Primary School Teachers' Image of a Mathematics Teacher

Hanna Palmér

Linnæus University, Sweden

Content

Abstract

The results presented in this paper derive from a longitudinal case study of seven novice primary school mathematics teachers' professional identity development. In the study it was found that this professional identity development did not include becoming a mathematics teacher. A primary school teacher in Sweden, like in many other countries, teaches many subjects but, at the same time they are the first teachers to teach mathematics to the school children. In the paper it will be shown how the novice primary school teachers' image of a mathematics teacher prevented them from developing a sense of themselves as mathematics teachers.

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1 Introduction

Research on teachers' professional identity formation has expanded in recent years with the mutual goal to better understand and support the needs of teachers, including student teachers (Beijaard, Meijer & Verloop, 2004; Bjuland, Luiza Cestari & Borgersen 2012; Ponte & Chapman, 2008). The results presented in this paper derive from a longitudinal case study of seven novice primary school mathematics teachers' professional identity development (Palmér, 2013). A teacher's professional identity is neither totally collective nor totally individual. A teacher is expected to have some characteristic professional knowledge, goals and attitudes but, at the same time, teachers are autonomous and differ with regard to knowledge, goals and attitudes (Beijaard, Meijer & Verloop, 2004). Further, the teaching profession is practiced in different contexts, which creates a plural teacher identity, including, for example, a mathematics thinker, a teacher in the classroom, a mentor for students, a colleague and so on. The unified professional identity is a teacher but it is practiced in different contexts in different communities, for example in the classroom and at meetings, and is therefore affected differently (Schifter, 1996; Sachs, 2001). Based on above, a teacher's professional identity is simultaneously individual, collective, plural and practiced in different contexts which is a challenge for the expanded research in the area.

According to McNally, Blake, Corbin and Gray (2008) the transfer from teacher education to teaching is to be seen as a shift in identity, where becoming accepted as a teacher by colleagues but also by oneself is central.

> Beginners in teaching face the fundamental question of whether they can see themselves as teachers, not only the reflections from colleagues and children in their schools, but also in the mirror that they hold up to themselves (McNally, Blake, Corbin & Gray, 2008, p.295).

In the here presented study of seven novice primary school mathematics teachers' professional identity development it was found that their professional identity development did not include becoming a mathematics teacher. Even if they taught mathematics they did not see a mathematics teacher "in the mirror that they [held] up to themselves" (McNally et al., 2008, p.295). When analysing the novice primary school teachers' professional identity development the first two years after their graduation, a question emerged regarding what it was that made them *not* think of themselves as mathematics teachers. That question is what will be focused on in this paper as *the image of a mathematics teacher.*

2 Theoretical Framing

According to Lerman (2000), research into mathematics education has "been turn[ed] to social theories" (p.20). He bases this on mathematics education research since the late 20th century, sees meaning, thinking and reasoning as products of social activities where learning, thinking and reasoning are seen as situated in social situations. The term situated refers to a set of theoretical perspectives and lines of research which conceptualise learning as changes in participation in socially organised activities and individuals' use of knowledge as an aspect of their participation in social practices (Borko, 2004). Peressini, Borko, Romagnano, Knuth and Willis (2004) argue for using such a situative perspective in studies of mathematics teachers' teaching.

According to Gee (2000-2001), identity is to be recognised (by oneself and/or others) as *a kind of person* in a given context, which would imply that professional identity as a mathematics teacher is being recognised (by oneself and/or others) as a mathematics teacher in a given context. As such, identity has both individual and social elements. To be recognised (by oneself and/or others) as *a kind of person* in a given context is neverending implying identity as a process. Similarly Morgan (2009) writes that establishing a (positive) professional identity as a mathematics teacher involves positioning oneself "within discourses of education in general and mathematics teaching in particular (p. 109)" in ways that allow one to be seen by others and oneself as a (good) teacher of mathematics.

In the study presented in this paper, two situative theoretical perspectives, communities of practice (Wenger, 1998) and patterns of participation (Skott, 2010; Skott, Moeskær Larsen, & Østergaard, 2011), are coordinated in a conceptual framework aiming to capture both the individual and the social part of identity development involved in the over-described recognition as *a kind of person*. According to Skott et al (2011) a teacher participates in "multiple simultaneous practices" (p.32) in the classroom and there are patterns in the ways in which the teacher participates in these practices. The aim in patterns of participation research is to understand how a teacher's interpretations of and contributions to immediate social interactions in the classroom relate to prior engagement in a range of other social practices. These other social practices are in the study treated as communities of practices by Wenger (1998). An individual's patterns of participation in different communities of practice influence how they are recognised, by oneself and others. To become recognised, by oneself and others, as a mathematics teacher, an individual's patterns of participation have to be in line with the patterns of participation of a mathematics teacher. But, what are the patterns of participation of a mathematics teacher?

3 The Study

The study of primary school teachers' professional identity development is a case study with an ethnographic approach, where seven Swedish novice primary school teachers have been followed from their graduation and two years onwards. In Sweden, primary school teachers most often work as class teachers teaching several subjects whereof mathematics may be one. This is similar to other countries around the world were most primary school teachers are educated as generalists (Tatto, Lerman & Novotná, 2009).

The teacher education the respondents were to graduate from at the beginning of the study is an integrated teacher education where professional and subject studies take place concurrently. Compared to the previous primary school teacher educations in Sweden, content knowledge was emphasised with decreased practice periods (Lindström Nilsson, 2012). The respondents in the here presented study were selected because they in teacher education chose mathematics as one of their main subjects. Some of them also wrote their final teacher education Bachelor theses on mathematics education. As a minimum the respondents in the study had taken 22,5 credits, at most 52,5 credits, of courses within the field of mathematics education. The meaning with this selection was to maximise the possibility for the respondents to teach mathematics after their graduation.

The ethnographic approach was used to make visible both the individual and the social part of professional identity development. The empirical material was collected through self-recordings made by the respondents, observations and interviews. To accomplish a balance between an inside and outside perspective (Aspers, 2007); the observations were both participating and non-participating. For the same purpose the interviews were both spontaneous conversations during observations and formal interviews (individual and in groups) based on thematic interview guides. These varying empirical materials have different characteristics but are in the analysis treated as complete-empiricism (Aspers, 2007) implying that all the empirical material constitutes a whole.

The results presented in this paper have been developed gradually based on interplay between fieldwork and analysis of observations, interviews and self-recordings. The starting point of the analysis in ethnographic research is the meaning the respondents themselves infer on the situations studied (Aspers, 2007; Hammersley & Atkinson, 2007). The analysis in this study has been done using grounded theory methods which implies building and connecting categories grounded in the empirical material by using codes (Charmaz, 2006). Coding the empirical material does not imply using pre-constructed codes, but labelling the empirical material, line-by-line, with as many codes as possible (Kelle, 2007). Based on the question what it is that make the respondents recognise

themselves as a kind of mathematics teacher (or not) segments in the empirical material were inductive labelled with the codes attribute, image, criteria and epithet. After that, these codes were deductive connected through axial coding. Finally, through the writing of memos the category *the image of a mathematics teacher* emerged. This category is the similarities found in the unique experiences and expressions of the respondents regarding what it implies to be a mathematics teacher.

4 Results

This section will be presented in three sub-sections. In the first section the time of graduation will be focused on. The second section contains a summary of the respondents' two years after graduation. Finally, in the third section, parts from a group interview two years after graduation is presented. The joint theme in the sub-sections is the similarities of the respondents regarding what it implies to be a mathematics teacher. The empirical examples below are not to be seen as the wholeness of what the category *the image of a mathematics teacher* is based on but as examples of empirical instances labelled within that category.

4.1 The Time of Graduation

The respondents were interviewed the first time just before their graduation from teacher education. By other things they were asked why they wanted to become primary school teachers and why they had chosen mathematics as one of their main subjects. They were also asked if they had any mathematics teachers as role models.

The respondents' motives to become teachers were connected to interest in working with children and in school. The choice of mathematics as one of their main subjects was explained as either a tactical choice or as a choice of interest.

> I have always liked mathematics a really lot. At least until upper secondary school. And I loved it already when I started school. […] mathematics is anyhow a subject I have always liked myself and I feel that it is fun, or like that. Then it is much easier. For example, quite the opposite I have had a really hard time with English and then you feel it is difficult to motivate the students to enjoy English when I have always experienced it as really, really difficult myself. (Camilla)

Mathematics as a tactical choice is explained as mathematics together with Swedish being the most important subjects in primary school.

> I love to work with children! I chose Swedish and mathematics for younger children since I think they are the foundation of the Swedish education system and they are the most important subjects. (Jenny)

> I guess I would have preferred to study physical education but since there are few physical education teachers in primary school, I thought it was cleverer to have science and mathematics when finished and applying for job. (Nina)

Only one of the respondents remembers having had a good mathematics teacher in school and that was in municipality adult education.

> I can't think of anyone because I don't think I have met anyone who, as I see it, is a really good mathematics teacher. There are mathematics teachers who have good knowledge of mathematics, but that doesn't mean that they can teach mathematics. (Barbro)

> I haven't had what I think is a good mathematics teacher. […] It is not enough to explain the same thing ten times and think that the student will understand. I have experienced that many times, that they explain in the same way over and over again. (Gunilla)

In time for graduation all of the respondents express a clear opinion regarding how mathematics ought to be taught in primary school and they want to reform mathematics teaching. They say that they have met a new way to teach mathematics in their teacher education. This new way to teach mathematics differs from the mathematics teaching they themselves have experienced in school.

> I believe that there are many different ways today. When we went to school, you were only allowed to work in one way. Today there are different ways. (Barbro)

> The first time I saw a cubic meter and realised that I could fit inside it I was totally surprised. And I experienced that the first time here at the university. Why haven't you experienced that in your own schooling when you were little? (Gunilla)

4.2 The Two Years after Graduation

After graduation the respondents start to work at different schools and preschools as class teachers, long-term and short-term substitute teachers and as teacher assistants[1]. Some of them teach mathematics a lot, others more sporadic. However, in one way or another, all of them teach mathematics during the two first years after graduation. Similar for all of them is that they, even when they teach mathematics a lot, do not emphasis mathematics in their work. Not much is seen of the new way to teach mathematics that the respondents emphasized before graduation. Quite the opposite they teach mathematics in a way that they disaffiliated themselves from before graduation.

[1] While collecting the empirical material for this study (2009-2010), it was difficult for primary school teachers in Sweden to get jobs, especially in certain municipalities.

4.3 Group Interview Two Years after Graduation

Two years after their graduation from teacher education the respondents are gathered for a group interview. When, in that group interview, being asked if they feel like a mathematics teacher, they all say no. For some of them mathematics teaching is not included in their teacher assignment right now but nor those who work as class teachers, teaching mathematics every day, express having a sense of themselves as a mathematics teacher.

> Gunilla It's easy for me to answer that question. I don't feel like a teacher of mathematics[2].
>
> Researcher Have you felt like it at any time since graduation?
>
> Gunilla No
>
> Researcher Not even when you were teaching it?
>
> Gunilla No. […] But no, I don't feel like a mathematics teacher but I can absolutely see myself having a job as a class teacher within which teaching mathematics is a part.
>
> Researcher Nina?
>
> Nina […] I have quite a lot mathematics right now but my biggest dilemma is that I came in like that, and have to practice mathematics teaching that's already been started. And I may not be one hundred per cent. I can feel like the next time I have mathematics, if I'm on my own and am to use a text book. I'll choose the text book I want to use, and how to use it.

Further, Helena says that she would like to work more as a "subject teacher" and not have to bother about subjects she has not got in her teaching degree. She also says that she have to learn more about the history of mathematics to develop a sense of herself as *a kind of mathematics teacher*.

5 Analysis

When analysing the empirical material with focus on why the respondents did *not* think of themselves as mathematics teachers, segments were labelled with the codes attribute, image, criteria and epithet. These codes put together is the similarities found in the unique experiences and expressions of the respondents regarding what it implies to be a mathematics teacher, their *image of a mathematics teacher.*

When, in the group interview two years after graduation, being asked if they felt like a mathematics teacher, all respondents said no. Even if they taught mathe-

[2] At the time for the group interview Gunilla is teaching Swedish as a second language.

matics they did not recognise a mathematics teacher "in the mirror that they [held] up to themselves" (McNally et al., 2008, p.295). The mathematics teaching the respondents had done had not made them receive feedback, from themselves or others (Gee, 2000-2001), in line with being *a kind of mathematics teacher*. Not recognising themselves as a mathematics teacher can be connected to what it, according to the respondent, implies to be a mathematics teacher.

Before graduation the respondents express a clear opinion regarding how mathematics ought to be taught in primary school and they want to reform mathematics teaching. After graduation mathematics teaching has a concealed and limited role in the respondents' work. My focus in interviews and observations during the two years after graduation is mathematics but, in the work of the respondents mathematics has a concealed and limited role. Answering *no* to the question of being a mathematics teacher two years after graduation is a natural answer for some of the respondent for whom mathematics teaching is not included in their teacher assignment at that time. But nor those who work as class teachers, teaching mathematics every day, express having a sense of themselves as a mathematics teacher.

All respondent had chosen mathematics as one of their main subjects in teacher education. However, based on this study it does not seem to be enough to have a teaching degree including mathematics as a main subject to develop a sense of yourself as *a kind of mathematics teacher.* One aspect in developing a sense of yourself as *a kind of mathematics teacher* seems to be teaching mathematics, but that does not seem to be enough either. Gunilla has taught mathematics as a short run substitute teacher and in time for the group interview Nina is a class teacher, teaching mathematics in two different classes but this does not make them feel like mathematics teachers.

Gunilla's expression "I don't feel like a mathematics teacher but I can absolutely see myself having a job as a class teacher within which teaching mathematics is a part" indicated that there are different degrees of being a mathematics teacher. As mentioned, *the image of a (mathematics) teacher* is the similarities found in the unique experiences and expressions of the respondents regarding what it implies to be a (mathematics) teacher. Together the respondents express two different images of a teacher teaching mathematics (figure 1).

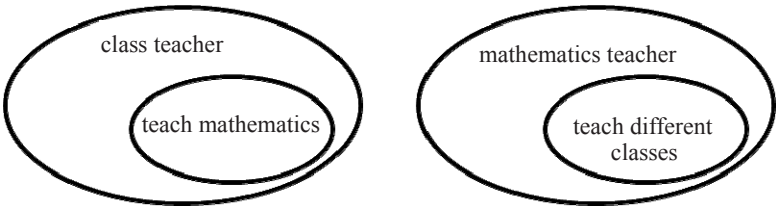

Figure 1 Two different images of teachers teaching mathematics.

The image to the left is in line with the teaching degree and the work of the respondents. However, that image is not, according to the respondents, a mathematics teacher. A mathematics teacher is the image to the right and none of the respondent identify with that. As such, their *image of a mathematics teacher* prevents them from recognising themselves as a mathematics teacher.

6 Conclusion and Discussion

As mentioned, to be recognised (by oneself and/or others) as *a kind of person* in a given context is a neverending process. After graduation mathematics teaching has a concealed and limited role in the respondents' professional identity development and above it was shown that their *image of a mathematics teacher* prevented them from recognising themselves as a mathematics teacher. According to George (2009) some student teachers are not given the opportunity to renegotiate their mathematical identity in teacher education and by that they bring psychic baggage from their own schooling into teaching. The respondents in this study had indeed, in teacher education, renegotiated their view of how mathematics should best be taught. But, what about their view of a mathematics teacher and its connection to this "new" way to teach mathematics?

According to Lindström Nilsson (2012), student teachers often retain the image they have of teachers when they start teacher education throughout their whole teacher education. According to van Bommel (2012) student teachers who are to become primary school mathematics teachers need to shift from seeing themselves as general teachers to locking at themselves as mathematics teachers. Van Bommel studied primary school student teachers during a mathematics education course and the requested shift was not made by the student teachers and neither was it addressed by the teacher educators. This is similar to other countries were most of the preparation primary school teachers receive places low emphasis on mathematics content in relation to the overall program which results in mathematics teaching never being put in the front in professional identity development (Tatto, Lerman & Novotná, 2009).

The results in the here presented study indicate that mathematics teacher is not a part of the professional primary school teacher identity of the respondents. But, when you, as a primary school teacher, are teaching mathematics you are a mathematics teacher. According to Palmer (2010), establishing a professional identity is about "picking up" the codes and the language associated with that profession. The codes and the language associated with the primary school teaching profession are seldom connected to mathematics but, instead, to caring and motherhood. Since the beginning of the 1900s, teachers teaching younger children have been pictured as warm, protecting and responsible females, a picture that still remains in both politics and the media.

To become recognised, by oneself and others, as a mathematics teacher, an individual's patterns of participation have to be in line with their image of the patterns of participation of a mathematics teacher (Palmér, 2013). With the image of mathematics teachers expressed by the respondents in this study it will become hard for them to recognise themselves as a mathematics teacher. For the respondents to develop (and striving towards developing) a sense of themselves as *a kind of mathematics teacher*; mathematics ought to become a part of their primary school teacher identities. Mathematics ought to become a part of their *image of a primary school teacher* as an *image of a primary school mathematics teacher*. Maybe then, mathematics teaching will become something they emphasise in their work.

According to Hodgen and Askew (2007) it is possible for primary school teachers to develop an identity as a teacher of mathematics but for this to happen the teacher has to "reconnect with mathematics whilst maintaining an identity as a primary teacher" (p.482). Just increasing the amount of mathematics courses in teacher education does not seem to be the solution (content knowledge was emphasised in the respondents' teacher education at the expense of decreased practice periods) but to connect mathematics to the student teachers' image of a primary school teacher. Then, maybe they will make a shift from looking at themselves as "only" general teachers to locking at themselves as also being mathematics teachers emphasising mathematics teaching in their work.

7 References

Aspers, P. (2007). Etnografiska metoder. Malmö: Liber AB.

Beijaard, D., Meijer, P.C. & Verloop, N. (2004). Reconsidering Research on Teachers' Professional Identity. Teaching and Teacher Education, 20(2), 107-128.

Bjuland, R., Luiza Cestari, M. & Borgersen, H.E. (2012). Professional Mathematics Teacher Identity: Analysis of Reflective Narratives from Discourses and Activities. Journal of Mathematics Teacher Education, 15(5), 405-424.

Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. Educational Researcher, 33(8), 3-15.

Charmaz, K. (2006). Constructing Grounded Theory. A Practical Guide through Qualitative Analysis. London: SAGE Publications Ltd.

Gee, J.P. (2000-2001). Identity as an analytic lens for research in education. Rewiew of Research in Education, 25, 99-125.

George, P. (2009). Identity in Mathematics. Perspectives on Identity, Relationships, and Participation. In L. Black, H. Mendick & Y. Solomon. (Eds.), Mathematical Relationships in Education. Identities and Participation (pp.201-212). New York: Routledge.

Hammersley, M. & Atkinson, P. (2007). Ethnography. Principles in Practice. Third edition. New York: Routledge.

Hogden, J. & Askew, M. (2007). Emotion, Identity and Teacher Learning: Becoming a Primary Mathematics Teacher. Oxford Review of Education, 33(4), 469-487.

Kelle, U. (2007). The development of cathegories: Different approaches in Grounded Theory. In A. Bryant & K. Charmaz (Eds.), The SAGE Handbook of Grounded Theory. Los Angeles: SAGE Publications

Lerman, S. (2000). The Social Turn in Mathematics Education Research. In J. Boaler (Ed.), Multiple Perspectives on Mathematics Teaching & Learning (pp.19-44). Westport, CT, USA: Greenwood Publishing Group.

Lindström Nilsson, M. (2012). Att bli lärare i ett nytt skollandskap. Identitet och utbildning. Riga: Arkiv Förlag

McNally, J., Blake, A., Corbin, B. & Gray, P. (2008). Finding an identity and meeting a standard: Connecting the conflicting in teacher induction. Journal of Education Policy. 23(3), 287-298.

Palmer, A. (2010). Att bli matematisk. Matematisk subjektivitet och genus i lärarutbildningen för de yngre åldrarna. Stockholm: Stockholms Universitet.

Palmér, H. (2013) To become – or not to become – a primary school mathematics teacher. A study of novice teachers' professional identity development. Linnaeus University Dissertations: Linnaeus University Press

Peressini, D., Borko, H., Romagnano, L., Knuth, E. & Willis, C. A (2004). Conceptual Framework for Learning to Teach Secondary Mathematics: A Situative Perspective. Educational Studies in Mathematics, 56(1), 67-96.

Ponte, J.P. & Chapman, O. (2008). Preservice Mathematics Teachers' Knowledge and Development. In L.D. English, M.B Bussi, G.A. Jones, R.A. Lesh, B. Sriraman & D. Tirosh (Eds.), Handbook of International Research in Mathematics Education (pp.223-261). London: Routledge.

Sachs, J. (2001). Teacher Professional Identity: Competing Discourses, Competing Outcomes. Journal of Education Policy, 16(2), 149-161.

Schifter, D. (1996). Whats's Happening in Math Class? Envisioning new Practices through Teacher Narratives. New York: Teachers College Press.

Skott, J. (2010). Shifting the Direction of Belief Research: From Beliefs to Patterns of Participation. In M.F. Pinto & T.F. Kawasaki (Eds.), Proceedings of the 34th Conference of the International Group for the Psychology of Mathematics Education, 4 (pp.193-200). Belo Horizonte, Brazil: PME

Skott, J., Moeskær Larsen, D. & Hellsten Østergaard, C. (2011). From beliefs to patterns of participation – shifting the research perspective on teachers. Nordic Studies in Mathematics Education, 16(1-2), 29-55.

Tatto, M.T., Lerman, S. & Novotná, J. (2009). Overview of Teacher Education Systems Across the World. In R. Even & D.L. Ball (Eds.), The Professional Education and Development of Teachers of Mathematics. The 15th ICMI Study (pp.15-23). NewYork: Springer

van Bommel, J. (2012) Improving Teaching, Improving Learning, Improving as a Teacher. Mathematical Knowledge for Teaching as an Object of Learning. Faculty of Technology and Science. Karlstad: Karlstad University Studies.

Wenger, E. (1998). Communities of Practice. Learning, Meaning, and Identity. Cambridge: Cambridge University Press.