiences of participating in a competitive mathematics classroom are expressed as her primary reason for entering teacher education. Lisa perceived herself as "good" at mathematics and had the highest possible grade in upper secondary school. It is also worth noticing and most important concerning this paper that Lisa

described herself as extremely competitive both as a private person and as an athlete, playing soccer at a high national level.

The role of social practices in different phases

The empirical material in this paper is interview transcripts, five in total, and field-notes from observations made during the internship and the mathematics education course. During the mathematics education course, I attended 31 lectures, seminars, examinations or study-group sessions. Based on the multi-sited ethnographic approach, considering social practices as ordered in time and space and considering the "outside", persons related to Lisa were also interviewed, in this paper the internship supervisor whom I will refer to as Mr Higgins.

Lisa's professional development is described, in this paper, in three different main phases related to how she re-negotiates the use of competitions in teaching mathematics. Each phase will start with excerpts in time spread over the actual phase. Then there will be a summary accentuating the role of social practices within the phase. This section set out to offer the reader a "virtual reality" to explore (Flyvbjerg, 2006), to provide the reader with situated aspects (Bjurland et al., 2012).

Phase one – The internship experience strengthens her experience of learning mathematics

In phase one, Lisa re-engages in her prior school-related experience, the social practice of her upper secondary mathematics classroom. This experience is later in this phase re-negotiated with the social practice where her internship supervisor Mr Higgins is a part.

In the first interview, conducted before entering teacher education, Lisa talks a lot about how she, from an early age, developed a passion for mathematics as a subject. She credits this passion to the fact that she found mathematics easy and she recalls positive memories with the subject itself. During primary school, Lisa perceives herself as extremely good in mathematics. "Secondary school was okay, it became harder, but it was not hard […] I chose a direction with as much mathematics as possible, so I thought it was fun." Lisa especially remembers two teachers. "Both were extremely interested… they taught playfully…" Lisa describes these teachers as knowledgeable and dedicated to their commitment as teachers. She also describes how they frequently used "competitive teaching" which increased Lisa's motivation: "this to get it a little more challenging and you got interested."

The first internship is conducted approximately eight months after Lisa enters teacher education. Lisa's supervisor Mr Higgins "admits" in an interview two months before that he uses competitions when teaching mathematics, all the time. However, he emphasises that the main idea is for students to compete with themselves, but that there might be some competition among the pupils as well. One example is how the class "do multiplication every third week […] we do it both on Mondays and on Fridays… on time… it might seem a little stressful and inconvenient, but they like it very much."

At the internship, Lisa is stunned after her initial participation in Higgins classroom.

> I think he explains in a way that is very close to pupils thoughts… it is very close to pupils, and it is… it is at their level of understanding ... and it is very playful all the time […] they [pupils]

> are involved in everything he does... then they have tests in mathematics where the competitive instinct comes into play... when he says something it becomes fascinating…

Lisa accentuates her admiration for the teaching that she participates in and relate the teaching to the use of competitions, "he has it all the time." Lisa concludes that "I am very impressed with him as a teacher and would I… I would be like him."

Two relevant social practices are visible in Lisa's tales. Lisa re-engages in the past social practice, upper secondary mathematics classroom, as a hugely successful pupil. The success was related to the competitive structure which increased her motivation. The common endeavour of participating in competitive teaching practices that she shared with some others is central in her positive experience of mathematics education. It is also central to her view of teaching. Lisa do not question her first internship. Her prior participation in the upper secondary mathematics classroom is instead reinforced as valid in the present school-related social practice.

These two social practices are closely related, there are many similarities. Lisa brings two different social practices together, her past and present participation moulds together while re-negotiating the role of competitions. By participating in a present educational model, the role of competitions is actualised from past participation to present experience.

Phase two – Questioning competitive teaching when teaching

The second phase links to the 30 ECTS course in mathematics education and the common endeavours of the teacher educators. This paper stresses two different ways of participating, ways of being, within the mathematics education course. There are also other social practices of importance, for example, the study group containing three other student teachers.

During the mathematics education course, it became apparent, to Lisa, that most students did not enjoy mathematics at school and competitive teaching is filled with anxiety. She immediately starts to question her experience in mathematics classrooms and begins to align with the teaching in mathematics education. To understand this shift in her participation, the re-negotiation of her past participation, we need to enter lecture halls and seminar sessions that the mathematics education course provided during the first week.

Several different teacher educators indicate that the student teachers' bad experience of mathematics teaching might relate to competitive teaching. During the first week, it becomes clear to Lisa that her positive experience of competitive teaching is uncommon and she starts to question her past participation in mathematics classrooms. "Everyone is more or less competitive, and it is a huge strong feeling in all of us… or in me… it is […] it suits them who are good and not those who have difficulties ... so I do not know how much one will use it ... you will have to think about the pros and cons... and then usually… well, the disadvantages take over ..." There are positive things with competitive teaching "everyone concentrates more and makes every effort to get ahead [of others] or to win… there will be more ... a bit more fight and quality ... sort of ..." However, the negative side takes over "it ruins the confidence and quality deteriorates because it usually goes on time and that it should go as quickly as possible ... instead of as good as possible. I think it is

important that they compete against themselves, but I think it is difficult for students to grasp that ..."

However, when engaging in informal discussions in other social practices, she talks differently. For example, in her study-group, she several times during this course highlight that “competitions are excellent” and "to get ahead in the textbook is a great feeling."

During the course in mathematics education, Lisa starts to contrast her prior experience with the mathematics education course developing a critical stance against the kind of teaching that is promoted by the teachers. ”You do not agree with everything they say.”

At the beginning of the mathematics course, Lisa makes a shift concerning competitive teaching. By participating in the social practice set up by mathematics education, she tries to balance her past participation while re-negotiating the role of competitive teaching. The manifestation of the conflict, Lisa participates in, can be viewed between the prior experience of competitive teaching and the present experience of mathematics teacher education. Also relevant is the experience of the “other”, those with negative experience from the past. The point is that Lisa re-engages and engage in two distinctly different themes that relate to different social practices, that do not relate to each other, trying to balance the role of competitive teaching during the mathematics education course. The teacher education course in mathematics education has a significant role in the shift describes, how Lisa use past and present experience. While trying to bring these different perspectives together, Lisa starts to develop a critical positioning to the promoted teaching presented at the mathematics education course.

Phase three – Competitions is positive for all learners

The last phase starts before the end of the mathematics education course. She engages in an imagined, present or future, social practice and relates that social practice against the content promoted at the teacher education course.

Even though Lisa think that this has been the best course, so far in her teacher education experience, she does not align with the general promoted teaching of the teacher educators. Lisa concludes that she is still positive to competitions even though it is described as an insufficient teaching strategy by the teacher educators. She admits that she may “sound mean” but "everyone is competitive more or less… everyone wants to win, and no one likes to lose”.

> I do believe that competitions engage pupils… then one might not do it so outspoken that the one who wins gets a candy box … but competitions are there… not that anyone gets knocked down because they never win… however, still there... something that engages them and makes them want to make an effort... and that…well… in that way, I do even believe that one can involve them who have it easy and those who find mathematics hard … that they can applaud and encourage each other in this way… but then I do not know if competitions are the perfect teaching way, but I do think that it can be of importance to put it into teaching… and mathematics feels like a subject where it can be easily done.

Lisa also conducts her second internship with Mr Higgins as a supervisor. He still works in the same way, and Lisa is very comfortable in that classroom. She highlights that Higgins still uses

competitions as a teaching strategy and in the final interview, two years and five months after the first one Lisa concludes that "Higgins is an excellent role-model at the moment… he is in my thoughts a splendid teacher… he is like the teachers I liked when I was young".

There is an apparent shift in Lisa's PoP. She is no longer obliged to participate in the collective way of being and share the common endeavour set by the teacher educators. She need not consider the role of the mathematics education course and the way of participating in this social practice. While bringing different perspectives together Lisa positions herself concerning future pupils, expand her educational model related to competitive teaching and develop a critical positioning to the teaching promoted by teacher education.

Discussion

This paper aimed to illustrate how different past and present social practices play for Lisa's, a generalist student teacher, tales of herself as primary mathematics teacher-to-be. In the result section, it has been illustrated what experiences from teacher education and other relevant social practices that are visible. PoP has offered a way to follow the re-negotiation of the meaning of teaching mathematics, how Lisa is using different social practices within communication to understand the world around her when emerging into the teaching profession.

Lisa's pathway through teacher education is viewed as "a process of flexibility, autonomy, and adaptation to the teaching context" (Hošpesová, Carrillo & Santos, 2018, p. 181). In her professional development, she has for example negotiated and re-negotiated her experience of competitions, upper secondary, internship, teacher education, and study-group work. She has first of all re-engaged positively in prior experience and in teachers teaching rather than teacher educators promoted teaching. The teaching of the teacher educators has been used as a discursive counterpart. Most important has been her own experience of being a pupil at school and how she re-negotiated that experience with Mr Higgins teaching practice. It can also be interpreted that her background as an athlete has contributed to her professional development.

Lisa draws on competitive classroom when entering teacher education and she still draws on competitive classrooms at the end of this study. In this sense, there is no shift in her participation. However, the third phase is no regression to the first phase, as Lisa brings in different perspectives and social practices in the different phases. Lisa uses other information in her argumentation and justification during different parts of her teacher education. Also notable is that teacher education promotes another teaching than the one Lisa draw on, and this evolves into the fact that Lisa questions some of her assumptions during her education. In this way, the mathematics education course has played a role, but in the end, not the role the teacher education community expects or wants.

The different phases in this paper are critical because we can interpret how social practices play a role in her tales of herself as teacher-to-be. We can interpret how past and present social practices influence how Lisa talks about competitive teaching during different parts in her teacher education. The point is, by looking closer to the process one can understand how and what students change or not. Many things happen during an education, both inside and "outside". While most others, for example, Hodges and Hodge (2017) focuses on social practices related to teacher education I

suggest that there are other social practices of importance when student teachers become educated teachers. There is a need to be interested in any social practice when trying to understand student teachers as teachers-to-be.

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