

A case study of a prospective upper secondary mathematics teacher's professional identity: Who does he want to be? What does he do in practice?

Hatice Akkoç and Hande Gülbağcı-Dede

Marmara University, Turkey

The aim of this study is to explore a prospective upper secondary mathematics teacher's professional identity and how it reveals itself in school context. Data was collected in the last year of a teacher preparation program during field experience courses in a state university in Istanbul, Turkey. Data collection instruments are unstructured interviews, observations of lessons and post-lesson reports. The prospective teacher's reflective writing about 'what kind of a mathematics teacher he wants to become' is analysed through content analysis. Among the emerged themes, three of them were specified for a further analysis: strong content knowledge, technology integration and use of daily life examples. These three aspects of our prospective teacher's professional identity are explored in the school context using descriptive analysis of data from interviews, observations and reports. It was found that three characteristics of Harun's mathematics teacher identity were actualised in practice.

Keywords: Prospective mathematics teachers; professional identity; field experience

Introduction

The notion of identity has been a focus of attention in teacher education research especially for the last two decades because studying identity has a potential in investigating learning (Sfard & Purzak, 2005) and learning to teach (Rodgers & Scott, 2008). Identity research in teacher education, on the one hand, investigated novice teachers' identities (e.g. Schatz-Oppenheimer & Dvir, 2014; Xu, 2013) since learning to teach especially in the first years of teaching, is thought to be crucial for forming professional identities. On the other hand, prospective teachers have been the subjects of many identity studies (e.g. Cattley, 2007; Izadinia, 2015).

Mathematics teacher education research also focused on the notion of identity both during teacher preparation programs and in the first years of teaching (Bjuland, Csetari, & Borgersen, 2012; da Ponte & Brunheira, 2001; Goos, 2005; Ma & Singer-Gabella, 2011; van Putten, Stols & Howie, 2014; Walshaw, 2004). For example, van Putten et al. (2014) investigated professional mathematics teacher identity (PMTI) of six prospective teachers by analysing their lessons with regard to the question of "Is the self-perceived PMTI, the self that is actualised in the classroom?" (p. 374) Data in this study indicated that the way participants perceived their selves as a mathematics teacher is different from actualisation of their selves.

In a year-long case study, da Ponte & Brunheira (2001) investigated the development of prospective teachers' professional discourse and professional identity throughout a field experience course. Data showed a change of point of view with regard to "innovative classroom methodologies, the dynamics of the school institution, and the educational system" (p. 26). Goos (2005), on the other hand,

investigated the development of prospective and novice teachers' pedagogical identities as users of technology.

A brief review of the literature indicates that the notion of identity should be the focus of teacher preparation programs. Therefore, the aim of this study is to explore a prospective upper secondary mathematics teacher's (Harun) professional identity and how it reveals itself in the school context during a field experience course. Although the notion of identity does not have an operational definition in the literature, this study will focus on identity considering the following questions: "Who am I at this moment?" and "Who do I want to become?" (Beijaard, Meijer & Verloop, 2004). Therefore, we will investigate two research questions: (a) What kind of a mathematics teacher does Harun want to become? (b) How is Harun's mathematics teacher identity reflected in practice?

Methodology

Setting and the participant

This qualitative study was designed as a case study which was conducted during the 2014-2015 academic year of a teacher preparation program in a mathematics education department in a state university in Istanbul, Turkey. It is a five-year program which awards its participants a diploma for teaching mathematics in upper-secondary school for students aged between 15 and 19. This study is situated in two field experience courses: School Experience and Teaching Practice. There was one partnership school for each course. The former course is mostly based on school and classroom observations which lasted for four hours a week, while the latter course requires actual teaching in schools. The university supervisors are the authors of this paper. A school mentor is appointed to two or three prospective teachers. During the whole year, prospective teachers discussed their experiences with their supervisors and their peers every week.

A twenty-three year old male prospective teacher, Harun, voluntarily participated in this case study. Harun decided to be a mathematics teacher at a very early age. He reported that his mathematics teacher in the high school was his role-model teacher. Harun visited the same partnership school for two terms. It is a public upper secondary school (with students aged between 15 and 19) in a central area of Istanbul, Turkey. Harun observed around thirty lessons of his mentor teacher, Dilek (a female mathematics teachers with 12 years of experience), and taught a total of ten lessons.

Data collection instruments

Data collection instruments are reflective writings, unstructured interviews, observations of lessons and post-lesson reports. In the beginning of School Experience course, Harun was asked to write his ideas about the following question: "What kind of a mathematics teacher do you want to become". The aim of this reflective writing was to explore how Harun see himself as a mathematics teacher in the future. To be able to investigate how Harun actualised himself as a mathematics teacher, his four lessons were observed and video recorded. This sequence of lessons was in grade 11 (third year of upper secondary education) and the topic was statistics. Harun was interviewed before his teaching sessions. The aim of the interview was to explore how he prepared his lessons and to provide feedback to him. During these unstructured interviews, he shared his teaching ideas with his university supervisors.

The interviews were audio-recorded. A post-lesson report form was designed by the researchers to explore (a) how the lesson was planned and (b) how the actual teaching was (e.g. evaluation of strengths and weaknesses). Harun prepared two reports for his four lessons.

Data analysis

The prospective teacher's reflective writing about 'what kind of a mathematics teacher he wants to become' is analysed through content analysis. Among the themes emerged, three of them were selected to be investigated further: strong content knowledge, technology integration and use of daily life examples. At various points in his reflective writings, Harun mentioned that he wanted to have very strong subject knowledge. The second theme was named as "technology integration" to refer to a teacher's knowledge and skills for successful technology integration. In his writings, Harun emphasised that he wanted to become a mathematics teacher who could use technology where necessary. As the third theme, Harun also mentioned that a good mathematics teacher should be able to use daily life examples of mathematical concepts and he would like to achieve this in the future.

At the second stage of data analysis, data obtained from interviews, observations and post-lesson reports were analysed using descriptive analysis. The aim of this analysis is to explore how the three themes above reveal themselves in Harun's lessons.

Findings

In this section, the findings that emerged from a descriptive analysis of Harun's lessons will be given. As mentioned above, three themes guided the descriptive analysis and findings will be presented in three sections concerning these themes. Before that, an overview of Harun's teaching practice will be discussed.

An overview of Harun's teaching practice

This paper focuses on Harun's four lessons on statistics. The objectives of his first two lessons were choosing the appropriate graphs, constructing and interpreting graphs in real-world contexts. In the beginning of the lesson, Harun asked students what statistics meant and how it was used in our everyday life. During these two lessons he focused on line graphs, bar charts and scatterplot graphs. When constructing these graphs he used data sets which he uploaded into VUstat software and as well as hot data which he obtained during the lesson.

The other two lessons focused on standard deviation and standard scores. He first calculated the standard deviations for two different data sets using VUstat software. He asked students to comment on the data sets which had the same mean value but have different standard deviations. In his last lesson, he gave the definition of standard scores and how to calculate z and t scores.

Strong content knowledge

In his reflective writings, Harun reported that he wanted to become a mathematics teacher who had a strong content knowledge. Analysis of his lessons indicated that he emphasised the key concepts and relationships between them, and noticed students' mistakes and difficulties.

In his first lesson, Harun presented a data set which represented the distribution of the amount of hazelnut production in Turkey over the years. He asked his students to produce bar charts. As students drew their graphs, he walked around the classroom and checked their graphs. He noticed that one of the students wrote the years on the x-axis jointly and Harun brought this mistake to the attention of the whole class:

Harun: Can everyone see this graph? What is the mistake here? What kind of a mistake? It's joint, isn't it? Be careful about this. Is there a value between 2007 and 2008 for our variable? Isn't it? If there was a value, it would be something like 2007.5 or 2007.2. Therefore, it depends on whether the variable is continuous or not. We have to be clear about that in bar graphs.

The way Harun noticed and attempted to overcome this difficulty can be considered as an indication of his strong subject knowledge. He was aware of the fact that the independent variable (time) is represented by years and therefore it is not a ratio variable. That is why he warned his students not to draw bars jointly.

In his third lesson on standard deviation, Harun used two questions which required reasoning on standard deviation: "(a) Let S be the standard deviation of a data set including n values. If we multiple each value by k , what happens to S ? (b) In which situations, standard value is zero?" By asking these questions, Harun wanted to draw the attention to important points as he mentioned this in his post lesson reports. This also can be considered as an indication of his strong subject knowledge.

Technology integration

Harun decided to integrate technological tools into his first two lessons which focused on constructing and interpreting graphs. He prepared an Excel task and talked it with his university supervisor. She suggested he use VUstat software which was recently translated into Turkish language. She made a short technical-demonstration on how to use the software. He decided to use the software and mentioned the following:

Harun: This software could be useful. Especially, not only for box-plot, it also draws pie charts, line graphs...Let's use it, but maybe I won't be able to spend so much time but I can show one or two examples...I can prepare data sets at home and then use it during the lesson.

Harun showed the data sets he prepared to his students and asked them to draw the graphs. After they completed this task, Harun drew the graphs using VUstat. On the other hand, he used hot data when teaching pie charts. He prepared a survey using the software and asked students to check their pulse for a minute. He then entered all data into the survey and produced a pie chart which represented the number of pulses for girls and boys. As the whole class, they interpreted the graph and results from the survey. He reflected about this activity in his post-lesson as follows:

Harun: I tried to make a difference by using technology...I tried to use technology where possible. Using technology made my lesson stronger. A visual approach made learning permanent. At the same time I saved time. Also, by doing a survey via technology made students more active during the lesson.

The excerpt above indicated that Harun was enthusiastic about integrating technology into his lesson and he quickly adopted his university supervisor's suggestions for which software to use.

Use of daily life examples

In his reflective writing, Harun mentioned that a good mathematics teacher should use daily life examples of mathematical concepts where necessary and he mentioned that he wanted to be such a teacher. Likewise, he used daily life examples in the context of statistics.

As mentioned before, Harun's first lesson made an introduction to statistics. He first asked students what statistics meant and how it was used in our daily lives. Students talked about population census and elections. He also used daily life examples when teaching the graphs some of which were taken from Turkish Statistical Institution reports. He explained the usefulness of this approach in his post-lesson report: "I brought data from Turkish Statistical Institution reports to be able to emphasize the use of statistics in our everyday life."

Discussion and conclusion

The aim of this study was to explore a prospective upper secondary mathematics teacher's professional identity and how it revealed itself in the school context. For this aim, three characteristics of Harun's mathematics teacher identity (strong content knowledge, technology integration and use of daily life examples) were examined to see whether they were actualised in practice. Data indicated that Harun had a strong content knowledge in statistics although it was a newly introduced topic in upper secondary mathematics curriculum in Turkey. Furthermore, he integrated technological tools such as VUstat software and daily life examples into his lessons. In summary, Harun's identity was in line with his practice. In Rodgers & Scott's (2008) terms, he is "the authority of his own voice" (p. 733).

Analysis of data indicated that Harun was strong-minded about his choice for being a mathematics teacher and about the characteristics of his teacher identity. Although he had not entered the profession yet, he demonstrated these characteristics in a short time. Therefore, findings suggested that our prospective teacher was aware of his identity which was not influenced by normative contextual or relational forces (Rodgers & Scott, 2008). By normative forces, we refer to the educational system in general and our partnership school in particular. Our partnership school was a typical school under the influence of traditional aspects of Turkish education system despite the current reform attempts in the country. Relational forces include peers in the teacher preparation program, school mentors and university supervisors. Although the related data was not presented in this current study, Harun was distinguished from most of his peers with regard to his efforts to improve himself. His peers were more likely to embrace a traditional view of teaching. This situation was the same for his school mentor. On the other hand, with regard to his university supervisor, Harun's decisions on integrating technology into his lesson were supported.

In contrast to studies such as van Putten et al. (2014) in the way in which participants perceived their selves as a mathematics teacher was different from actualisation of their selves, the reason for why our prospective teacher could actualise himself in the classroom could be because he was strong-minded about being a teacher and aware of his identity. However, this study analysed only four lessons of a single prospective teacher. Further studies should focus on teaching practice for longer periods. Furthermore, we only focused on a specific subject, namely statistics. As mentioned before it is a newly introduced topic in the curriculum. Therefore, our prospective teacher did not have a learning experience of

this topic in school when he was a student. Therefore, statistics differs from other topics which were traditionally taught to him. In other words, he is more open-minded about how this subject could be taught. Furthermore, statistics is a suitable subject for technology integration and the use of daily life examples. Therefore, observation of teaching other topics could elucidate further the nature of identity.

Acknowledgement

This study is part of two research projects (project numbers EGT-B-131113-0441 and EGT-D-071015-0499) funded by Marmara University Scientific Research Projects Commission.

References

- Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education*, 20(2), 107-128.
- Bjuland, R., Cestari, M. L., & 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.
- Cattley, G. (2007). Emergence of professional Identity for the pre-service teacher. *International Education Journal*, 8(2), 337-347.
- da Ponte, J. P., & Brunheira, L. (2001). Analysing practice in preservice mathematics teacher education. *Mathematics Education Research Journal*, 3, 16-27.
- Goos, M. (2005). A sociocultural analysis of the development of pre-service and beginning teachers' pedagogical identities as users of technology. *Journal of Mathematics Teacher Education*, 8, 35-59.
- Izadinia, M. (2015). A closer look at the role of mentor teachers in shaping preservice teachers' professional identity. *Teaching and Teacher Education*, 52, 1-10.
- 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.
- 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* (3er ed.) (pp, 732-755). New York: Routledge.
- Schatz-Oppenheimer, O., & Dvir, N. (2014). From ugly duckling to swan: Stories of novice teachers. *Teaching and Teacher Education*, 37, 140-149.
- 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.
- van Putten, S., Stols, G., & Howie, S. (2014). Do prospective mathematics teachers teach who they say they are?. *Journal of Mathematics Teacher Education*, 17(4), 369-392.
- Xu, H. (2013). From the imagined to the practiced: A case study on novice EFL teachers' professional identity change in China. *Teaching and Teacher Education*, 31, 79-86.
- Walshaw, M. (2004). Pre-service mathematics teaching in the context of schools: An exploration into the constitution of identity. *Journal of Mathematics Teacher Education*, 7, 63-86.