Identity development in limbo: teacher transition from education to teaching

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The theories and results discussed in this article are from a study investigating the identity development of novice primary mathematics teachers. The article has two aims: first, to elaborate the notion of beliefs in relation to the notions of identity and identity development, with the purpose of developing a framework to investigate the process of becoming and being a teacher of mathematics; and second, to offer an example of the use of this framework in a study of novice primary mathematics teachers. The core of the example is the case of Jenny [1], a Swedish novice primary mathematics teacher. Jenny's case, however, is not simply about her but also about identity development when the formal aspect of employment is missing, a case not rare [2] in Sweden.

To become, be and develop as a primary mathematics teacher is a process that formally begins with teacher education and continues in professional duty after graduation. The process can be, and has been, looked at in different ways from different aspects, e.g. formally from a perspective of graduation and employment or more informally from a perspective of the individuals' beliefs and mathematical knowledge for teaching.

In many studies regarding the process of developing as a teacher of mathematics the formal aspects, graduation and employment, are fulfilled. Perhaps as a result of this it is shown in Cooney's (2001), Phillip's (2007) and Sowder's (2007) research reviews that beliefs and mathematical knowledge for teaching have often been the analytic focus in studies regarding professional development as a mathematics teacher.

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In reality there are also other scenarios for the development of mathematics teacher identity. These include newly graduated teachers without employment, employed mathematics teachers without a degree and teachers with degrees in other subjects teaching mathematics.

The results in this article are from an ongoing study of novice primary teachers of mathematics. The aim of this research is to investigate the development of their professional identity as seen from the perspective of the teachers themselves. This article has two parts: first, an elaboration on the notion of beliefs in relation to the notions of identity and identity development. The starting point in beliefs is based on the widespread use of the notion in earlier studies regarding novice mathematics teachers. On the basis of beliefs and the notions of identity and identity development the framework of the study will be presented. The article's second part will provide an example of the use of this framework in the study of a novice teacher, Jenny. I shall use Jenny as a case of the identity development of primary teachers who do not get a teaching position immediately after graduating, i.e. when the formal aspect of employment is missing. It is not uncommon in Sweden that novice primary teachers do not find employment after graduation. This leaves them in limbo and makes their identity development vulnerable.

The notion of beliefs

Cooney (2001), Phillip (2007) and Sowder (2007) show in their research reviews that beliefs and mathematical knowledge for teaching have often been the analytic focus in studies regarding novice teachers. There is no agreement, however, regarding the meaning of the two concepts or their relationship. This article will only focus on beliefs and will not address the field of mathematical knowledge for teaching or the unsolved problem regarding the relationship between the two concepts.

Several of the studies that Cooney (2001), Phillip (2007) and Sowder (2007) refer to regarding beliefs show that teacher education has little effect on teacher students, and that what teacher students learn in teacher education tends to transform when they start working as novice teachers. Similarly, in his review of beliefs research, Pajares (1992) refers to studies showing that the thousands of hours teacher students have spent as students in mathematics classrooms far outweigh the effect of teacher education. Frykholm (1999) also argues that many prospective teacher students' beliefs about mathematics teaching are shaped before teacher education. In Frykholm's studies, in-service teachers[3] had the greatest influence on teacher students. One problem, however, was that the in-service teachers did not always work according to the same model

of mathematics teaching as stressed in teacher education. According to Gellert (2007), novice teachers who worked successfully with reform-based mathematics teaching during their teacher education often reverted to traditional teaching after graduation. Similarly, in a study of novice mathematics teachers, Ensor (2001) found that it was easy for the novice teachers to agree with the teacher educators but harder for them to convert their ideas into classroom practice.

Traditionally beliefs research has focused on individuals with an assumption that the classroom practice is the teacher's practice and that you can predict the classroom teaching by studying the teacher. Limitations in this focus on the individual have been discussed (e.g. Speer, 2005, 2008; Skott, 2001, 2010; Lerman, 2009) and, for instance, Gellert (2007) and Ensor (2001) above have taken a more social approach. If the purpose is to understand the role of beliefs in practice, the empirical material must also be collected and analysed in connection with that practice, and if you want to understand individual teachers you need to look at their social settings (Lerman, 2000, 2001). Also, the definition problems and problems regarding methodological issues in beliefs research have been discussed (e.g. Speer, 2005, 2008; Skott, 2001, 2010; Wilson & Cooney, 2002).

Skott (2010) summarizes earlier definitions of beliefs as "individual, object-like, mental entities with significant impact on classroom teaching and student learning" (p. 1). He recommends a shift in research from the objectified notion of beliefs to the individual's patterns of participation in social practices. He describes patterns of participation as the pre-reified processes of teachers' participation in social practices, some of them oriented towards the teaching and learning of mathematics.

The notions of identity and identity development

The notion of identity has increased in importance in mathematics education research. Many researchers assert that identity offers a connection between the individual and the social, and that studies focusing on identity can make previously ignored phenomena visible (Stentoft, 2009; Sfard, 2008; Lerman, 2000, 2001).

Lave and Wenger (1991), Wenger (1998) and Sfard (2008) place identity as a pivot point between the social and the individual. Identity is "man-made and [...] constantly created and re-created in interactions between people" (Sfard & Prusak, 2005 p. 15). Studying identity in social terms does not mean that the individual is denied but rather that the individual's identity is seen as developing in relation to different communities of practice.

Wenger (1998) describes a community of practice as relations (not necessary physical) between people, activities and the world, a shared learning history. A community of practice does not have to imply a well defined group or visible social bonds between members of the community. Instead, it implies a mutual engagement in a system of activity around which the members have an understanding about what they are doing and what it means for their lives. Through sharing and new design in these activity systems, members define their identities in relation to the communities of practice. A community of practice exists over time, and different communities of practice overlap.

Since an individual participates in, or is excluded or disaffiliated from, different communities of practice, identity development also concerns negotiating these different belongings. Starting to work as a teacher means not only negotiation between different communities of practice, but also changes within communities of practice. According to Lave and Wenger (1991), a community of practice develops when newcomers gain access to it. In this way it is not only the identity of the individual that develops, but also the community of practice.

The individual can, according to Wenger (1998), belong to/identify with a community of practice through engagement, imagination or alignment. These different modes of belonging may give rise to tensions within an individual's identity, causing negotiation in identity between and within communities of practice. According to Wenger (1998), this can be the hardest challenge for an individual moving between communities of practice.

Patterns of participation and communities of practice
In this section I will connect Skott's (2010) notion of patterns of participation with the notions of identity and identity development in communities of practice as described by Wenger (1998).

Teacher identity can be described in primarily individual or collective terms (Petersson, 2003). When the individuals are foregrounded their patterns of participation become the unit of analysis. If the collective is placed in the foreground, instead overlapping constellations of patterns of participation become the unit of analysis. Such overlapping constellations can be described in terms of Wenger's (1998) communities of practice. According to Wenger, a community of practice implies a mutual engagement in a system of activity. Through sharing and new design in these activity systems, members define their identities in relation to the communities of practice. What Wenger describes as systems of activity

are treated in this study as overlapping constellations of several individuals' patterns of participation. As such, patterns of participation in communities of practice can be understood in terms of identity and identity development.

According to Wenger (1998), the sources of communities of practice are mutual engagement, joint enterprise and a shared repertoire. Individuals' patterns of participation in social practices give rise to these, and at the same time are results of them. As such, communities of practice are simultaneously both the result and the source of patterns of participation.

A novice primary mathematics teacher can be a member of several different communities of practice within his or her teacher role, for instance different groupings of teachers and students in different subjects within teacher education, as well as communities of practice with teachers at schools where they performed their practical training, or applied for or received their first teaching jobs. Engagement, imagination and alignment, as ways individuals identify with communities of practice are part of individuals' patterns of participation.

An individual's patterns of participation can simultaneously be the core of membership in one community of practice and the reason for exclusion from another. The individual's patterns of participation affect and are affected by the communities of practice of which the individual is, wants to or does not want to be a member and from which they are excluded, as well as what kind of membership they develop. According to Wenger (1998), identity development is an individual's learning trajectory through different communities of practice, and in the present study this learning trajectory is interpreted as changes in patterns of participation.

According to Lerman (2000) an analysis can start with the individual to explain the social, or in the social to explain the individual. Whichever starting point is taken, however, each part consistently affects the other. The individual is part of situations in different contexts, and the contexts are part of the individual in those situations.

In the present study the individual is the primary starting point, with communities of practice in the background. Communities of practice (overlapping patterns of participation) are observed indirectly based on the individuals' patterns of participation. Based on these, interpretations are made regarding which communities of practice the individuals are members of or distance themselves from and how their individual patterns of participation are influenced by or influence these different modes of belonging.

Operationalization of identity and identity development

Identity as multimembership in different communities of practice, and identity development as learning trajectories in such multimemberships, can be regarded as observable from an outside perspective. However, with the aim of investigating the development of professional identity as seen from the perspective of the teachers themselves the notions of identity and identity development must be made operational to be investigated from an inside perspective. This does not mean an additional perspective on identity and identity development, but rather a methodological development of the notions.

Sfard and Prusak (2005) link identity to communication and define identity as "a set of reifying, significant, endorsable stories about a person" (p. 14). These stories are told by the individual but are simultaneously influenced by and located in different communities of practice. The reified part of the stories refers to the fact that we, when we talk about ourselves, tend to talk in actual states rather than actions. In the stories, we freeze impressions from actions in a jointed story about ourselves. The possibilities that previously existed in actions instead become possibilities within the individual actor. As such the stories, the identity, are shaped in several communities of practice, and change based on the needs and perceptions of the author and recipient. The stories, which according to Sfard and Prusak (2005) are identifying stories, are significant and endorsable from the perspective of the individual.

Sfard and Prusak (2005) distinguish between different kinds of identifying stories based on who tells them and to whom they are told. First-person identity is told by the identified person him or herself. Second-person identity is also about the identified person, but is told to him or her. Third-person identity is about the identified person told by a third party to a third party. Of these, only the first-person identity fulfils the criteria of being a reifying, significant and endorsable story. But since these stories are collectively shaped in different communities of practice, they are influenced by second- and third-person identities.

According to Sfard and Prusak (2005), identity development is connected to first-person identity stories of two kinds: those about the current state and those about states expected to be. Sfard and Prusak (2005) call these stories *current identity* and *designated identity*. Identifying stories of current identity are told in present tense, while identifying stories of designated identity are told in future tense or as wishes, commitments, obligations or necessity. The designated identity gives direction to the actions and influences the needs of the individual. It is not always wanted, but can sometimes serve as binding for the individual.

Sfard and Prusak's (2005) operationalization of identity as first-person stories is in line with the purpose of investigating identity development from the perspective of the individual. Based on the earlier connection between patterns of participation and communities of practice and inspired by identity as first-person stories, identity in this study is operationalized as:

> The reified and significant stories that teachers tell about their patterns of participation regarding education in mathematics, in present and future, interpreted with a background in contemporary multiple communities of practice.

Sfard and Prusak's (2005) notions of current and designated identity are used to make visible the present and future. Doing this, one can talk about identity development as actions and learning (changes in patterns of participation) with the purpose of reaching the designated identity or increasing the distance from an unwanted designated identity. Which actions and learning are possible in doing this are formed from the current identity. As such, neither current nor designated identity is to be seen as a closed unit. The current identity forms and enables the designated identity, and the designated identity affects the needs and actions performed in the current identity.

The study

The study of Jenny is part of a multiple case study of eight novice primary mathematics teachers' professional identity development. The study was initiated shortly before their graduation in 2009. A Swedish teaching degree for primary school comprises at least 210 ECTS, of which approximately 35 ECTS involve studies in mathematics education. In the selection of the eight primary teachers in the study, those who had chosen to write their 15 ECTC degree project on mathematics education research [4] were selected. This was done in the hope that they would also choose to teach mathematics after graduation, and that teaching mathematics would increase the primary teachers' possibilities to develop an identity as mathematics teachers, which is the focus of the present study.

According to Patton (2002) and Ragin (1992), more than one object can be the unit of analysis in a case study, as several cases are enacted within it. The results discussed in this article, identity development as a primary mathematics teacher without employment, form a case that has grown gradually during the analysis of the empirical material and range thematically over the eight different cases. Ragin (1992) calls this a specific

theoretical case construction. In this article I use Jenny to illustrate this case, but since a specific case construction like this ranges thematically over different cases this article is not exclusively about Jenny. Rather, she is an information-oriented selected case (Flyvberg, 2006) used to explore the questions of how professional identity development occurs when the formal aspect of employment is missing.

The empirical material in the article comes from three interviews with Jenny, the first just before her final exam and the other two during her first semester after graduation. The three interviews were semi-structured with open questions. The informants were initially asked to give examples of what they considered good and less good mathematics teaching. The reason for having them give examples was to reduce the possibility that they would reproduce phrases from teacher education. They were also asked questions about the teacher's role in general and in mathematics in particular, and about their thoughts about starting to work. The open questions were used to make visible central aspects of identity development from the participant's perspective. The open character of the questions allowed Jenny and the other research participants to focus on organizational, social, emotional, subject-related and individual aspects.

In addition to these open questions, the interview before the participants' graduation contained activities in which they were invited to reflect and comment on students' solutions and student-teacher dialogues. The purpose of this was to draw connections between the interview and the almost-graduated teachers' upcoming work as primary mathematics teachers. They were asked to comment on the student solutions and dialogues and to tell and motivate how they would have continued the work if they had been the teacher. In the interviews during the novice teachers' first semester, they themselves came up with examples of and comments on different lessons, actions and activities based on teaching they had practised. All interviews lasted between 35 and 60 minutes and were audio-recorded and later transcribed in full.

The analysis has been done based on the Swedish transcriptions. The quotes in this article have been translated by a native English speaker. The data have been analysed using methods inspired by constructivists' grounded theory (Charmaz, 2006).

As a researcher you would like to gain access to individuals' first-person identity stories about themselves to themselves (Sfard & Prusak, 2005). Methodically this is clearly impossible, and instead, you have to settle for the individuals' identity stories to you and/or to others. In this study as a whole, stories both to me and to others are used, but this article discusses only identity stories told to me as researcher. This entails the

considerations that always accompany interviews regarding the impact from the researcher.

The case of Jenny

At the time of graduation, Jenny is 22 years old. In the interview shortly before her graduation, she talks about being a teacher and starting working as a teacher. At one point she says about herself "I as a teacher" and then starts to laugh. According to her, this is the first time she has called herself a teacher. After laughing, she continues to talk about when you can call yourself a teacher. She says that graduation is one important part from the perspective of society, but that graduation is not enough. She also mentions competences and belonging, belonging to a school, as important.

In this first interview Jenny also talks about her upcoming teaching and has a clear picture of the kind of teaching she wants to practise after graduation: mathematics teaching with elements of outdoor activities, group work and hands-on material. She motivates her standpoints by saying that mathematics teaching of this kind includes the students, allows them to make the knowledge "more their own". She also talks about the kind of mathematics teaching she does not want to practise, that is, teaching that proceeds from and depends on a math book.

However, already before graduation she has an idea that her thoughts about mathematics teaching may not be conformable to the mathematics teaching in the schools. At one point she talks about having to "fit in" and I ask her want she means.

> You know, you have that picture of a teacher. How a teacher is supposed to be and how a teacher is supposed to act. And as a new teacher you may have to yield a little to your big ideas. But at the same time you want to show your best side, I don't know. Sometimes it feels like some of the teachers out in the field, if you can say so, have this thought that you take too much initiative. Yes, now you're newly graduated but you're not allowed to be too full of enterprise. Yes I have, you need to have backing for what you want and what you want to do. And then I think, it can be hard to suggest new ideas. This template or how you think, well it's not a template neither because it changes the whole time. Society wants new stuff from teacher students if you can say so. Out with the old and in with the new sometimes. [...] I can come with a lot of ideas but they might say "What are you doing now?" or "What's happening? We don't work like that".   (Interview before graduation)

Before graduation Jenny refers to some kind of task assigned by society to contribute "new stuff" to school. This "new stuff" is part of what she describes as the way she wants to teach mathematics. To better understand what she means by society, I ask her who it is that wants the old out.

> Media, I think. It feels like they want something new, something fresh. But then reality says something else. Because media do not feel like a reality. (Interview before graduation)

Even if Jenny has a clear picture of her desired mathematics teaching, before graduation she expresses insecurity regarding how this teaching will be received in "reality". In the interview she talks about how she will or will not be accepted in schools.

> Sure you can come and crawl in, you can show yours and what you can do and we want to take part in that but then, then you ought to stay in your place. It is not, and then sure I believe that some workplaces are like paradise, where you can play out and take initiative.
>
> (Interview before graduation)

The next time I meet with Jenny is eight weeks after her graduation. She has not gotten a teaching job but has rather applied to the intermedium of substitute teachers, which mediates substitute teachers to schools in the municipality. This means that the teacher (if he or she is lucky) gets a call in the morning from the intermedium and gets a job as a substitute teacher at a school for one or several days. Jenny combines these temporary teaching jobs with temporary jobs of other kinds. During these eight weeks she has had many temporary teaching jobs at different schools on different levels, and has been teaching different subjects, including mathematics. When I ask her if she now feels like a teacher, she says:

> Yes, I'm a teacher. I have come into it more and more. It feels like, when I get my own class or when I can be a part of just one school, not just jumping around, then I will probably feel even more like a teacher because then I will have something firm.
>
> (Interview eight weeks after graduation)

Jenny's image before graduation that her ideas about good mathematics teaching not would be in line with the mathematics teaching out in the schools is verified when she starts working as a substitute teacher after graduation.

> It is just that, this updating. I am thinking about the teachers out there. [...] And all the time [they] have that older version in their

head. It should look a specific way. So, they really need updating sometimes. And to really embrace it also and not just dig their heels into the old.   (Interview eight weeks after graduation)

To discover more about her activities and belonging to teachers, schools and the different kinds of mathematics teaching she described before graduation, I ask her how she plans her mathematics teaching and whether she is doing this together with someone else. She explains that her situation as a substitute teacher has resulted in her not planning any mathematics teaching at all during these eight weeks. Instead, she has carried out mathematics teaching planned by other teachers. She has not been involved in this planning, and says about the mathematics teaching she has performed:

> It is so much the math books. It is the math books all the time. I have to adjust to that right now, I have to. [...] it is mostly the math books and I feel like that is not really me. As I probably said the last time it's more hands-on things, I want to pick and potter and get them to understand in that way.
>
> (Interview eight weeks after graduation)

Jenny continues to work as a substitute teacher for the rest of her first semester as a teacher. When I interview her immediately after that, i.e. at the beginning of summer break, she talks about her role as a substitute teacher and her teaching in mathematics during this first semester:

> So, you do not make any connections, like deep connections. [...] Yes, it is lonely. You have to take care of yourself a lot.
>
> Yes but I want to be more practical than using the math book. And I still want to try to do that. [...] I believe it is difficult. Doing the things I want. It has to wait. It will be when my own class comes. Then I can start doing such things.
>
> (Interview after the first semester)

Analysis

The notions of current identity (current patterns of participation), designated identity (designated patterns of participation), and identity development in communities of practice presented at the beginning of this article will be used here to interpret the case of Jenny.

Jenny's identifying stories before graduation

From the perspective of identity and identity development used in the study, Jenny's examples of good and less good teaching in mathematics before graduation and her motivations for these examples can be described as parts of her patterns of participation regarding mathematics teaching. Not patterns regarding performed mathematics teaching but patterns regarding talking about mathematics teaching. Her stories have been formed in her current identity, influenced by both the communities of practice she belongs to and those she does not belong to today, and by the identifying stories that exist there. In Jenny's stories it is clear that she has experienced different ways of teaching mathematics and that she is clear on how she wants to teach mathematics after graduation.

As such, her stories about teaching are also part of her designated identity as a primary teacher of mathematics. Jenny has an idea of how she wants to teach mathematics after graduation. In saying "you have that picture" she indicates that she does not think of herself as alone in wanting to teach like that. This is further emphasized when she calls the picture a "template", one that changes. This template comes from "society". There seems to be an overlapping pattern of participation regarding mathematics teaching that Jenny's stories are a part of, a community of practice regarding how to teach mathematics. I will call this community of practice "reform mathematics teaching"[5], to be able to distinguish it from other communities of practice in Jenny's stories.

Jenny's descriptions before graduation about becoming a teacher can be seen as a description of another community of practice she wants to belong to, a community of teachers. Being a member of a community of teachers is also part of her designated identity. In the interview before graduation she talks about all teachers as belonging to one community of practice. To gain access to this community she must have a formal degree, but also competences. Jenny's talk of belonging can be seen both as a presumption that she will gain access to the community of teachers and as a result of gaining that access. The formal degree is something she gets from society, and she can influence the competences herself. Regarding belonging, she is dependent on a community of teachers that she can belong to.

From the perspective of identity and identity development used in the study, the identity development from current identity to designated identity entails actions and learning in order to increase or close the gap between the two. In Jenny's current identity she describes these two different communities of practice that figure in both her current and designated identities. She is, and wants to remain, a member of the community of practice regarding reform mathematics teaching, and she also

wants to perform that teaching. She also wants to become a member of the community of teachers.

These two communities of practice originate from overlapping patterns of participation of various kinds. The community of teachers originate from patterns of participation of physically existing teachers. The community of teachers physically exists, and even if Jenny expresses that she will have to "crawl in" she is aware of the possibility that the community of teachers can be of diverse natures regarding accepting the kind of mathematics teaching she wants to practise. When she talks about patterns of participation in the community of practice regarding reform mathematics teaching, she refers to "society" and "media" as intangible assets. It is not physically existing people who are the core of this community but the perceptions of how mathematics teaching should be conducted. She also talks about active teachers as those not performing that kind of teaching, which can explain her talking about having to "crawl in".

Her membership in the community of reform mathematics teaching seems mainly to be in the forms of imagination and alignment. Due to the different structures of the two communities of practice, it is possible that Jenny's membership in them, through engagement, imagination and alignment, will develop in different ways after her graduation.

The two different communities of practice in Jenny's designated identity would not have to become a problem, but already before graduation she has an idea that the community of teachers may not be conformable to that of reform mathematics teaching. Looking at Jenny's identifying stories you can see that, according to her, her ideas about reform mathematics teaching can become a problem when she simultaneously wants to become a member of the community of teachers, as the community of reform mathematics teaching is not like the community of teachers. Quite the contrary: In Jenny's identifying stories; the community of teachers is often performing "less good mathematics teaching". According to her, reaching one's designated identity regarding reform mathematics teaching is not easy as "reality says something else". Reality can be seen as the community of teachers. She talks about teachers in the field as those performing less good mathematics teaching, which she disassociates herself from. This way of talking seems to be part of the patterns of participation in the community of reform mathematics teaching.

Before graduation, Jenny has an idea about reforming the existing mathematics teaching in schools. Being the one who suggests new ideas is not easy, according to her. A community of practice implies mutual engagement in a system of activity (overlapping patterns of participation) in which the members have their own understanding about what they are

doing and what it means for their life; Negotiation in identity between communities of practice can be the hardest challenge for an individual moving between communities of practice. Wenger (1998) calls an individual who introduces elements from one community to another, or tries to merge two communities, a broker. Being a broker requires sufficient access to the communities and a balance between not being rejected and not becoming a full member of the practice intended for change. Jenny must first gain access to the community she wants to reform. When she talks about "fitting in" she refers to the community of teachers. This can be seen as her knowing that she will have to change her patterns of participation regarding mathematics teaching to become a member of the community of teachers.

Jenny's identifying stories after graduation

After her first semester as a teacher, Jenny is still a peripheral member of the community of teachers. She sees herself as a teacher but again mentions belonging, to a class or a school, as a criterion for reaching her designated identity as teacher. This can be seen as a need to belong to a limited community of teachers at one school to be able to further develop her teacher identity. Wenger (1998) mentions sharing and new design in communities of practice as grounds for the individuals' identification with the community. Talking about the community of teachers, Jenny mentions planning and connections as criteria for membership in that community and it requires physical interaction. The community of reform mathematics teaching does not seem to need such a physical interaction but rather exists in a virtual way sharing and new design are possible in a virtual manner, but regarding the community of teachers there is no such virtual community. Not getting employment as a teacher then becomes an obstacle to developing membership in the community of teachers.

Jenny does not talk about the activity in the community of teachers, teaching, but mentions having her "own class" as another criterion for reaching her designated identity as a teacher. From the perspective of communities of practice, a teacher and the children in a class cannot be seen as a community of practice around learning because that is not the joint activity they are involved in. Rather, the class and teacher are in a community of teaching together; not a community of teaching like those regarding reform mathematics teaching, but a community of practice joined around the teaching activity: The teacher teaches and the class is taught. According to Jenny, gaining access to one kind of community of practice like this is important for her reaching her designated identity as

a teacher. It could also be that having her "own class" serves as an artefact for her imagined identity as a teacher.

Jenny has not changed her ideas about reform mathematics teaching, even if her situation as a substitute teacher does not allow her to teach that way. She is still sharing her ideas regarding mathematics teaching in this community, but is not performing it this way. Instead, she is performing mathematics teaching that, according to her, contains examples of less good mathematics teaching.

Even if Jenny is formally a teacher, she has not really moved towards her designated identity as a primary mathematics teacher regarding the two communities of practice. She does not feel that she belongs to a community of teachers or to a community of a class which, according to her, are both important for her. Her role as a substitute teacher has also resulted in her not being able to deepen her activities within the community of reform mathematics teaching, another part of her designated identity. Her membership is in the form of imagination and alignment. Instead, she is performing mathematics teaching that she distances herself from and wants to reform. Jenny herself says that "it has to wait" until she has her own class, something she cannot influence herself.

The two communities of practice overlap. From the perspective of identity development as the activities and learning in order to move towards her designated identity Jenny has not come far, and she is aware of this. She is working in limbo out in the periphery of different communities of practice, which are important for her identity development towards her designated identity as a mathematics teacher. According to her, she has to wait until she has her own class. Jenny not finding employment as a teacher causes her not to be able to develop her membership in any of the communities of practice that are important for her reaching designated identity as a primary mathematics teacher.

Jenny's identity development in limbo

Schifter (1996) argues that teachers construct their professional identity based on their experiences in different communities. The unified identity is *teacher of mathematics*, but the identity crosses the communities of practice a teacher participates in, e.g. the classroom, staff meetings, parent-teacher meetings and so on. Jenny does not have access to these places either physically or virtually, and is therefore not able to develop membership in any communities of practice existing there. I believe this makes her identity development as a primary mathematics teacher vulnerable.

One vulnerability is that Jenny relates to several different communities of practice – reform teaching in mathematics, teachers, class – that

in different ways are important for her to reach her designated identity as a primary mathematics teacher. Her role as a substitute teacher results in her not being able to develop deeper memberships in the communities of either reform mathematics teaching, teachers or class, which are all parts of her designated identity.

This can be expressed as a forced empty space that the role of substitute teacher puts Jenny in, which prevents her from developing deeper memberships in communities of practice important for her identity development as a primary mathematics teacher.

> Being a teacher of mathematics means developing a sense of self [as] a teacher. Such an identity grows over time. It is built from many different experiences with teaching and learning. Further, it is reinforced by feedback from students that indicates they are learning mathematics, from colleagues who demonstrate professional respect and acceptance [...].   (NCTM, 1991).

A lack of this makes one's identity development as a mathematics teacher vulnerable.

Instead Jenny is performing something that, according to her, is less good mathematics teaching. She says that she has to "adjust to that [teaching with math books all the time] right now" and that doing what she wants "has to wait". Instead of being the one reforming the existing mathematics teaching in the schools, she is performing that teaching. I believe this is another vulnerability in her identity development because it probably affects her feelings about herself as a mathematics teacher, and as a substitute teacher she cannot change the situation.

Summary and conclusions

At the beginning of this article I presented two aims: to elaborate the notion of beliefs in relation to the notions of identity and identity development in an interwoven framework and to give an example of the use of this framework in a study of novice primary mathematics teachers not finding employment as teachers after graduation.

Jenny's situation is not unique in Sweden. Most novice primary teachers work their first years as substitute teachers. For Jenny, this led to her not gaining access to communities of practice where her identity development towards her designated identity as a mathematics teacher could develop, even though she is formally a teacher through her graduation.

In earlier studies regarding novice teachers' beliefs, research participants often fulfilled the two formal criteria for being a teacher, graduation and employment. This led to a research focus on individuals'

development of beliefs with the finding that teacher education has little effect on teacher students, and that what teacher students learn in teacher education tends to transform when they start working as novice teachers. But looking at novice teachers who do not fulfil the formal criteria of employment in the light of patterns of participation and identity development as a pivot point between the social and the individual sheds new light on this explanation.

The transformation in beliefs that many previous researchers have attributed to individuals can instead be described as learning in communities of practice. Novice teachers who find employment also have the possibility to develop membership in the community of teachers. In one way this makes their identity development as mathematics teachers less vulnerable than Jenny's, but at the same time membership includes developing mutual engagement in a system of activity (overlapping patterns of participation). The engagement in this system, the development of membership in the community of mathematics teachers, can be what has previously been described as transformed beliefs after teacher education. The transformation is not a regression, but rather identity development in the forms of learning and increased membership (changes in patterns of participation) regarding the mathematics teaching in the community.

Novice teachers teaching traditionally after graduation could be a conscious adaptation in order to gain access to a community of teachers. Perhaps the community of mathematics teaching in which the novice teachers want to increase their membership becomes subordinate or, as in Jenny's case, is not even an option. Jenny herself talks about having to fit in and being accepted. Before becoming a broker, an individual must have sufficient access to the community intended for change. In the process of gaining this access, it is probably easier to develop full membership in a community than to be a broker.

The explanation above shows how identity may be used as an analytic focus and offers other possibilities to understand the process of becoming and being a teacher of mathematics, other than those offered in earlier studies focusing on beliefs. New possibilities are offered when looking at the pre-reified patterns of participation and identity and identity development in communities of practice. To understand the process of being and becoming a (mathematics) teacher, both the individual and the social must be considered; The classroom is not the teacher's practice and the identity development is not the individual novice teacher's practice. It is not only the individual that should be in focus; The focus must also be on the different communities of practice the individual belongs to, wishes to belong to or distances him- or herself from. Having identity

as an analytic focus will help in understanding the process of becoming and being a (mathematics) teacher.

In a way, the results discussed in this article lead to a dead end. Professional identity development as a primary mathematics teacher when the formal aspect of employment is missing prevents one from developing an identity as a mathematics teacher, but enables the novice teacher to maintain his or her patterns of participation regarding reform mathematics teaching. On the other hand, professional identity development as primary mathematics teacher when the formal aspect of employment is fulfilled allows one to develop an identity as a mathematics teacher, but at the same time membership in that community concerns mutual engagement in activity systems regarding mathematics teaching which, according to other studies, seems to cause individuals to change their patterns of participation (often called beliefs in earlier studies) about mathematics teaching, since being a broker is such a difficult job.

The phenomenon that teacher education prepares teachers for working with and promoting reform in the practice of school mathematics exists worldwide (Sowder, 2007). But in relation to the demanding mission of being a broker between communities of practice, the possibilities involved in promoting reform through novice teachers can be discussed. Boaler (1999) showed how mathematical knowledge developed in schools offering different communities of learning was transmittable in different ways to communities outside school. According to Matos (2009), teachers' learning, the learning that forms their identity, enables their engagement in the communities of practice with which they identify. Different teacher education programmes offer different communities regarding mathematics teaching, and the knowledge developed there is transmittable in different ways to communities of practice outside teacher education. Depending on how the community of mathematics teaching looks, different schools will demand different negotiations of identity for novice teachers. This makes every story of identity unique, but with the mutuality that identity is developed at the pivot point between the social and the individual.

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Notes

1 Jenny is also mentioned in a conference paper presented at Madif 2010.

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2 According a report from the labour office in Sweden it has been a big competition regarding employment as primary teacher between spring 2006 and autumn 2009 (Statistics from the labour office in Sweden in the report "Where are the jobs?". Retreived October 15, 2010 from http://www.arbets-formedlingen.se/Om-oss/Statistik-prognoser.html)

3 In-service teachers work at schools and tutor teacher students during their practical training.

4 The teacher student can choose between several different subjects for the degree project, and must be qualified to be allowed to choose certain subjects. A primary mathematics teacher student is qualified to choose one of at least three subjects for his or her degree project.

5 The term "reform mathematics teaching" is widely used international and is here based on Jenny's stories about the difficulties involved in being the one suggesting new "big ideas", society wanting "new stuff" from teacher students and schools needing "updating".

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