A Sociocultural Approach to Learning to Teach with Technology: Reflections on Pre-service Teachers' Field Experiences

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ABSTRACT: One cannot fully understand the nature of learning to teach through a cognitive approach. Teacher educators should support the development of attitudes, beliefs, and identities of pre-service teachers as well as their knowledge and skills related to teaching with technology. Therefore, this study embraces communities of practice framework which has been widely used in teacher education research to explain social aspects of learning to teach. The participants are fifteen senior pre-service mathematics teachers enrolled in a four-year teacher preparation program in a state university in Turkey. Pre-service teachers participated in "legitimate peripheral participation" activities in order to encourage them, as novice teachers, to take responsibility and interact with experienced teachers for successful technology integration. Participants conducted workshops on technology-enhanced mathematics teaching in two different upper-secondary schools. A total of ten mathematics teachers participated in the workshops. Data sources are videos of workshops conducted by pre-service teachers and focused group interviews with pre-service teachers. Content analysis of verbatim transcripts indicated important issues regarding the social and cultural aspects of technology integration. This presentation will propose implications for pre-service teacher education in general and mathematics teacher education in particular.

KEYWORDS: sociocultural approach, pre-service teacher education, field experience, communities of practice, technology integration

Introduction

Recently, communities of practice framework have been used in teacher education due to its potential to explore the process of learning to teach as a socio-cultural perspective. Jean Lave who is a social anthropologist and social learning theorist, and Etienne Charles Wenger who is an educational theorist and practitioner first introduced the framework in their book which was published in 1991. The framework describes learning as a social process (Lave & Wenger, 1991). In education, there is a huge body of literature so-called socio-cultural perspective which deals with social aspects of learning mostly in the context of the classroom. However, in teacher education, most of the studies have been used communities of practice framework. Below, I explore the framework in detail and then report how it has been used in teacher education research.

Communities of Practice

A community of practice is not just simply a group of people who come together to do something. It should also have three main features (Wenger, 2010). First, it should have a domain which is related to the following questions: "What is our partnership about? Why should we care? Are we likely to be useful to each other? What is our learning agenda? What specific set of issues does it entail?" (p. 12). The second feature is that it should have a community in which a partnership grows and make progress. Beyond a common interest, people who come together a community should have a joint enterprise which brings us to the third feature: practice which is related to the following questions: "How can the practice become the curriculum? How can it be made visible and inspectable? What should participants do together to learn and benefit from the partnership?" (p. 12).

Lave and Wenger (1991) emphasized that social learning develops through participation and they developed terminology to distinguish different levels of participation of oldtimers and newcomers in a community. They defined "legitimate peripheral participation" through which newcomers increase their participation. It is "peripheral" because they are not at as active as the core group in a community. Experts, leaders or coordinators are at the level of core participation (See Figure 1).
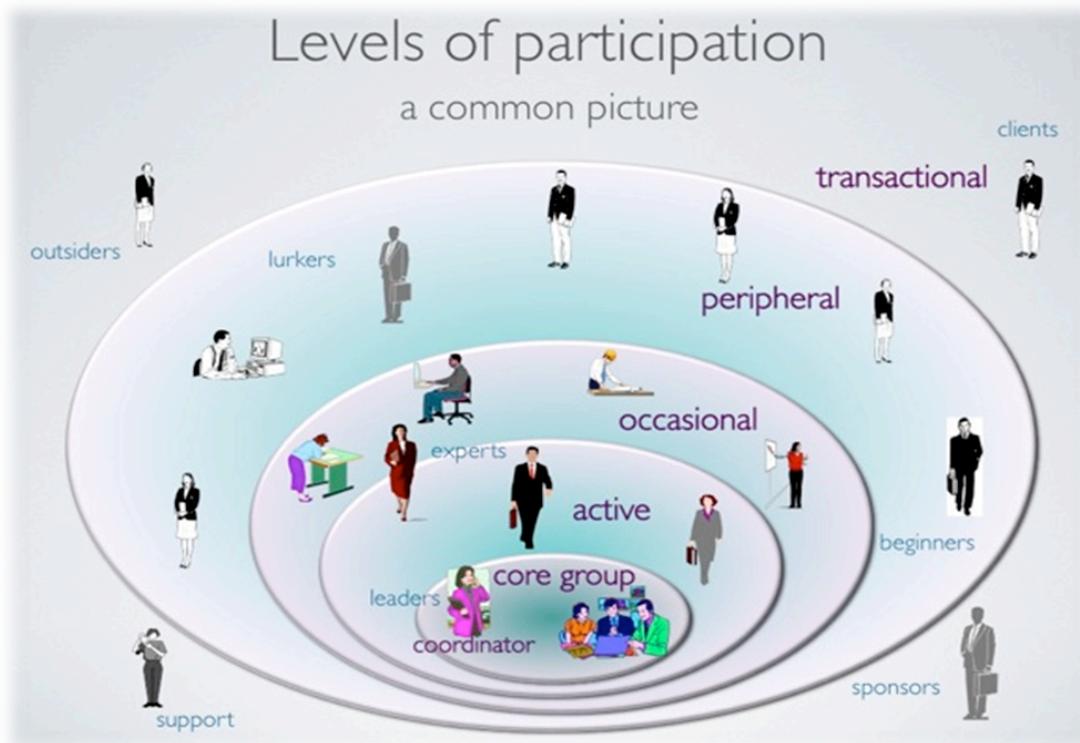
Figure 1. Communities of Practice: Levels of Participation

Source: http://wenger-trayner.com/resources/slide-forms-of-participation

Communities of Practice in the Context of Teacher Education

 Research studies specifically used communities of practice framework in the context of professional learning during which novices interact with experts. Therefore, teacher education research also used this framework to explore how pre-service teachers and teachers learn to teach through participation in a professional community. Studies that focus on in-service teachers are more common. These studies explore how novice teachers become part of a professional community of teachers (Brodie 2014; Goodchild, Fuglestad and Jaworski 2013; Graven 2004; He An 2009; Lambson 2010; Vescio, Ross & Adams 2008). On the other hand, studies that focus on pre-service teachers focused on their field-experiences during which they first participate in a community of teachers at the periphery (Akkoç, Balkanlioglu & Yesildere-Imre 2016; Cornu & Ewing 2008; Peressini, Borko, Romagnano, Knuth & Willis 2004; Sutherland, Scanlon & Sperring 2005; Tsui & Law 2007).

Based on the literature review above, the aim of this paper is to explain the social aspects of learning to teach with technology using the communities of practice framework in the context of pre-service teacher education.

Methodology

This qualitative study was situated in a four-year teacher preparation program at a state university in Turkey. The participants are fifteen senior pre-service mathematics teachers enrolled in the program. Pre-service teachers participated in "legitimate peripheral participation" activities in order to encourage them, as novice teachers, to take responsibility and interact with experienced teachers for successful technology integration. Participants conducted workshops on technology-enhanced mathematics teaching in two different upper-secondary schools under the guidance of the course tutor (the author of this paper). Seven female pre-service teachers attended School 1 and eight pre-service teachers (one male and six female) attended School 2. A total of ten mathematics teachers participated in the workshops: six teachers (two male and four female) from School 1 and four teachers (one male and

three females) from School 2. Each workshop lasted approximately for an hour. Participants gave examples of technology-enhanced mathematics teaching using Geogebra and CabriGeometry software. The mathematical content included three-dimensional geometry, functions, and derivative. Mathematics teachers reflected on these activities and their usefulness in the classroom.

Data sources are videos of workshops conducted by pre-service teachers and focused group interviews with pre-service teachers. Videos of seminars and focused-group interviews were verbatim transcribed. Content analysis of verbatim transcripts focused on important issues regarding the social and cultural aspects of technology integration.

Findings

This section will present the findings in two sections. The first section will report the issues raised by mathematics teachers during the workshops. The second section will focus on the discussions among pre-service teachers and the university mentor on these issues after the workshops.

Issues raised by mathematics teachers during the workshops

Mathematics teachers reflected on the activities and their usefulness in the classroom. As a result of the interaction between pre-service teachers and mathematics teachers, various emerged during the discussions. The first theme is concerned with time-constraints. Mathematics teachers mentioned that using technology is time-consuming. Another theme is related to the first one. They reported that the pressure of high-stakes exams on teachers is an important factor in their decisions for not using technology. However, they believe that technological tools would be useful for three-dimensional geometry since they help them to make visualizations which is difficult to do on the board. They do not prefer to use them for teaching topics of mathematics other than geometry. Another theme raised my mathematics teachers is their concern about when and how to use technology which refers to pedagogical issues.

Issues raised by mathematics teachers after the workshops

Analysis of data indicated pre-service teachers preferred to reflect on what teachers discussed after the workshop when teachers were not present there. As a result of the interaction between pre-service teachers and university mentors, the following issues emerged. First, they reflected on the issue of time constraints. Some of the pre-service teachers agreed with the teachers that technology is time-consuming while others acknowledged that it is time-consuming but suggested to use it once or twice a week. On contrary, some of the pre-service teachers claimed that technology could save time by allowing to draw graphs very quickly and efficiently.

Participants reflected on the issue of "pressure from high-stakes exams" in different ways. Pre-service teachers acknowledged the existence of pressures from exams on teachers and they claimed that they, as future teachers, will be judged by their students' success in exams. Some of the pre-service teachers would like to use technology in their future lessons but at the same time have concerns about exam pressure. With this regard, they mentioned about the tension between curriculum and exams. Furthermore, they mentioned their concerns about a lack of resources for teachers such as textbooks. To overcome these difficulties, they suggested that technology should be integrated into the examinations.

"When and how to use technology" is an important theme emerged from the data. Pre-service mathematics teachers emphasized the importance of appropriate use of technology. One of them mentioned the following:

> *Teachers' perception of using technology is limited to smart boards. As I understand from the workshop, teachers assumed that mathematical software should be used in every lesson. It's not the aim. Also, teachers privilege paper and pencil methods.*

Pre-service teachers also claimed that technology and paper-pencil methods should be balanced. In other words, it is important to decide when to use technology and when to use the paper-pencil method in the instructional design and implementation of a lesson.

Another issue raised by pre-service teachers was about the resistance of teachers towards technology. Although they are aware of teachers' negative attitudes towards technology, pre-service teachers also have their own concerns about tailoring the needs of students according to their levels when using technology.

Conclusions

In this study, pre-service teachers, as newcomers, were given the chance of discussing technology-enhanced teaching with old members of the professional community. Pre-service teachers participated in "legitimate peripheral participation" activities in order to encourage them, as novice teachers, to take responsibility and interact with experienced teachers for successful technology integration. This allowed pre-service teachers to align themselves between the university and school cultures.

In conclusion, I suggest designing legitimate peripheral participation activities during teacher preparation courses, especially in field experience courses. Pre-service teachers should be faced with the reality of schools under the guidance of university mentors. University mentors should guide pre-service teachers during this process which take place when they start the profession. However, it is important to monitor this process during teacher preparation programs. University mentors should be a mediator between university and school (Goos 2005).

Acknowledgments

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