Exploring prospective mathematics teachers' professional identities through communities of practice framework: Post-lesson reflection report technique

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The aim of this study is to investigate prospective mathematics teachers' professional identities by analysing their post-lesson reflection reports. The study was conducted in a teacher preparation program in a state university in Istanbul, Turkey. Participants of the study are twenty-one upper secondary prospective teachers who taught a total of forty-five lessons in two partnership schools. Data source of this study is thirty-three post-lesson reflection reports. They were analysed using content and descriptive analysis. Data analysis was based on three constructs of communities of practice framework: engagement, imagination, and alignment. The findings of the study indicated that three constructs were explanatory for revealing prospective teachers' teaching approaches. The study also indicated that post-lesson reflection reports were found to be an effective tool for exploring professional identity.

Keywords: prospective mathematics teachers, school practicum, professional identity, communities of framework

Introduction

The notion of identity has been a focus of attention in teacher education research in general (Beijaard, Meijer & Verloop 2004) and mathematics education in particular (Peressini, Borko, Romagnano, Knuth & Willis, 2004; van Putten, Stols & Howie, 2014) especially for the last two decades because studying identity has the potential to better understand learning.

The notion of identity has different definitions in the literature. Darragh (2016) critically reviewed the literature on identity within mathematics education journals published over the past two decades. She emphasises that there are different definitions most of which cannot be considered as clear and operable.

Sociologists define identity as situational or contextual (Borgatta & Montgomery, 2000). For prospective teachers, different contexts could be school, teacher education programs, family and religious groups (Rodgers and Scott, 2008). Contextual forces are normative and determined by those in authority (Britzman, 1993; as cited in Rodgers and Scott, 2008). A more detailed discussion of different definitions of identity could be found in Darragh (2016).

Theoretical Framework

We claim that the definition of identity in 'communities of practice' framework offers a more operable definition of identity (Wenger, 1998). The framework attempts to explain learning from a social perspective (Lave & Wenger, 1991). The central theme of the framework is "learning by participation" (Wenger, 1998). "To become a full member of a community of practice requires access to a wide range of ongoing activity, old-timers, and other members of the community; and to information,

resources, and opportunities for participation" (Lave and Wenger, 1991, p. 101). Members participate at different levels (Lave & Wenger, 1991; Wenger, 1998). New comers who enter into the community participate at the periphery. Lave & Wenger (1991) describe this level as "legitimate peripheral participation". In teacher education research, prospective teachers' participation is considered as legitimate peripheral participation (e.g. Sutherland, Scanlon & Sperring, 2005). Members gradually increase their participation and learning requires becoming a full participant in the community (Lave & Wenger, 1991).

Wenger (2010) distinguishes between modes of identification (which he previously preferred to call 'modes of belonging' in Wenger, 1998) that position learning in the landscape: engagement, imagination, and alignment.

Engagement is defined as "engaging in activities, doing things, working alone or together, talking, using and producing artefacts" (Wenger, 2010, p. 184). Wenger (2010) describes *imagination* as follows:

> Imagination is concerned with constructing an image of the world that helps us understand how we belong or not... images of the world to locate and orient ourselves, to see ourselves from a different perspective, to reflect on our situation, and to explore new possibilities. The world provides us with many tools of imagination (e.g., ..stories,...role models) (p. 184).

Alignment is concerned with "making sure that activities are coordinated, that laws are followed, or that intentions are communicated" (Wenger, 2010, p. 185). It is a two-way process. In one direction, members submit to external authority or follow a prescription. In the opposite direction, members might enlist a colleague's collaboration or convince a manager to change a policy.

The aim of this study is to investigate prospective mathematics teachers' professional identities by analysing their post-lesson reflection reports based on the three constructs of communities of practice framework: engagement, imagination, and alignment. Research questions are: (i) What kinds of *engagement* do prospective mathematics teachers have during their teaching practice in partnership schools? (ii) What kinds of *alignment* do prospective mathematics teachers have during their teaching practice in partnership schools? (iii) How does prospective mathematic teachers' own model of a good mathematics teacher come into play during their teaching practices? (*imagination*)

Methodology

This study was designed as a qualitative case study, which was conducted in a teacher preparation program in a mathematics education department in a state university in Turkey. The mathematics teacher preparation program is a five-year program that prepares prospective teachers to teach in upper secondary schools. Prospective teachers complete subject matter, education and mathematics education courses.

This study was conducted during the teaching practice course which was in the spring term of senior year. This course is based on actual teaching in partnership schools. Two mentors, one from university and one from the partnership school, guided prospective mathematics teachers. The prospective mathematics teachers observed and taught at partnership schools six hours per week and discussed their own practices at the university for two hours per week.

A total of twenty-one prospective mathematics teachers (fourteen female, seven male) participated in the study. The participants, who were senior students at

this program, were aged between 22 and 23. They were allocated to two different partnership schools.

In this study a post-lesson reflection report was used as a data collection instrument. The reflective framework of reports helps prospective teachers to actively think about their own teaching practices at partnership schools (Freese, 1999). Using these reports, the prospective mathematics teachers explored their thoughts and experiences about their teaching practices at schools. The post-lesson reflection report designed by the researchers has three parts:

(i) Information about lesson: This part is about the topic and aim of lesson and classroom level etc.

(ii) Preparation for the lesson: In this part, prospective teachers explain how they prepare for their lessons.

(iii) *Reflection on teaching practice:* Prospective teachers define and reflect on their own teaching practice. They evaluate the lesson with regard to strengths and weaknesses and whether their approach fit into their own model of a good mathematics teacher.

The prospective teachers taught a total of forty-five lessons at two partnership schools. Six of them were in 9th grade, seventeen of them were in 10th grade, and twenty-two of them were in 11th grade. Prospective teachers wrote a total of thirty-three post-lesson reflection reports. Some of the prospective teachers wrote one post-lesson reflection report for two lessons.

Participants' post-lesson reflection reports were analysed through descriptive and content analysis. Data analysis was based on the three constructs of communities of practice framework: engagement, imagination, and alignment. *Engagement* represents cases where prospective teachers themselves engage in activities before and during teaching practice e.g. meeting with the mentor. *Alignment* refers to instances where prospective teachers adapt to the school culture or challenge it e.g. the way in which prospective teachers consider mentors' advice. *Imagination* represents how prospective teachers reflect on their teaching practice to build their perception of the mathematics teacher e.g. reflection on their own model of a good mathematics teacher.

Findings

This section consists of three sub-sections each of which is devoted to the constructs of communities of practice framework: engagement, imagination, and alignment.

Engagement

Prospective teachers were engaged in various activities during their lesson preparations. First of them is *preparing a lesson plan*. Twenty-six out of thirty-three reports included a lesson plan. In other reports prospective teachers mentioned that they instead prepared teaching notes. When preparing lesson plan or teaching notes, participants mostly used national curriculum documents (24), internet sites (22) and textbooks (12).

Another theme for engagement is *preparing questions* (including problems or exercises) to be asked during lessons. Participants reported that they tried to find questions with different types and at different levels of difficulty. Some of the participants had difficulties in preparing suitable questions since they knew little about the students they would teach. Therefore, some of them prepared alternative questions.

Another theme for engagement is *designing tasks* to be used during lessons. Some of the prospective teachers prepared traditional lessons in which concepts were introduced with definitions and rules followed by exercises. On the other hand, some of the participants designed alternative tasks. For example, two prospective teachers (T7 and T10) used Cabri and VUstat, one prospective teacher (T20) used an origami task to teach similar triangles and another one planned to use a game to teach matrices.

Another theme for engagement is *meeting with mentors*. During the field experience course, prospective teachers were directed to their school mentors to schedule the lesson and to decide which topic to teach. In their reflection reports, prospective teachers reported that their school mentors mostly advised them on classroom management issues. They also guided them in choosing questions to be used during the lesson. In that sense, participants reported that their school mentors restrained their lessons. On the other hand, some of the mentors did not interfere with prospective teachers' lessons.

Alignment

Analysis of post-lesson reflection reports indicated that there were different factors that affected prospective teachers' alignment processes. These factors are mentors, expectations of students, available resources, and physical conditions. The most effective factor in shaping prospective teachers' lessons is *school mentors*. Some of the participants made major changes in their lesson plans after they met with their mentors. For example, some of the mentors objected to alternative tasks designed by prospective teachers since tasks would take more time to implement. One of the prospective teachers mentioned the following:

> T19: My school mentor said to me that she was behind the schedule. She asked me not to waste time with extra activities and to use traditional lecture notes and I did so because of her intervention but I integrated proofs of theorems into my lesson plans. I thought that giving proofs promotes understanding.

On the other hand, some of the participants did not consider their mentor's advice.

Another factor that was effective in alignment process is *the educational context of Turkey*. In Turkish education system, de facto curriculum is determined by the university entrance examination which consists of multiple choice questions. Therefore, schools and teachers privilege procedural knowledge. One of the participants said that the expectation of students and teachers was procedural understanding; therefore he tried to meet this expectation.

Another factor effecting alignment process is *resources available for teaching* such as textbooks, technological tools and concrete materials. Some of the prospective teachers followed the curriculum and textbook approaches. On the other hand, some of them integrated alternative resources with their own approach:

> T12: There weren't any multiple representations in the textbook that I used as a resource. I used questions on sequences which could be solved by using graphs of functions of second degree…. I didn't follow the curriculum in terms of order of concepts. I taught fundamental concepts first to students for the following concept

The last theme concerned with factors affecting alignment process is physical conditions. Some of the participants wrote into their reports that they could not integrate technology into their lessons due to the lack of resources in the classroom.

For example, one of the participants prepared a lesson plan on polynomials using Cabri Geometry but she could not use it in her teaching. She reported the following:

> T22: I had trouble with using the smart board. I couldn't control the smart board with my computer… That was a problem. The lesson was partial as I planned. I taught 30 minutes instead of 40 minutes because of technical problems which occurred in the beginning of the lesson

Imagination

In the post-lesson reflection reports, prospective teachers were asked to evaluate their own teaching practices according to their own model of a good mathematics teacher. Two categories emerged from the analysis. Most of the participants reported that they taught a lesson which reflected their own model of a good mathematics teacher:

> T27: …it was a lesson which I think got me closer to my own model of a good mathematics teacher in my mind. I interacted with students, helped them to make sense of what I taught, made them love the topic and interested in the lesson…I think this (lesson) was a big step for me.

On the other hand, some of the participants could not teach a lesson that reflected their model of a good mathematics teacher due to factors of alignment especially due to school mentors. One of these cases is exemplified below:

> T18: My own model of a maths teacher was a person who privileges conceptual knowledge rather than procedural knowledge, who uses real-world examples, who teaches concepts not only because they are responsible for exams but also because he wants his students to use maths through visualization. But I couldn't do so, since I needed to follow my mentors' suggestions

As can be seen from the excerpt above, some of the school mentors constrained prospective teachers' lessons by interfering with their plans.

Discussion and Conclusion

The aim of this study was to explore prospective upper secondary mathematics teachers' professional identities using post-lesson reflection reports. The findings of the study indicated that the three constructs (engagement, imagination, and alignment) were explanatory for revealing prospective teachers' membership of community.

Data indicated important findings especially for *alignment* construct. Prospective teachers' alignment processes are two-way. In one direction, some of the participants submitted to the external authority (school mentors) and modified their lessons according to their mentors' advice. On the opposite direction, some of the participants enlisted their mentors' advice to change their lessons. Therefore, the direction of alignment determines prospective teachers' professional identities and is an indication of what kind of mathematics teacher they would become when they enter the profession. On the other hand, alignment to some other factors such as physical conditions of classrooms is one-way.

Data also have some indications about the dynamics of the three constructs in identity formation. Interacting with mentors is one of the basic *engagement* processes in school placements. During these interactions, some of the school mentors constrained prospective teachers' teaching approaches. The way in which prospective teachers responded to this intervention and the direction of *alignment* determined the *imagination* phase. That is prospective teachers' practices might or might not fit into their good models of a mathematics teacher. Therefore, the three constructs are inter-related.

Finally, data analysis indicated that post-lesson reflection report technique was found to be an effective tool for exploring professional identity. Likewise, Cattley (2007) pointed out the value of reflective writing as a professional development tool. This study asserted that reflecting writings of prospective teachers helped us relate professional identity to different approaches to mathematics teaching. In that sense, there is a gap in identity research in mathematics education and further research is needed for both pre-service and in-service teacher education research.

Acknowledgement

References

Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education, 20*(2), 107-128.

Borgatta, E. F., & Montgomery, R.J.V. (2000). Identity theory. In *Encyclopedia of Sociology*, (2nd ed., pp. 1253-1258). New York, USA: Gale Group. Georgina.

Cattley, G. (2007). Emergence of professional identity for the pre-service teacher. *International Education Journal, 8*(2), 337-347.

Darragh, L. (2016). Identity research in mathematics education. *Educational Studies in Mathematics, 93*(1), 19-33.

Freese, A. R. (1999). The role of reflection on preservice teachers' development in the context of a professional development school. *Teaching and Teacher Education, 15*(8), 895-909.

Lave, J., & Wenger, E. (1991). *Situated learning: legitimate peripheral participation.* Cambridge: Cambridge University Press.

Peressini, D., Borko, H., Romagnano, L., Knuth, E., and Willis, C. (2004). A conceptual framework for learning to teach secondary mathematics: A situative perspective, *Educational Studies in Mathematics, 56,* 67–96.

Rodgers, C. R. & Scott, K. H. (2008). The development of the personal self and professional identity in learning to teach. In M. Cochran-Smith, S. Feiman-Nemser, D. J. McIntyre & K. E. Demers (Eds.), *Handbook of Research on Teacher Education* (3th ed., pp, 732-755). New York: Routledge.

Sutherland, L. M., Scanlon, L. A., & Sperring, A. (2005). New directions in preparing professionals: examining issues in engaging students in communities of practice through a school–university partnership. *Teaching and Teacher Education, 21*, 79–92.

van Putten, S., Stols, G. & Howie, S. (2014). Do prospective mathematics teachers teach who they say they are? *Journal of Mathematics Teacher Education, 17,* 369–392.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity.* Cambridge: Cambridge University Press.

Wenger, E. (2010) Communities of practice and social learning systems: the career of a concept. In C. Blackmore (Ed.), *Social Learning Systems and communities of practice* (pp. 179-198). London: Springer Verlag.