Becoming a mathematics teacher: the role of professional identity

Hatice Akkoç [i]
Marmara University

Sibel Yeşildere-İmre [ii]
Dokuz Eylül University

Abstract
Teachers' pedagogical practice and choices for their actions could not only be explained by their knowledge, beliefs or attitudes (Rodgers & Scott, 2008). Identity also has a crucial role in learning to teach. The aim of this study is to investigate contextual nature of preservice mathematics teachers' professional identities. For this aim, a case study was designed. Participants are three preservice mathematics teachers in a state university in Turkey. The data was collected through semi-structured interviews. Pre-interviews were conducted in the beginning of the data collection process. Participants were asked questions about why they chose teaching as a profession. During the following ten weeks, preservice teachers participated in activities such as teaching in real classroom settings, interviewing pupils, mathematics teachers and school administrators. Following these activities, post-interviews were conducted. Qualitative content analysis was used to analyze the data. The findings revealed that preservice teachers' identities were not stable throughout different contexts.

Keywords: Identity, preservice mathematics teachers, teacher education, sociology of education

[i] **Hatice Akkoç** had a BSc degree in mathematics from Çukurova University, Turkey and an EdD degree in mathematics education from University of Warwick, UK. She is currently working in the department of Mathematics and Science Education in Marmara University, Turkey. Her research interests are mathematics teacher education, technology-enhanced learning environments, technological pedagogical content knowledge and socio-cultural approach to teacher education.
Correspondence: hakkoc@marmara.edu.tr

[ii] **Sibel Yeşildere-İmre** Sibel Yeşildere-İmre is an associate professor in the department of primary mathematics education in Dokuz Eylül University, Turkey. She had a BEd degree in mathematics education from Anadolu University and PhD degree in primary mathematics education from Dokuz Eylül University. Her research interests are centered on abstraction and mathematics teacher education.

Introduction

Teachers' pedagogical practice and choices for their actions could not only be explained by their knowledge, beliefs or attitudes (Rodgers & Scott, 2008; Eryaman, 2007; 2008). Identity also has an important role in learning to teach. Especially, initial phases of the profession are crucial for identity formation as suggested by various studies in the field of teacher education in general and mathematics teacher education in particular (Walshaw, 2004).

The notion of identity is the concern of disciplines such as psychology, sociology and education. It is mostly confused with the notions of character and personality which, to some extent, are naturally given (Sfard & Prusak, 2005). In sociology literature, while character is taught to be formed of signified individual attributes which are permanent, identity is socially constructed and subjective (Gale, 2000; Stevenson, 2006). In other words, it is constructed through interaction with people. Sociology and psychology disciplines explore identity in relation to the notion of self (Mead, 1934). Stets and Burke (2003) claim that self comprises of different parts each of which reveals itself as a different identity in a different context e.g. self as a friend and self as a teacher. Furthermore, identity is concerned with "fine judgments about contextual factors" (Coldron & Smith, 1999, p.716). Therefore, identity is contextual and situational (Borgatta & Montgomery, 2000).

The notion of professional identity has been the focus of attention of many studies in teacher education research in general (Beijaard, Meijer & Verloop 2004; Peressini, Borko, Romagnano, Knuth & Willis, 2004; Cook, 2009; Johnston, 2015; Riedler & Eryaman, 2016) and mathematics teacher education in particular (Goos, 2005; Ma & Singer-Gabella 2011; Hossain, Mendick, & Adler, 2013; Akkoç, Yeşildere-İmre & Balkanlıoğlu, 2014; van Putten, Stols & Howie, 2014). Since initial phases of the profession are crucial for identity formation, research studies especially focused on preservice teachers' or beginning teachers' identities (Flores & Day, 2006; Eryaman & Riedler, 2009; Sutherland, Howard & Markauskaite, 2010). For example, Johnston (2015) investigated the problematic nature of their admission to the school community. He found that preservice teachers could start to build an identity as a teacher in field experience courses if they were allowed to voice opinions and join in on decisions.

Peressini, Borko, Romagnano, Knuth and Willis (2004) bring a situative perspective to learning to teach which emphasizes the role of multiple contexts in teacher preparation. They investigate novice teachers' participation in a variety of activities in two different contexts: university and public school setting. They focus on the development of participants in three domains of professional knowledge: mathematics, mathematics-specific pedagogy and professional identity. One of the participants of this case study developed two different conceptions of the fundamental notion of proof. Authors suggested not considering this finding as confusing since it indicates the preservice teacher's ability to play different roles (student in her coursework, teacher in her field placements) and respond to different sets of norms and expectations. Considering the contextual nature of identity, differences should be treated as coherent and sensible and as an indication of novice teachers' evolving professional identities.

Another study on contextual nature of professional identity focuses on technology-related identity of a mathematics teacher. This case study reports on how a teacher teach with technology and how his approach changed across different school contexts (Goos, 2005). Findings indicated that technology-related identity was influenced from personal and contextual factors.

On the other hand, some of the studies emphasize the importance of reflection for identity formation. For example, Cattley (2007) found links between reflective writing and identity formation. Making use of preservice teachers' biographies is also important in the process of identity formation (Beijaard, Meijer & Verloop, 2004).

Theoretical Framework of the Study

As suggested by the related literature, identity formation is crucial in the first years of teaching. Therefore "teacher training programs should address the difficulties of the embodiment of a teacher identity" (Alsup, 2006, p. 92). In parallel to these concerns, the aim of this study is to investigate nature of preservice mathematics teachers' professional identities. In teacher education research, one of the basic assumptions concerning identity is its contextual nature. Rodgers and Scott (2008) assert that "identity is dependent upon and formed within multiple contexts which bring social, cultural, political, and historical forces to bear upon that formation" (p. 733). Clandinin and Huber (2005) define context as "the landscapes past and present in which [a teacher] lives and works" (p. 4). For a teacher, context could be family, past experiences as a student, school, teacher education program or religious groups (Rodgers and Scott, 2008; Bruce & Eryaman, 2015). According to Britzman (1993) there is a set of norms in each community and members are expected to fit in with these norms which are determined by those in authority. If teachers are not aware of norms within a context, then they cannot find their voices and are subject to contextual forces. Therefore, as context changes, norms and the way in which teachers form their identities might change. In other words, identity is contextual.

Preservice teachers are faced with various contextual factors such as teacher education programs and reform-based national curriculums which are promoted by especially university-based teacher training programs. Another context is field experience they have in partnership schools. Research sometimes refer to the former context (university) representing the "theory" and the later (school) as the "practice" and emphasises the tension between theory and practice (Darling-Hammond, 2006; Korthagen & Kessels, 1999; Nolan, 2006). Literature review on teacher beliefs points out inconsistencies between preservice teachers' beliefs which are sometimes influenced by reform-based teacher education programs in universities and their teaching practices in schools which are more traditional. On the other hand, socio-cultural perspective declines to define such cases as an "inconsistency" but prefers to use the notion of identity to describe learning to teach as a socially constructed activity (De Ruyter & Conroy, 2002). This is especially relevant for preservice teachers since they move from one practicum setting to another and professional identity emerges in each context (Cattley, 2007). Studies on sociocultural perspective in teacher learning are limited, particularly for preservice teacher education (Goos, 2005). Considering the contextual nature of identity, the main research question of this study is "How do contextual factors shape preservice mathematics teachers' professional identity?" This study will approach professional identity with regard to the way in which preservice teachers see themselves as a mathematics teacher or what kind of a mathematics teacher they want to be (Rodgers & Scott, 2008; Cook, 2009).

Methodology

This qualitative research was part of a larger study that took place with three preservice teachers over a period of fourteen weeks. Aim of this current study is to investigate contextual nature of preservice mathematics teachers' professional identities. As the interest of case study design is "process rather than outcomes, in context rather than a specific variable (Yin, 2003, s.19)" and as this study aims to explore the contextual nature of professional identity, a multiple case design was chosen for this study.

Setting and participants

This study is situated within a teacher education program in Turkey which promotes reform-based mathematics teaching in response to current reform in national curriculum of mathematics. In order to be accepted to the program, students have to be successful in the university entrance examination. The Turkish university entrance exam system is based on two exams both of which consist of multiple-choice questions. Teacher education programs give priority to those who studies in Anatolian Teacher Training High Schools by providing extra points to their university entrance exam scores because these high schools offer specialized instruction on pedagogy. In order to get higher scores from university entrance exam, some students also prefer to attend university preparation

courses and private lessons after school hours. These courses promote rote learning rather conceptual understanding.

The participants of the study were three preservice teachers enrolled in a four-year teacher training program in a state university in İzmir, Turkey. After graduating from the program, they will be entitled to a diploma for teaching mathematics in elementary schools for students aged between 11 and 14 (Grades 5-8). Preservice teachers were at the third year of their education and they had already taken courses related to mathematics, pedagogy and content-specific pedagogy.

Data Collection

Data was collected during a school practicum course which lasted for fourteen weeks. The course has two components: university and school. Preservice teachers made observations and taught in partnership schools with the guidance of a school-based mentor. In the university component, preservice teachers reflect on their experiences for an hour every week. The university-based mentor of the course who was the second author of this paper guided the discussions. Certain topics were assigned for sessions during a 14-week period (50 minutes per week). In doing so, the purpose was to develop a reflective discussion environment for preservice teachers about these topics. Each week preservice teachers focused on different topics such as "what it means 'being a good teacher' according to students?" or "how school heads define 'a good mathematics teacher'? They spent two hours in schools to explore the topic of the week. Table 1 provides a brief summary of each session both in school and faculty in terms of the themes of the week.

Table 1. *Brief summary of sessions in school practicum course*

Week	Themes of University Component	Themes of School Placement
1	Pre-interviews about being a mathematics teacher	
2	Sharing ideas about preparing a mathematics lesson and teaching mathematics	
3		Teaching mathematics-1
4	Discussion of videos of two experienced mathematics teachers	
5		Interviewing students about "what it means to be a good mathematics teacher?"
6	Discussion of interviews	
7		Interviewing mathematics teachers about "what it means to be a good mathematics teacher?"
8	Discussion of interviews	
9		Interviewing with school head about "what it means to be a good mathematics teacher?"
10	Discussion of interviews	
11	Sharing ideas about preparing a mathematics lesson and teaching mathematics	
12		Teaching mathematics-2
13	Discussion of videos of preservice mathematics teachers	
14	Post-interviews about being a mathematics teacher	

The primary data was obtained from interviews. With each participant, two semi-structured interviews were performed. Each interview lasted about forty minutes. All interviews were recorded using a digital voice recorder and transcribed verbatim. The aim of the first interview was to explore participants' professional identities via asking why they chose teaching as a profession. The second interview focused on contextual dimension of being a mathematics teacher and preservice teachers were asked to reflect on their experiences with their peers, students, teachers and school heads.

Analysis of data

Qualitative content analysis was conducted to analyze the data. A grid (see Table 2 below) was used to write memos about each preservice teacher's professional identity in each context.

Table 2. *Content Analysis of Data*

| Name | Context | | | |
	Teacher education program	School	Private tutoring	Personal experiences
Taner	Memos	Memos	Memos	Memos
Davut	Memos	Memos	Memos	Memos
Handan	Memos	Memos	Memos	Memos

Themes were discovered concerning preservice teachers' professional identities as they interact with different people such as pupils, teachers, administrators in schools, and the mentor in the university. A total of eleven themes emerged (two for Taner, five for Davut and four for Handan). Themes were examined in four different contexts. Therefore, two different researchers examined a total of forty-four cases (See Appendix). Forty of them were found to be consistent. Therefore, interrater reliability was calculated as 90%.

Findings

This section reports findings in three sub-sections each of which is devoted to a preservice teacher. Each sub-section starts with the participant's professional choices. Second, the way in which the preservice teacher comes to see himself as a mathematics teacher throughout different contexts will be reported to be able to reveal the dynamics of their identity constructions.

Preservice Teacher Taner

Although Taner was graduated from a Anatolian Teacher Training High School, teaching was not his first choice for a university degree. During the first interview he mentioned that he wanted to be a computer engineer but could not get the required score from the university entrance exam. Therefore, he needed to prepare for the exam for one more year. His second attempt was not successful either, and he chose teaching as a second option.

When this study was conducted he was in his third year in the teacher education program. At the same time he was working part-time in a private teaching institution and were giving lessons to high school students in groups and as individuals to prepare them for the university entrance examination. During an interview he mentioned that he preferred to teach in one of these institutions rather than a state school.

One of the themes emerged from data analysis is "practical mathematics" as expressed by Taner. What he referred to as "practical mathematics" is concerned with "instrumental mathematics" in Skemp's (1976) term. Skemp (1976) distinguishes between relational and instrumental understanding of mathematics. The former is concerned with developing rich connections among mathematical ideas. On the other hand, the latter refers to rules without reasons. Data indicated that Taner's approach to instrumental understanding varied according to the context. For example, in the context of private teaching he privileged instrumental understanding by giving formulas directly:

> Because you're appreciated, they say how come you remember this all…if I want to make a difference then I must give shortcuts and formulas which they don't know. That's what I want…First of all, I solve mathematics so that everyone can understand, I find simpler ways so that everybody could say "I can do something". I used to teach my uncle maths. What I see in him is that he first did not have any hope and was joking about himself, did not believe in himself…after two lessons he started to find the correct answers, he gained his confidence…students need to believe that they can do it by solving similar questions…when I become a mathematics teacher in the future I will teach this way by encouraging students. This way, students will see that they can do mathematics and that they can improve.

As can be seen from the excerpt above, Taner believed in the usefulness of an instrumental approach based on his private teaching experience. Furthermore, he mentioned that students preferred him as a mathematics teacher since he used shortcuts and practical methods. On the other hand, other contexts challenged this approach. For example, in the context of his high school experience, he observed his teachers and from these observations he concluded that a teacher should be open to different solutions to mathematical problems. Similarly, in the context of teacher education program, he realized that he needed to improve himself in introducing a concept since instrumental mathematics is not enough on its own. Furthermore, he noticed that everyone had a different learning style:

> That's the point I haven't noticed…I used to think that everybody would understand (mathematics) the way I do but there's no such thing. Especially after our work in school…every student learn differently, some of them want to visualise…in the future I will not think of the way I learn. I will consider how students would learn and understand

Another theme emerged from data is concerned with mathematics teaching methods. In the context of private teaching, Taner preferred example-based mathematics teaching where required definitions and properties are given followed by examples and exercises. This approach is adopted by private teaching institutions in preparing students for the university entrance exam with multiple-choice questions. On the other hand, in the context of field experience, he taught a task-based lesson. His teaching approach was similar to the teacher in the video which they discussed in the teaching method course in the teacher education program. His lesson was on the area of a circle and a circular segment. During his lesson, he asked students to generate examples of circles in daily life and how to produce the same circle. He helped students to discover the area of circular segment. In other words, he embraced a task-based lesson for his own teaching.

Preservice Teacher Davut

Davut was also graduated from a Anatolian Teacher Training High School. As he mentioned in an interview, he was determinant to be a teacher: "Either English teacher or mathematics teacher…mathematics was more enjoyable, at least you deal with numbers. But language is not like this. It's so routinized…So I chose maths" (Davut). There were a lot of teachers in his family: father, mother and sister. Although his family encouraged him to choose engineering or medicine as a profession, he did not change his decision since he was very self-assured as a person as he emphasized during an interview. For his future carrier, he plans to be a mathematics teacher in a state school rather than a private teaching institute.

Themes emerged from data revealed contextual nature of Davut's identity. One of them was related to self-confidence. During the interviews, Davut showed different levels of self-confidence depending on the context and the way in which he sees himself as a mathematics teacher. For example, in the context of private teaching, he believed that he would become a very good teacher in one or two-years time. Similarly, based on his observations in school, he realized that knowing the key points and rote learning provide self-confidence for a teacher. On the other hand, in the context of teacher education program, he does not believe that he is ready to be a good mathematics teacher. He explained how mathematics education courses and observations in school made him think so:

I realized that being a teacher is not just giving lessons, for example there are lots of studies on how students learn. It's not straightforward. It's very complicated…it may look easy, teaching students and then expecting them to understand naturally, but it's not the way it is. For example, if you consider exponential numbers, there are a lot of concepts and we examine how students understand these concepts and the structure of their cognition. Mathematics is like this. It's more complicated. OK, children learn but what kinds of difficulties or misconceptions they have. Actually these are theoretical issues. We don't take them seriously. I noticed that while I was doing our coursework…I didn't think very professionally…this showed me that I could leave my student-identity behind, I mean in a positive way. I enjoyed teaching in school.

As can be seen from the excerpt above, Davut's perception of a mathematics teacher has been challenged as he participated in activities of the teacher preparation program. As he mentioned he started to see teaching as a profession which required important knowledge and skills. Therefore, his self-confidence has been reduced in the context of teacher education program due to its higher expectations.

Another theme emerged from data is concerned with different approaches to teaching mathematics. In the context of teacher education program, he thinks that mathematics tasks could not be applied in the classroom due to time constraints and pressures from high stakes testing. On the other hand, in the context of school practice, he thinks that mathematical tasks which were promoted by the teacher education program could be applicable in practice: "I used to think that I don't have enough time to do them. But I'll try to do it as much as possible...after talking to teachers in the school and based on my own experiment" (Davut). He taught a discovery-based lesson on the volume of a cylinder in the partnership school. He started his lesson by giving daily-life examples of a cylinder. He then arranged his students in groups, gave them circles and sticks, then asked them to produce cylinders. As can be derived from the data, Davut changed his beliefs about the applicability of mathematical tasks which were promoted by the teacher education program based on his own practice in the classroom.

Another theme was concerned with misconceptions and students' difficulties in mathematics. In the context of teacher education program, Davut said he learnt a lot about misconceptions in mathematics and he thought that being aware of them was important to be a successful teacher. With this regard, he mentioned that courses on students' difficulties were more beneficial for him. He thinks that mathematics teachers should never give up overcoming students' difficulties. On the other hand, misconceptions in mathematics were not an issue in the context of his school placement.

Another theme was concerned with motivation. Experiences in different contexts reinforce his beliefs about motivation and daily life examples and affected how he conceptualized pedagogy of teaching. He realized that students in school needed daily life examples to motivate them. Similarly, in the context of teacher education program, he observed how the teacher in the video motivated her students and he tried the same thing in his lesson (a discovery-based lesson on cylinder). Reflecting on this experience, he criticized the way teachers in the partnership school did not made use of motivation: "Teachers just bring some cylinder into the classroom and show them to students. I cannot call this as a mathematical activity considering what I've learnt in the university" (Davut).

Last theme is concerned with "respect" which revealed itself differently in different contexts. In the context of teacher education program, he preferred being a respectable teacher to being a successful teacher in high-stakes exams. On the other hand, in the context of school placement, he considered success important. He thought that it was the expectation of both students and head teachers. Therefore, he was confused about how a mathematics teacher is considered as respectful.

Preservice Teacher Handan
Handan decided to be a mathematics teacher when she was in secondary school and that was why she went to an Anatolian Teacher Training High School. She mentioned in an interview that she

used to love her mathematics teacher and observed her during the lessons. Therefore she thought about choosing mathematics teaching as a profession even when she had difficulties in mathematics lessons in secondary and high schools. When this study was conducted she was in her third year and she started to teach part-time in a private teaching institution to prepare students for the university entrance examination.

Various themes emerged from data obtained from interviews with Handan. One of them was concerned with reform-based mathematics curriculum. In the context of teacher education program, she had concerns about the applicability of reform-based mathematics activities. On the other hand, in the context of school placement, she realized that she could use mathematical tasks which were offered in the reform-based mathematics curriculum:

> I didn't use to believe that this was applicable in a lesson. It is a good method but I used to think that I cannot catch up with it. But in my own lesson I saw that time was enough. The teacher model in my mind has changed. A good teacher should consider the formal curriculum and should carefully think about everything written there, should not skip anything and teach them students. Well, I started to think about these...I used to have a more traditional teacher model. But now, it's not.

She said that she learnt how to engage students into the activities in her second lesson in the school.

Another theme was the nature of mathematics and its teaching. In the context of her high school experience, she thinks that a mathematics teacher should be practical and quick (instrumental mathematics in Skemp's (1976) terms). On the other hand, in the context of teacher education program, she mentioned that "mathematics is not just about calculations and students should be taught the real meaning of mathematics (Handan)". She mentioned that she wanted to be a teacher who can teach students why they learn mathematics. A teacher should be able to teach in different ways and be creative.

Another theme was "knowledge of curriculum". Handan's experiences in different contexts reinforced the importance of having a grasp of mathematics curriculum. Both in the context of teacher education program and school placement, she noticed that following the mathematics curriculum guided the teacher in addressing the misconceptions and planning her lesson:

> After all these processes, the most striking was…if you use the teaching methods which are suggested by the national curriculum, I personally observed this in my school placement, if you use these methods then they guide teachers. It makes teachers' job easy. Because you enter the classroom well prepared. You know what to teach…and you are more careful about students' misconceptions. You have a guide and a well-designed task.

As can be inferred from the excerpt above, the importance of knowledge of curriculum was reinforced as Handan gained experience in different contexts such as classroom observations and university-based courses on students' misconceptions. Her reflections were also in parallel to expectations of head teachers in the partnership school as she mentioned during the interview.

Misconceptions and students' difficulties were another theme on its own as derived from data. Importance of addressing misconceptions and students' difficulties during a lesson was reinforced as Handan participated in university-based courses and partnership school:

> We have learnt about students' misconceptions as part of pedagogical content knowledge, but I've realized that I asked higher order questions. It wasn't appropriate considering the levels of students.

As can be seen in the excerpt above, knowledge of students that was emphasized by university-based mentors was also an issue in Handan's lesson in the partnership school.

Discussion and Conclusion

This study aimed at investigating contextual nature of preservice mathematics teachers' professional identities. Three preservice mathematics teachers' identities were explored with regard to how they see themselves as a mathematics teacher and what kind of a mathematics teacher they want to become. Data were analyzed to reveal how contextual factors shaped participants' identities.

In some cases, participants' perceptions of a mathematics teacher were stable throughout different contexts. These cases emerged especially where pedagogical ideas promoted by university-based courses were validated in practice e.g. the way daily-life examples motivates students, the importance of knowledge of mathematical misconceptions and how to address them in a lesson. In this situation, participants' perceptions of a mathematics teacher and pedagogical perspectives were reinforced.

In other cases, participants' identities were not stable. These cases especially emerged from institutional differences. For example, when working part-time in a private teaching institution participants privileged instrumental mathematics in Skemp's terms (1976). On the other hand, they noticed the usefulness of task-based teaching of mathematics not only in the context of university-based teacher preparation program but also in the context of their own teaching practice in the classroom. As Cattley (2007) mentions self-confidence is one of the aspects of professional identity. For one of the participants (Davut), it was an issue which varied across different contexts. Data indicated that he felt less confident in the contexts of teacher education program and school placement while he was confident as a teacher while he was giving private tutoring.

Another finding is concerned with the context of participants' past experiences e.g. their own learning experiences or role model teachers in secondary or high school. Data indicated that emerged themes were not an issue within this context. This finding is contrary to many studies which report the role of past experiences in identity formation (Knowles, 1992).

Although this study indicated differences in perspectives in various contexts, literature suggests that different actions or approaches in different contexts should not be treated as conflicts. They indicate the dynamics of identity construction. Likewise, identity is contextual (Rodgers and Scott, 2008). Contextual factors come together to shape the pedagogical identities of novice teachers (Goos, 2005). Findings regarding different perspectives in different contexts also support the claim that identity is shifting and multiple ("in the making", rather than stable) (Gee, 2001).

This study has some implications particularly for preservice teacher education. Findings emphasized the importance of addressing the difficulties of the embodiment of preservice and novice teachers' identities (Alsup, 2006). They are faced with various contextual factors such as learning experiences before they enter into the teacher preparation program, school placement and the teacher education program itself. As Britzman (1993) argues, contextual forces are normative and teacher education programs should discuss them and develop an awareness of these norms so that preservice teachers could voice opinions and be consciousness of their identities (Rodgers and Scott, 2008).

References

Akkoç, H., Yeşildere-İmre, S. & Balkanlıoğlu, M. A. (2014). Examining Identity through Story Telling, *Research in Mathematics Education*. 16 (2), 204-205.

Alsup, J. (2006). *Teacher identity discourses: Negotiating personal and professional spaces*. Mahwah, NJ: Lawrence Erlbaum.

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

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

Britzman, D.P. (1993) The terrible problem of knowing thyself: toward a poststructuralist account of teacher identity. *Journal of Curriculum Theorizing*, 9, pp. 23–46.

Bruce, B. C. & Eryaman, M. Y. (2015). Introduction: Progressive Impuls in Education. In M. Y. Eryaman & B. C. Bruce (Eds.). *International Handbook of Progressive Education*. New York: Peter Lang, pp. 1-52

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

Clandinin, D.J. & M. Huber (2005) Shifting stories to live by: interweaving the personal and the professional in teachers' lives. In D. Beijaard, P. Meijer, G. Morine-Dershimer & H. Tillema (eds.) *Teacher professional development in changing conditions*. Dordrecht: Springer.

Coldron, J. & Smith R. (1999). Active location in teachers' construction of their professional identities. *Journal of Curriculum Studies*. (31) 6, 711-726.

Cook, J. S. (2009). "Coming Into My Own as a Teacher": Identity, Disequilibrium, and the First Year of Teaching, *The New Educator*, 5, 274–292.

Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of Teacher Education*, 57(3), 300 – 314.

De Ruyter and Conroy, J. (2002) The formation of identity: the importance of ideals. *Oxford Review of Education*. 28 (4), 509-522.

Eryaman, M. Y. (2007). From reflective practice to practical wisdom: Toward a post-foundational teacher education. *International Journal of Progressive Education*, *3*(1), 87-107.

Eryaman, M.Y. (2008). *Teaching as practical philosophy*. Saarbrücken, Germany: VDM Verlag Dr. Müller.

Eryaman, M. Y. & Riedler, M. (2009). From interpretive progressivism to radical progressivism in teacher education: Teaching as praxis. In M. Y. Eryaman (Ed.). *Peter McLaren, education, and the struggle for liberation*. Cresskill, NJ: Hampton Press.

Flores, M.A. & Day, C. (2006). Contexts which shape and reshape new teachers' identities: a multi-perspective study, *Teaching and Teacher Education*, 22 (2), 219–232

Gale (2000). *Encyclopedia of Sociology*, 2nd Edition.

Gee, J. P. (2001) Identity as an analytic lens for research in education. In W.G. Secada (ed.) *Review of research in education*, 25, 2000–2001. Washington, DC: American Educational Research Association.

Goos, M. (2005). A Sociocultural Analysis Of The Development Of Preservice And Beginning Teachers' Pedagogical Identities As Users Of Technology, *Journal of Mathematics Teacher Education*, 8: 35–59

Hossain, S., Mendick, H., & Adler, J. (2013). Troubling "understanding mathematics in-depth": Its role in the identity work of student-teachers in England. *Educational Studies in Mathematics*, 84(1), 35-48. doi: 10.1007/s10649-013-9474-6

Johnston, D.H. (2015) 'Sitting Alone in the Staff-room contemplating my future': Communities of Practice, Legitimate Peripheral Participation and student teachers' experiences of problematic school placements as guests. *Cambridge Journal of Education*, DOI: 10.1080/0305764X.2015.1069793

Knowles, G. J. (1992). Models for understanding preservice and beginning teachers' biographies: Illustrations from case studies. In I. F. Goodson (Ed.), *Studying teachers' lives* (pp. 99–152). London: Routledge.

Korthagen, F. A. J., & Kessels, J. P. A. (1999). Linking theory and practice: Changing the pedagogy of teacher education. *Educational Researcher*, 28 (4), 4 – 17.

Ma, J. Y., & Singer-Gabella, M. (2011). Learning to teach in the figured world of reform mathematics: Negotiating new models of identity. *Journal of Teacher Education*, 62(1), 8-22. doi: 10.1177/0022487110378851

Mead, G. H. (1934). *Mind, self & society, edited and introduced by C. Morris*. Chicago: University of Chicago Press.

Nolan, K. (2006). A socio-cultural approach to understanding preservice teachers' negotiated journeys through theory/practice transitions. Paper presented at the 2006 *Annual Meeting of the American Educational Research Association* (AERA), San Francisco, CA, 7-11 April

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.

Riedler, M. & Eryaman M.Y. (2016). Complexity, Diversity and Ambiguity in Teaching and Teacher Education: Practical Wisdom, Pedagogical Fitness and Tact of Teaching. *International Journal of Progressive Education. 12*(3): 172-186

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* (pp, 732-755). 3rd Edition, New York: Routledge.

Sfard, A. & Prusak, A. (2005). Telling Identities: In Search of an Analytic Tool for Investigating Learning as a Culturally Shaped Activity, *Educational Researcher*, 34, 14 -22.

Skemp, R. R. (1976). Relational Understanding and Instrumental Understanding, *Mathematics Teaching*, 77, 20–26.

Stets, J. E., & Burke, P. J. (2003). A Sociological Approach to Self and Identity. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of Self and Identity* (pp. 128–152). New York: The Guilford Press.

Stevenson, N. (2006). Identity. In B. S. Turner (Ed). *The Cambridge Dictionary of Sociology*. (pp. 277-278). Cambridge University Press, Cambridge: UK.

Sutherland, L., Howard, S. & Markauskaite, L. (2010). Professional identity creation: Examining the development of beginning preservice teachers' understanding of their work as teachers, *Teaching and Teacher Education*, 26(3), 455–465.

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

Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage.

Walshaw, M. (2004). Preservice mathematics teaching in the context of schools: an exploration into the constitution of identity. *Journal of Mathematics Teacher Education*, 7, 63–86.

Appendix. *Emerged themes across different contexts*

	Teacher Education Program	**School**	**Private Teaching**	**Past experiences**
Taner	*Relational understanding* is priviliged	*Relational understanding* priviliged	*Instrumental understanding* priviliged	Not an issue
	Mathematics teaching methods: Task-based	*Mathematics teaching methods*: Task-based	*Mathematics teaching methods*: Example-based	Not an issue
Davut	Low self-confidence	Low self-confidence	High self-confidence	Not an issue
	Mathematics teaching methods: Tasks are not applicable	*Mathematics teaching methods*: Tasks are applicable	Not an issue	Not an issue
	Knowledge of misconceptions is useful	Not an issue	Not an issue	Not an issue
	Motivation: Daily life examples	*Motivation*: Daily life examples	Not an issue	Not an issue
	Respect is more important than success	*Success* (in exams) is more important	Not an issue	Not an issue
Handan	*Reform-based curriculum*: not applicable	*Reform-based curriculum*: applicable	Not an issue	Not an issue
	Mathematics teaching: Relational understanding	Not an issue	Not an issue	*Mathematics teaching*: Instrumental understanding
	Knowledge of curriculum is important	*Knowledge of curriculum* is important	Not an issue	Not an issue
	Knowledge of misconceptions is important	*Knowledge of misconceptions* is important	Not an issue	Not an issue