A PRESERVICE MATHEMATICS TEACHER'S REFLECTIVE PRACTICES ON SELF-IMPROVEMENT REGARDING TEACHING AND LEARNING PROCESS IN PRACTICE TEACHING

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Approval of the Graduate School of Social Sciences

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ABSTRACT

A PRESERVICE MATHEMATICS TEACHER'S REFLECTIVE PRACTICES ON SELF-IMPROVEMENT REGARDING TEACHING AND LEARNING PROCESS IN PRACTICE TEACHING

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This study investigated a female preservice mathematics teacher's reflective practices on self-improvement regarding teaching and learning process in practice teaching (PT). The participant of this study was a pre-service teacher registered to a two-year Teacher Certification Program (TCP) in Turkey in the Fall semester of 2014-2015 academic year.

The preservice mathematics teacher was interviewed in several occasions and her lessons through the PT course studies were observed. In addition to these, reflective journal entries and portfolio of the participant and several documents related to the PT process were used in data analysis.

At the beginning of the practice, the participant underlined some issues related to Teacher Certificate Program (TCP) and its requirements and teaching process. During PT process the participant had reflections on planning, decisions and

reasons behind them, teaching in general, students' learning and in-class dynamics. At the end of the PT, the participant reflected on several issues such as planning, teaching process, assessment, classroom management, students and their learning, teaching profession, personal characteristics and the requirements of TCP. Orientation of reflections of the participant after teaching practice were identifying strength in being a teacher, identifying the areas of needs for improvement, identifying improvement for the next practices and identifying as a learner.

By using several tools and analyzing the results obtained in the research process, the study provided profound information about the reflection phenomenon and the process of reflective practice of preservice mathematics teacher.

Keywords: reflection, reflective practice, reflection-in-action, reflection-on-action, preservice mathematics teacher

ÖZ

BİR MATEMATİK ÖĞRETMEN ADAYININ ÖĞRETİM UYGULAMALARI KAPSAMINDA ÖĞRETİM VE ÖĞRENME İLE İLGİLİ GELİŞİMİ ÜZERİNE YANSITICI DÜŞÜNME UYGULAMALARI

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Bu çalışma bir matematik öğretmen adayının öğretim uygulamaları kapsamında öğretim ve öğrenme ile ilgili gelişimi üzerine yansıtıcı düşünme uygulamalarını incelemeyi amaçlamaktadır. Çalışma, 2014-2015 akademik yılı Güz döneminde Türkiye'deki iki yıllık bir Öğretmenlik Sertifikası Programı'na (ÖSP) dahil olan bir matematik öğretmen adayı ile gerçekleştirilmiştir.

Çalışmada, matematik öğretmen adayı ile bir çok ve farklı türde görüşmeler yapılmış, Öğretmenlik Deneyimi (ÖD) dersi kapsamındaki dersleri gözlenmiştir. Bunların yanısıra katılımcı öğretmen adayının hazırladığı yansıtıcı düşünme günlüğü

ve portfolyo ve veri analizi sürecinde öğretmen adayının yansıtıcı düşünme süreci ile ilgili birçok doküman da veri toplama araçları olarak çalışmada kullanılmıştır.

Uygulamanın başındaki yansıtıcı düşünme süreçlerinde katılımcı matematik öğretmen adayı, ÖSP ile ilgili birtakım konuların ve programın gereklilikleri ve öğretim süreciyle ilgili konuları ele almıştır. Matematik öğretmen adayı Öğretim Uygulaması (ÖU) sırasındaki planlama, kararlar ve bunların ardındaki nedenler, genel olarak öğretim ve planlama öncesi dönemde göz önünde bulundurduğu noktalar, öğrenci öğrenimiyle ve sınıf yönetimiyle ilgili yansıtıcı düşünceleri ön plana çıkmaktadır. ÖU sonunda katılımcı planlama, öğretim süreci, değerlendirme, sınıf yönetimi, öğrenciler ve öğrenimleri, öğretmenlik mesleği, kişisel özellikler ve ÖSP'nın gerekleriyle ilgili yansıtıcı düşünmüştür. Matematik öğretmen adayının öğretim uygulamalarına yönelik olarak yansıtıcı düşünme tarzı, öğretmenliğinin güçlü yönünü belirleme, geliştirmesi gereken alanları belirleme, sonraki uygulamalar için gelişimi belirleme ve kendini bir öğrenen olarak görme şeklinde olmuştur.

Çalışmada kullanılan bir çok veri toplama aracı ve bunların analizi ile elde edilen sonuçlar yansıtıcı düşünme olgusu ve matematik öğretmen adayının yansıtıcı düşünme süreci ile ilgili derin bilgi sağlamaktadır.

Anahtar kelimeler: yansıtıcı düşünme, yansıtıcı düşünme uygulaması, eylem üzerine yansıtıcı düşünme, eylem sırasında yansıtıcı düşünme, matematik öğretmen adayı

To my son

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LIST OF ABBREVIATONS

Graduate School of Education: GSE

Teacher Certification Program: TCP

School Experience: SE

Practice Teaching: PT

Council of Higher Education: CoHE

National Council of Teachers of Mathematics: NCTM

National Library of Virtual Manipulatives: NLVM

Science, Technology, Engineering and Mathematics: STEM

Graduate School of Education: GSE

International Baccalaureate: IB

CHAPTER I

INTRODUCTION

Teachers play a significant role in shaping the quality and effectiveness of the teaching and learning practices, because teaching becomes effective in the classrooms through the actions of teachers. Quality teaching composes of good teaching which implies the worthiness of the activity, and successful teaching which involves the realization of intended outcomes (Fenstermacher & Richardson, 2005).

Research on effective teaching has shown that effective practice is linked to inquiry, reflection, and continuous professional growth (Harris, 1998). Dewey (1933) defines reflection as an "Active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further consequences to which it leads" (p.9). Schön (1983) distinguishes between the reflection done before and after the implementation as reflection-on-action, and reflection done during the process as reflection-in-action. Van Manen (1995) defines the types of reflection as anticipatory, contemporaneous, and retrospective types of reflection, which correspond to reflection before, during and after the action respectively.

Teacher reflection provides a way of authoring the teacher's self into a justification of pedagogy which encourages development. Correspondingly, it "implies an active concern with aims and consequences, as well as means and technical efficiency; it is applied in a cyclical or spiraling process, in which teachers monitor, evaluate, and revise their own practice continuously" (Pollard et al., 2005, p.15). While experience is the source for learning, learning cannot be actualized without reflection. Reflective practice comes about when preservice teachers volunteer to take the role of reflective practitioner, question their personal theories

about teaching and learning, account for their actions in the classroom, and keep on to progress their teaching practices (Farrell, 2008; Jay & Johnson, 2002, Valli, 1997).

For teaching, reflective practice refers to the process of the teacher studying his or her own teaching methods and implementations and determining what works best for the students. Reflective practice is thoughtfully considering one's own experiences in applying knowledge to practice while being coached by professionals in the discipline (Schön, 1983). Similarly, Jaworski (1998) defines reflective practice as "a rather thoughtful way of teaching, evaluating what occurs and feeding into future planning without a demand for overt, critical, knowledgeable action" (p.7).

In fact, reflective practice is simply creating a routine, structure, or recurrence around examining experience (Amulya, 2004) which can be developed over time. Thus, it is a key component of teacher development (Richards, 2000). Consequently, many teacher education programs spend effort on developing reflective practitioners (Christensen, 1996). The aim of such teacher education programs is consistent with a constructivist viewpoint for teaching and learning. If the intention of teacher training programs is to train preservice teachers in several ways in order to help them deliver quality instruction, then their education should be considered in several ways. With the intention of providing quality instruction, preservice teachers should be trained to use several viewpoints to reflect on teaching situations and students' learning.

The intent of reflective practice of preservice teachers and inservice teachers is to improve the quality of practiced act and to qualify the individual to advance competence (Osterman & Kottkamp, 1993). Therefore, if there is a desire to change and progress teaching practice and enhance students' learning mathematics, there is a need to change the way of thinking about mathematics learning processes of students (Thompson, 1984; Trigwell & Prosser, 1996).

Research on the concerns of preservice teachers (Schussler et al., 2010) and beginning teachers (Fuller, 1969) showed that they focused on survival and practical techniques and delivery of instruction in their early teaching experiences, rather than students' learning (Schussler et al., 2010). As they gained experience, by reflecting on their teaching, they started to emphasize curriculum and students' learning of the

content. For that reason, preservice teachers should be involved in reflective actions not only for the improvement of learning, but also to endure professional progress after graduation (Lee, 2005) and starting their teaching career.

The lack of focus on students' learning in initial practices (Schussler et al., 2010) underlined in the literature addresses that preservice teachers' reflective practices are essential for effective teaching in their future professional life. When this is the case, the training of preservice teachers becomes an important concern for all teacher educators (Tabachnick & Zeichner, 1991). The overall aim of the reflection in teacher education programs is to broaden and deepen the preservice teachers' thinking about their teaching (Posner, 1996) and also students' learning. However, it is not an easy job to develop a reflective teacher (Ostorga, 2006).

Preservice teachers can engage in reflective practices at any time they need to develop themselves when teacher education programs present the exact contexts and opportunities preservice teachers need for initiating and improving their reflective practices (Loughran, 2002). Programs could be organized by prioritizing preservice teachers' program experiences and their reflections of these experiences in order to improve their teaching and especially on students' learning.

This research has been conducted with one preservice mathematics teacher who registered and completed the first year of two-year Master of Arts with Teaching Certification Program (TCP) of Department of Educational Sciences at the Graduate School of Education (GSE) in one of the universities of Turkey. The nature of the program made this study a special case and it was explained below.

Mathematics education programs in Turkey are four-year programs at Faculties of Education at universities and students in these programs attend to School Experience (SE) and Practice Teaching (PT) courses in respectively in the Fall and Spring semesters of their senior year (Council of Higher Education (CoHE), 1998). Mathematics Teacher Certification Programs' courses are defined as, Introduction to Teaching Profession, Development and Learning, Planning and Evaluation in Teaching, Classroom Management, Coursebook Analysis and Mathematics Teaching and Practice Teaching (CoHE, 1998).

The TCP has three components, which are Teaching Certification, International Baccalaureate (IB) Teacher Award and Master's Degree. The graduates of TCP are rewarded by the teaching certificate which qualifies them to teach at high schools. In 2014-2015 academic year, there were 8 preservice teachers enrolled in TCP, that the preservice mathematics teacher was registered. Apart from that there were other preservice teachers who had undergraduate degree from Physics, Chemistry, Biology, Turkish Language and Literature, and English in the program. As a structure of the program, the preservice teachers from all those different areas attended to some common courses in TCP such as Introduction to Teaching Profession, Assesment and Evaluation, and some courses for Master of Science degree such as Written Academic Discourse. Preservice teachers perform activities and tasks in those courses according to their areas of study. Besides, they attend to the courses that are specific to their own field such as Mathematics Teaching Methods.

Due to its nature, TCP has a different structure compared to other teacher training or Master of Arts Programs in Turkey. The preservice teachers spend most of the week with courses due to intensity of the TCP program. As an example, in each semester, the preservice teachers registered to 5 or 6 courses in a two-year program. This structure is different from other graduate programs or Teaching Certificate Programs in Turkey. In this respect, TCP is in a more similar structure to the undergradute programs. Due to the intensive content and high number of courses, there is no preservice teacher enrolled in the program and works in a full time job at the same time. Most of the preservice teachers are the ones who applied to the program and accepted right after graduation. However, being less in number, there are a few preservice teachers involved in the TCP, who previously worked in different teaching institutions without having a teaching certificate or who were experienced in different jobs.

In the scope of TCP, the preservice mathematics teachers take courses related to each of these components of the program. For instance, Mathematics Teaching Methods is one of the courses related to Teaching Certification. Students who successfully complete this two-year program are also given an IB Teacher Award.

The students enrolled in TCP take courses such as Curriculum in an International Context, which is one of the lessons related to IB Teacher Award. In addition to Teaching Certification International Baccalaureate (IB) Teacher Award, students accepted to the program are expected to write a Master's Thesis in order to complete the program. The courses such as Written Academic Discourse are related to Master of Arts component of TCP.

In the SE course in regular Teacher Certification Programs, the preservice teachers spend most of their time by observing the cooperating teacher in the class by reporting these observations. In the TCP, in the context of the SE course, preservice teachers are expected to conduct both observations and teaching, but the focus is mainly on lesson observations. The preservice teachers spend one day in every week in the cooperating private school and observe mathematics lessons.

In their second year of TCP, they take the PT course. The PT course is an intensive course in which preservice teachers have their teaching practices by being in the cooperating schools in Turkey the whole week except an half day for six consecutive weeks through the semester. In that half day, the preservice teachers attend the theoretical and discussion part of PT course with their supervisor. Due to the course requirements, preservice teachers are expected to teach mathematics starting from the first week. They are expected to complete at least thirty hours of teaching during those six weeks in cooperating schools in Turkey. After PT period in the cooperating schools in Turkey, they spend three weeks at the University of Cambridge in the Postgraduate Certification in Education Program followed by two weeks in cooperating schools in England.

This study was conducted in order to explore the reflective practice process of a preservice mathematics teacher on self-improvement regarding teaching and learning process in practice teaching in such a unique reflective oriented TCP case.

1.1 Purpose of the study and research questions

This study was conducted with a preservice teacher registered to a non-traditional two-year Teacher Certification Program (TCP) in Turkey in the Fall semester of 2014-2015 academic year. The main focus of the study was to

investigate how and about what the preservice teacher, who was attending to the second year of the program, had reflections during observation and teaching periods of the course that she taught in a real classroom in the context of Practice Teaching (PT) course.

The research question sought in the study is presented below:

How does one preservice mathematics teacher perform reflective practice on self-improvement regarding teaching and learning process in practice teaching?

Sub questions related to the research question are as follows:

1. How does she reflect on her previous experiences and self-improvement regarding teaching and learning process at the beginning of the practice?

1.a. What are the issues she reflects on?

1.b. What is the orientation of those reflections?

2. How does she reflect on her experiences regarding teaching and learning process before her teaching practices?

2.a. What are the issues she reflects on?

2.b. What is the orientation of those reflections?

3. How does she reflect on her experiences regarding teaching and learning process during her teaching practices?

3.a. What are the issues she reflects in?

3.b. What is the orientation of those reflections?

4. How does she reflect on her experiences regarding teaching and learning process after her teaching practices?

4.a. What are the issues she reflects on?

4.b. What is the orientation of those reflections?

5. How does she reflect on her experiences and self-improvement regarding teaching and learning process at the end of Practice Teaching period?

5.a. What are the issues she reflects on?

5.b. What is the orientation of those reflections?

6. How does she reflect on these issues to achieve self-improvement regarding teaching and learning process in practice teaching?

7. How does the preservice teacher's reflective practice change on self-improvement regarding teaching and learning process through the teaching practice?

The research questions expressed above was investigated in the context of the cooperating school component of the PT course.

1.2 Significance of the study

Reflective practice has an important place in the literature and has been mentioned as an essential component of the professional development of teachers and preservice teachers (Calderhead, 1989; Ghaye & Ghaye, 1998; Pollard et al., 2005). By means of the reflection on their classroom practices, teachers and teacher candidates would have a chance to observe their disposition toward teaching and setting within which they work (Zwozdiak-Myers, 2009). The studies related to reflective practice revealed the need for qualitative studies in order to deeply investigate the reflective practice process of the preservice teachers (McKenna, 1999). The investigation related to the reflection process of preservice teachers in the context of Practice Teaching course would provide useful information for this need.

In this study, reflective practices of a preservice mathematics teacher were investigated in order to gather information about her reflection processes on teaching and students' learning. Based on the aforementioned issues, main aim of this research study is to provide a representative and meaningful understanding about the preservice mathematics teacher's reflection which can be advanced over time (Harford & MacRuairc, 2008), content of those reflections and developments in this reflective practice process.

The data of the study were collected with several tools and in several ways which were found as useful tools in promoting reflective thinking such as interviews (Alozie, 2009; Cavanagh & Prescott, 2010; Curtis & Szestay, 2005; Frid, 2000; Heng & Khim, 2004; Lowery, 2003; McDuffie, 2004; Nicholas, 1994; Roehrig et. al., 2008; Tok, 2008), observations (Frid, 2000; McDuffie, 2004; Nicholas, 1994), reflective journal entries (Farrell, 2007, Schweiker-Marra et al., 2003), portfolios (Hartmann, 2003) and documents of the TCP. By using several tools and analyzing the results obtained in the research process, the study provided profound information about the reflection phenomenon and the process of reflective practice of preservice mathematics teacher. In addition to this, the way of using several tools and documents would provide example for the researchers who would conduct research on reflective practice phenomenon.

Reflective studies in the literature are desired as the most favorable mode of inquiry (LeCompte, Millroy & Preissle, 1992; McDuffie, 2004; Stake, 1995) in order to understand the reflective practice processes of preservice teachers. The development process of reflective thinking of preservice mathematics teacher, being in an intensive PT is investigated in this study and the results of the study provide extensive information about the details of this development process. By this way, the results of this study would provide in-depth information about the development of preservice mathematics teacher.

In the literature, reflective practice found critical component in the progression of student teachers (Bartlett & Leask, 2005; Calderhead, 1989; Day, 1999; Ghaye & Ghaye, 1998; Pollard et al., 2005; Zwozdiak-Myers, 2009). In consequence, the findings about reflective process of preservice mathematics teacher on teaching and students' learning may contribute to the construction of the structures of future preservice teacher education programs in Turkey which may aim to train reflective teachers.

Teacher educators are concerned about preparing teachers for reflection during their studies in teacher education programs (Tabachnick & Zeichner, 1991). Precisely, since the study addresses the fundamental issues related to the improvement of student teachers in a reflection oriented PT course, teacher educators

may benefit from the results of the study in shaping the structure of the Practice Teaching courses where the main aim is improving preservice teachers' teaching skills and their awareness related to students' learning via reflective practice. In addition to this, since the reflection and reflective practice processes are significant in the training of preservice teachers (Cumyn, 2010) and both Practice Teaching course (Köksal and Demirel, 2008) and cooperating school component of this course are crucial, the structure and the roles of cooperating schools in this study provide useful information for defining principles for cooperating school and education faculty partnership specifically for reflection. The results and process of the study prove useful information about the roles of mentor who support, model and sustain useful classroom practices (Darling-Hammond, 1997) in such a structure.

1.3 My motivation for the study

As being a mathematics teacher, having experience for more than 10 years, teaching grades from 5 to 8, and being actively involved in several mathematics teaching environment designs, curriculum implementation processes, several action research processes, I have realized that students have some problems related to mathematics learning starting from early ages. It can be said that, students do not learn as well as we desire and I believe that some of these problems are directly related to the way we teach the mathematics topics. In addition to the roles mentioned above, being a mentor responsible for the development of preservice mathematics teachers has provided useful information for me about how teachers affect the learning environment and specifically students' learning.

Several prospective teachers from several universities having different educational approach performed their practicum in the cooperating school that I have been working. By observing those preservice teachers during the lesson delivery, analyzing their lesson plans, conducting several meetings with them, and reading several documents prepared by them, I realized that preservice elementary teachers' thinking process regarding teaching should be investigated deeply in order to provide information for students' learning.

In Turkey, preservice teachers are responsible for taking a course in the teacher education program, named the Practice Teaching course. Although the preservice teachers are expected to have teaching experience in cooperating schools through this course, the amount and intensity of these experiences are not sufficient to survive in their first year of profession.

The way we teach is strongly related to the way we were taught (Calderhead & Robson, 1991; Feiman-Nemser & Buchmann, 1986). In this respect, preservice mathematics teachers should be supported by means of teaching practice courses which involve several components such as lesson planning, lesson observations, weekly meetings, and reflective practices. That's why, from my point of view, this study serves a valuable information in order to understand the way of thinking of preservice mathematics teachers have about teaching mathematics and students' mathematics learning by means of the reflective practices and provides ideas to promote student teachers' reflective thought.

1.5 Definitions of important terms

Reflection: "Active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further consequences to which it leads" (Dewey, 1933, p.9). In this study, reflection is regarded as the considerations of a preservice mathematics teacher before, during and after teaching processes.

Reflection-in-action: Reflection which occurs during the action (Schon, 1983).

Reflection-on-action: Reflection which occurs before and after an action (Schon, 1983).

Reflective practice: In this study, it "implies an active concern with aims and consequences, as well as means and technical efficiency; it is applied in a cyclical or spiraling process, in which teachers monitor, evaluate, and revise their own practice continuously" (Pollard et al., 2005, p.15). In this study, the term reflective practice is used for reflection process of the preservice mathematics teacher during Practice Teaching.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter is devoted to the review of the literature related to this study. The issues that will be covered in this chapter are reflection, reflective practices, developing reflective thinking, and studies on reflection and reflective practice.

2.1 Reflection and Reflective practice

2.1.1 Meaning of Reflection and Reflective Practice

Reflective practice is appreciated by inservice teachers' training programs as well as preservice teacher education programs. It has been mentioned as a foremost apprehension (Tabachnick & Zeichner, 1991) and a critical constituent of the teacher education process (Calderhead, 1989; Pollard et al, 2005). Several researchers have mentioned the strong relationship between reflection and learning and addressed reflection as a potent element of teaching and learning (Goodell, 2000).

Although a great deal of literature is available on reflection, there is no consensus on the meaning of the term. In the literature, there are several definitions or interpretations of reflection (Dewey, 1933; Schon, 1983) and the theory–practice division is a significant theme in the literature related to reflective practice (Schon, 1983; van Manen, 1995). For instance, Dewey (1933), who was admitted as the pioneer of the reflective practice, defines reflection as an "Active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further consequences to which it leads" (p.9). In his book, How We Think (Dewey, 1933), he makes a significant distinction between routine action and reflective action. In reflective action, in contrast to routine action, reason and emotion are engaged. As Dewey (1933) states, "reflection involves

intuition, emotion, and passion and is not something that can be neatly packaged as a set of techniques for teachers to use" (p.9).

Dewey (1933) asserts that an individual should have three characteristics in order to reflect: these profiles are being open-minded, being responsible, and being whole-hearted. These imply openness to new ideas and thoughts, being aware of the meaning and consequences of one's actions, and the capacity to fully engage with new ideas and actively seek them out respectively. Correspondingly, Rodgers (2002) lists the four conditions that are pigeonholed by ideas of Dewey. According to her;

> "reflection is a meaning-making process that moves a learner from one experience into the next with deeper understanding of its relationships with and connections to other experiences and ideas, it is a systematic, rigorous, disciplined way of thinking, with its roots in scientific inquiry it needs to happen in community, in interaction with others and requires attitudes that value the personal and intellectual growth of oneself and of others" (p.845).

Teacher reflection provides a way of authoring the teacher's self into a justification of pedagogy and, hence, is a way of stimulating change. In fact, for both inservice and preservice teachers, reflection is "thinking about teaching" (Artzt & Armour-Thomas, 2002, p.7). According to Dewey (1933), initiator of the process of reflection for teachers is the moment that they experience a difficultly, wearisome event, or experience that cannot be immediately fixed. In line with Dewey (1933), reflection does not consist of a series of stages or events to be used by teachers. Rather, it is a holistic approach of confrontation and responding to difficulties, a way of being a teacher.

Reflection of the inservice and preservice teachers can be practiced at different rate of recurrence. According to Schon (1983), reflection can be seen in two time frames. These frames are called reflection-in-action and reflection-on-action.

Schon (1983) called the reflection which occurs before and after an action as reflection-on-action and called the reflection which occurs during the action as reflection-in-action. Another distinction about the time frames of reflection is done by van Manen (1995). The simplest forms of reflection that regularly occur in teacher education take place before, during, and after teaching, and van Manen (1995) defines them as anticipatory, contemporaneous, and retrospective types of

reflection. Retrospective reflection, which is related to the past experiences, differs from anticipatory reflection done on future experiences (van Manen, 1991). In contrast, contemporaneous reflection in situations allows taking a step back of action. van Manen (1991) defines this type of reflection when the reflective awareness is increased during the active teaching process, especially involving problematic situations and unexpected problems.

In addition to the differences in time frame, reflection can also vary in depth and process. Either individuals or groups can engage in reflective practice around their work (Amulya, 2004). Henceforward, 'reflection' is an ambiguous term, and its use does not always connote the same understanding (Zeichner & Liston, 1996). Thus far, although there are many definitions of reflection (e.g. Dewey, 1933; Schon, 1983; van Manen,1991) the concept of reflection resembles thinking in problem solving process identified by Polya (1945).

The term reflective practice likewise has several meanings in the literature. Jaworski (1998) defines reflective practice as "a rather thoughtful way of teaching, evaluating what occurs and feeding into future planning without a demand for overt, critical, knowledgeable action" (p.7). Similarly, Schon (1983) defines reflective practice as considerately making an allowance for one's own experiences in applying knowledge to practice. On the word of Pollard et al. (2005);

> "the reflective teaching implies an active concern with aims and consequences, as well as means and technical efficiency; it is applied in a cyclical or spiraling process, in which teachers monitor, evaluate, and revise their own practice continuously" (p. 15).

In fact, reflective practice is simply creating a routine, structure, or recurrence around examining experience (Amulya, 2004) which can be developed over time. On the other hand, reflective practice might be seen more dynamically as requiring an accomplishment as a result. Since the intent of reflective practice is to increase the quality of practiced performance (Osterman & Kottkamp, 1993), reflective practice is widely recognized as a central principle of the teaching and learning process (Brookfield, 1995; Zeichner & Liston, 1987). In the same nature, Farrell's (2001) describe reflection as a process of learning to question their own teaching and learning.

Henceforth, there has been little consensus on meanings associated with reflective practice as well as the term reflection, and additionally towards its implementation and ideas as to what should to be the entity of reflective practice (Adler, 1991; Calderhead, 1989; Feiman-Nemser, 1990; Hatton & Smith, 1995; Tom, 1985; Valli, 1992; Tabachnick & Zeichner, 1991). McKenna (1999) listed the characteristics of practitioner, who is 'reflective' as an individual who

> "focuses on some dimension of their pedagogy, sees that dimension from a variety of perspectives using techniques of reframing and reflective listening; and, engages in dialogue with their peers in order to illuminate the boundaries and frames of thought which limited their current perspective, with the goal being to take action based on a thorough and reflective understanding of events, alternatives, and ethics" (p. 13).

In a similar tone, Zeichner and Liston (1996) listed five key features that they developed related to reflective practitioner. These features are; examining, framing and attempting to solve predicaments of classroom practice; being aware of and enquiring the suppositions and values he or she brings to teaching; being attentive to the instructional and cultural circumstances in which he or she teaches; taking part in program of study improvement and is involved in school change efforts; and taking responsibility for his or her own professional development. When this is the case, then reflective teaching requires that teachers can take more responsibility for their actions in the classroom (Korthagen, 1993).

Several research have revealed that reflective practice comes about when preservice teachers volunteer take the role of reflective practitioner, question their personal theories about teaching and learning, account for their actions in the classroom, and keep on to progress their teaching practices (Farrell, 2008; Jay & Johnson, 2002, Valli, 1997). On the other hand, when teachers lack questioning their goals, values, context of teaching, and their assumptions, then they do not conduct reflective teaching (Zeichner & Liston, 1996). Reflective teaching is an essential skill for teachers and is a powerful component of successful teaching (Mewborn, 2000). Thus, it is a key component of teacher development (Richards, 2000).

Once the several definitions for reflection and reflective practice are analyzed, the common expressions and perspectives are better seen. One of the

commonality is related to the cyclical or spiral nature of the reflective practice. In addition to this, these terms defined reflective processes as continuous and active procedures and they are related to classroom enquiry, teaching experience, and beliefs. Another commonality in the definitions is related to the time of reflection; the reflective practice can be done before, during and after the action. It is not only student teachers that can benefit from such reflection and feedback, but experienced teachers as well (Curtis & Szestay, 2005).

2.1.2 Underlying Theories of Reflection

The conceptual basis for reflective thinking can be found in the areas of cognitive psychology and the literature relates reflection and reflective practice to constructivism, inquiry, and experiential learning (McIntyre & O'Hair, 1996; Osterman & Kottkamp, 1993). The reflective practice approach has emerged out of the developmental tradition of teacher education (Piaget, 1967). This tradition assumes that the natural order of the development of the learner runs the basis for defining what should be taught to students and their teachers (Zeichner, 1993). As this tradition progressed to a more student centered manner, it became grounded in a constructivist line to teaching and learning.

Constructivism is an evocative theory of learning that points to active construction of knowledge and meaning by an individual. In addition to this, it is defined as the intellectual arrangements that the individual develops in, or stems from his or her learning environment (Bussis et al., 1985). In constructivist theory, the learner constructs knowledge and meaning from their experiences by engaging and working together with the content (Fosnot, 1996; Piaget, 1967; Steffe & Gale, 1995; Vygotsky, 1982). This theory has roots that extend back through many years and many philosophers, including Dewey (1938). According to the constructivist viewpoint, learning is an ongoing process of trying to make sense and to construct meaning based on individuals' own experiences and connections with the environment in which they are engaged (Zaslavsky & Leikin, 2004). Thus, constructivism acknowledges the learner's active role in the personal construction of knowledge, the importance of practice in this knowledge construction process.

The constructivist theory defines reflection as a crucial element in the teaching and learning process (Cooney, 1994; Farrell, 2007; Osterman & Kottkamp, 1993). Consequently, constructivist learning forms a base for many teacher education programs (McDuffie, 2004) and growth of reflective practitioners (Christensen, 1996) is the effort of many teacher education programs.

There is an emphasis on the literature that reflection is strongly related with experience, in other words, practice. Teachers can engage in these reflective practices in a constructivist way at any time they need to progress (Frid 2000; Jaworski, 2006). Accordingly as Jaworski (2006) mentioned, it is easy to set relationship between constructivism, inquiry method, and reflective practices.

While experience is the source for learning, learning cannot be actualized without reflection. While reflection is essential to the process, reflection must be integrally linked with action. Reflective practice is fundamentally structured around inquiry (Amulya, 2004; Osterman & Kottkamp, 1993) and from this point; reflection is linked with experiential learning. Since the 1980s, experimental knowledge is given attention in their classroom practices (Clandinin et al., 1993; Zeichner & Liston, 1996). In another point of view, reflective practice is a professional development strategy and it is also a problem solving strategy (Osterman & Kottkamp, 1993). According to Dewey (1933), reflective thinking has two fundamental characteristics:

> "(1) A state of doubt, hesitation, perplexity or mental difficulty, in which thinking originates; and (2) an act of searching, hunting and inquiring, to find material that will resolve the doubt, and settle and dispose of the perplexity" (p.14).

From this aspect, Dewey (1993) defined the reflection process which is cyclic in nature as a kind of problem solving process. In this cyclic process, the starting point of reflection is problem (Shermis, 1992). Teachers in everyday practices, confront with many problems in class and out of class. These anticipated problems are initiators of reflective action of teachers (Dewey, 1933).

2.1.3 Models and Frameworks for the Reflection

The roots of the term “reflection” extend to John Dewey; however, it became popular after the studies of Schon (1983). Dewey’s ideas and the idea of reflective practice were developed in the 1980s with the Schon’s (1983) new concepts of reflection-in-action and reflection-on-action. Schon (1983) stressed the relationship between reflection and experience and distinguished between reflection-on-action and reflection-in-action. While reflection–in-action can be described as the reflection done during the action, reflection-on-action is done after the action. Reflection both in and after action is vital in order to weigh instinctive practices (Griffiths, 2000).

Ghaye (2011) highlighted some foremost progresses in learning through reflection. These are development as an expansion of view of reflective practice, development from insufficiencies and towards strengths, development from fixing to flourishing and development from models to frameworks.

Reflective thinking is a process with a cyclic nature (Clark, 1995; Dewey, 1933; Lee, 2005; Pollard et al, 2005; Schon, 1983). There are many models for reflection that are concomitant with cycles. One of the models is provided by Mezirow (1981). In the model generated by Mezirow (1981) the reflective thought is defined in three levels; which are non-reflective action, reflective action, and premise reflection. The non-reflective action level is subdivided into three levels. These sublevels are called habitual action, thoughtful action, and introspection. Second level of the model also consists of three sublevels; content reflection, process reflection, and content and process reflection. In the last level which is premise reflection, the person deals with the thoughts, perceptions, feelings, and actions and reasons behind them.

Another model provided by Smyth (1991) framed by questions to describe, inform, confront and reconstruct. In the describe phase, the person thinks on the action. In the inform phase, (s)he tries to understand what this action means. In the confront phase, the person thinks on his or her situation and raises self-cognizance on the situation. In the last phase, which is reconstruct phase, the person assesses and synthesizes his or her thinking.

The cyclical model provided by Gibbs (1998), which is another categorization, has six steps, each of which is accompanied with a key question. These steps are called description, feelings and thoughts, evaluation, analysis, conclusion, and action plan. The first phase is related to the portrayal of the event. In this stage, the person describes in detail the event that (s)he is reflecting on. In the second stage, the person recalls and explores the things related to the event. In the next stage, the person evaluates what has happened. In the following stage, the person considers the event by breaking it down into its constituents so that each part can be explored separately. In the fifth stage, the person explores the issue from different perspectives and uses this information as a base for judgment. In the last stage which is action plan phase, the person thinks as if (s)he experiences the event again and plans what to do.

When the several models given above are analyzed, it appears that they have some common standpoints. At the outset, in the reflection models, the person thinks on the action, then understands what the action means by evaluating and analyzing, thinks on his or her situation and develops an action plan by synthesizing his or her thinking. It is necessary to emphasize the recursive character of these phases and the cyclic structure of the reflective thinking process (Dewey, 1933; Lee, 2000; Schon, 1987). Each model, more or less, emphasizes the recursiveness of the steps, which means that each one strongly depends on all stages before it. The essence of the matter is that, the four-part experiential-reflective cycle showing the relationship between experience, description, interpretation and action, developed by Dewey (1933), can be used as a leading framework for all commonalities of these models. Reflective practice assumes a holistic methodology to learning; beginning with individual actions, whatsoever related to it becomes part of the process (Osterman & Kottkamp, 1993). From this aspect, the commonality of the models, their cyclical process and holistic approach can be used as the basis of a framework for investigating preservice teachers' reflective practices in their teaching processes.

Developmental change emanates through self-awareness of formerly unrecognized conventions lying in the theory-in-use, unrecognized routine activities, and unrecognized undesirable consequences of these activities (Osterman &

Kottkamp, 1993). Through the reflective process, teachers aim to develop effective teaching practices (Dewey, 1933; Lee, 2005; Schon, 1987; Sparks-Langer & Colton, 1991). Teachers possess a vital role in students' learning. The superiority of students' learning is related to effective teaching. According to Fenstermacher and Richardson (2005), effective instruction has two main constituents; good teaching and successful teaching. Fenstermacher and Richardson (2005) differentiated good teaching from successful teaching by stating that good teaching is related to the worthiness of the activity and successful teaching is related to realization of anticipated learning outcomes. Along similar lines, Ramsden (1992) defines good teaching as an umbrella term that involves;

> "giving helpful feedback, making an effort to understand the difficulties students may be having, being good at explanations, making subjects interesting, getting the best out of students, motivating students and showing an interest in what the students have to say" (p.66).

If the intention of teacher training programs is to train preservice teachers in multiple ways in order to make them realize the quality instruction, then their education should be considered with several perspectives. The quality instruction strands out three key features: (i) teaching conceptually for understanding, (ii) making connections within the content (Shepard et al., 2005) and (iii) directing attention through student engagement (Marzano et al., 2001). From this aspect, teacher education can play a crucial role in enlightening preservice teachers' consciousness about students' learning. This emphasis is consistent with a constructivist viewpoint for teaching and learning, which is the heart of many teacher training programs (McIntyre, Byrd & Foxx, 1996). Thus, for the advancement of the quality of instruction, it is critical to scrutinize the preservice teachers' reflection processes.

2.2 Developing Reflective Thinking and Practice

2.2.1 Conditions that Promote Reflection

Dewey (1933) listed three conditions to make reflection as being open-minded, responsible and wholehearted. Being open-mindedness is about searching for the reasons of one's actions. Being responsible is about thinking the reasons

beyond usability of the actions. And being wholeheartedness is about questioning who will be affected by the results of one's actions and in what ways (Zeichner & Liston, 1996).

Preservice teachers bring their personal views, personal theories, knowledge, proficiencies, and several suppositions about teaching (Zeichner & Liston, 1996) and there is a vigorous relationship between teachers' conceptions and their classroom practices (Thompson, 1992). Both preservice and inservice teachers' actions are habitually guided by their conceptions about teaching and learning mathematics (Thompson, 1984). From this perspective, reflective thinking is contingent with personal experience, field experience contexts, and the genre of interaction of them (Lee, 2005). Individual differences might be significant in the level of this progress and the degree of concern about them. By means of the reflection on their classroom practices, teachers and teacher candidates would have a chance to observe their inclination toward teaching and environment within which they work (Zwozdiak-Myers, 2009).

Besides, one can draw little or learn a great deal from one's experiences, however, how much we learn from these experiences and how they affect our ideas about practice vary (Zeichner & Liston, 1996). Handal and Lauvas (1987) maintain that teachers' practical theories can be understood as the balance between their personal understandings, transmitted knowledge, and core values. From this standpoint, reflective teaching requires that preservice or inservice teachers examine their personal theories about teaching and students' learning so that they can be more responsible for their actions as a teacher (Korthagen, 1993). Moreover, thinking further about reflective teaching is needed, since reflection is not a practice whose effects can be observed immediately. In a reflective approach, rather long-term development is essential (Dewey, 1933) and it should be considered as a habit that can be advanced over time (Harford & MacRuairc, 2008).

Mewborn (1999) argued that to facilitate reflection, it is essential to provide a non-evaluative atmosphere for preservice teachers and relationship with cooperating teachers, and university component should be constructed in this way. By doing so, the preservice teachers would have a change to produce assumptions and to work out

on problematic events related to classroom practices without fear of judgment (McDuffie, 2004). As a result, it is indorsed in the literature that that preservice teachers engage in reflective practices not only for the improvement of new teaching ideas but also to continue their professional development after leaving the teacher training program.

2.2.2 Tools that Promote Reflective Practice

When we look at the literature from the aspects of tools and strategies in order to promote reflective practices, we see that reflective journal writing (Farrell, 2007; Heng & Khim, 2004; Lee, 2005; Lowery, 2003; McDuffie, 2004; Schweiker-Marra et. al., 2003) is one of the most prominent tools that stimulate reflection. Farrell (2007) suggests that writing regularly in a teaching journal can help preservice teachers in elucidating their own thoughts, seeing their own beliefs and practices, and becoming more aware of their teaching, and thus being better able to observe their own teaching practices. Supporting Farrell's (2007) opinions, Schweiker-Marra and her colleagues' study (2003) exhibited that, preservice teachers who kept reflective journals as part of their teacher training program improved their levels of reflective thinking.

Observations and peer observations (Frid, 2000; McDuffie, 2004; Nicholas, 1994) are other ways that preservice and inservice teachers can use in crafting reflection on their teaching practices. Observing a number of teachers in several classrooms and practicing teaching in such environments would help preservice teachers make reflections related to their teaching progressions.

In addition to observations and journal writing, interviews are indicated as valuable tools in literature (Alozie, 2009; Cavanagh & Prescott, 2010; Curtis & Szestay, 2005; Frid, 2000; Heng & Khim, 2004; Lowery, 2003; McDuffie, 2004; Nicholas, 1994; Roehrig et. al., 2008; Tok, 2008) which stimulate reflective practice. Several forms of interviews are advantageous for putting on the right track, regulating and promoting reflection of preservice and inservice teachers. Besides, by means of reflection process, portfolios, which include a reflective component, may

encourage beginning teachers to gather significant artifacts in one place representing their professional development (Farrell, 2004; Ferraro, 2000; Lowery, 2003).

The use of videos (Harford & MacRuairc, 2008) is another most common way in promoting reflective practice of teachers. By watching their own lesson videos, teachers can find opportunity to self-reflect on their teaching practices.

Besides, using small group discussions (Frid, 2000, Harford & MacRuairc, 2008; van Zoest, 1994) is another way in encouraging reflective practice. Along with these methods and tools, coaching and peer association are considered as two facets of reflective practice which are appreciated most often at the preservice teacher education (Ferraro, 2000).

2.3 Development of Preservice Teachers' Teaching and Learning Process through Reflective Practices

2.3.1 Rationale for Developing Reflective Preservice Teachers

Lowery (2003) asserts that, through reflection, preservice teachers become able to evaluate their teaching, make trajectory about their learning, and project their own learning in courses such as practice teaching course which employs constructivist approach and in a school context in which preservice teachers easily have access to the inservice teachers and students. In such a context, preservice teachers can have the opportunity to track their own improvement related to their reflection process. Reflective practice is regarded as revenue by which teacher candidates can develop a greater level of self-awareness about their performances on the subject of teaching.

Acting on reflections discriminates reflective practice from only thinking back and may be a principal feature in the improvement of teachers (McDuffie, 2004). Thus, reflective practice is widely acknowledged as a critical constituent in the specialized growth of student teachers (Bartlett & Leask, 2005; Calderhead, 1989; Day, 1999; Ghaye & Ghaye, 1998; Pollard et al., 2005; Zwozdiak-Myers, 2009). Reflective practice can be imagined as a collection of tactics used as a vehicle to inspire professional development (McCormack, 2001). The intent of reflective

practice of preservice and inservice teachers is to improve the quality of practiced act and to qualify the individual to advance competence (Osterman & Kottkamp, 1993). For that reason, preservice teachers should be involved in reflective actions not only for the improvement of learning, but also to endure professional progress after graduation (Lee, 2005) and starting their teaching career.

Loughran (2002) finds the reflection-on-practice crucial and stresses the importance of reflection in preservice teacher education which is the crucial place for it to be initiated and developed. Reflective teaching is essential component for designing teaching and learning experiences for preservice teachers. Farrell (2008) described the fundamentals and constituents of reflective practice to accelerate the use of reflective teaching approach among educators by discussing some techniques and tools such as action research, teaching journals, teaching development groups. In another study, Lowery (2003) describes the three-level plan to promote reflective teaching: (i) understanding the importance of reflective thinking, (ii) implementing reflective strategies, and (iii) developing a reflective venue. In the same manner, Loughran (2002) suggests how it might become an effective reflective practice that can be developed and enhanced through teacher preparation programs, by underlining the inefficiency of experience alone and importance of reflection for learning. McDuffie (2004) supported this result and in a parallel vein, indicated that the preservice teachers use their pedagogical content knowledge in anticipating problematic events and in reflecting on problematic events in instruction. However, limits in pedagogical content knowledge and lack of confidence impede the preservice teachers' reflection while in the act of teaching.

The overall goal of reflection in teacher education is broadening and deepening of preservice teachers' thinking about teaching and learning (Posner, 1996). Teacher educators are concerned about preparing teachers for reflection during their studies in teacher education programs (Tabachnick & Zeichner, 1991). Reflection can lead to a superior understanding among preservice teachers regarding the knowledge of what constitutes accurate pedagogical practices.

The situation is valid for preservice mathematics teachers as well. An essential aim of mathematics teacher education is to educate prospective

mathematics teachers to plan and deliver instruction to develop students' conceptual understanding, procedural fluency, and mathematical reasoning. Supporting this reality, Lowery (2003) underlines the value of reflection on preservice mathematics teachers' development by saying that;

> "Through reflective practices, preservice teachers had a greater sense of self, autonomy, self-efficacy, confidence and competence in teaching mathematics and science, and had incorporated the value of reflection into their belief system" (p.26).

As a consequence, reflection has long been recognized as an important and valuable intellectual process for the development of preservice and inservice teachers (Boud, Keogh, & Walker, 1985; Dewey, 1933; Hullfish & Smith, 1961).

2.3.2 Reflective Practice of Preservice Teachers and Preservice Mathematics Teachers

In the related literature, major foci of the studies on reflection of preservice mathematics teachers are related to the content of the reflection and the improvement of reflective skills in the context of teacher education programs. Griffiths (2000) discusses how the concept of reflection is taken into account in courses of initial mathematics teacher education in various countries and also in several cultural contexts. In addition to this, questions about the worth and tenacity of reflection have also been raised, especially in the situation of its practical application to teacher education. Jay and Johnson (2002) explored the features of reflection and they provided a typology which comprises of three dimensions of reflective thought. These dimensions are descriptive, comparative, and critical, and they are designed to guide teacher educators in training preservice teachers.

The reflection and reflective practice process are significant in the training of preservice teachers (Cumyn, 2010). Cooperating school managers, teacher educators in the program, and mentors, and inservice experienced teachers who are have several important roles in stimulating the improvement of preservice teachers in reflective practice (Lowery, 2003). It is not necessarily requisite for practicum classrooms to be ideal constructivist models to encourage reflection, but they do need to provide appropriate environment for preservice teachers to envisage their teaching

and its development (Ebby, 2000). Nonetheless, developing a reflective teacher is a difficult job and it is likely to take account of several aspects of teacher education programs in which preservice teachers are taught how they should make transformation in the way of thinking about teachers' and students' roles (Ostorga, 2006).

Dewey (1933) defined the starting point of reflection as experiencing a difficulty, troublesome event, or a situation that cannot be immediately resolved. In teacher education, reflection occurs before, during, and after teaching (Griffiths, 2000), because preservice teachers encounter problems during their actual teaching processes. In addition to facing with the real problem situations on their own, the preservice teachers' experiences can be a valuable learning resource for other preservice teachers as well (Zeichner & Liston, 1996). Accordingly, studies related to the reflection of preservice teachers have focused so far on the collaborative reflection (Weiss & Weiss, 2001), context of reflection (Basile et. al., 2003), content of reflection (Liston & Zeichner, 1987; Valli, 1997; Zeichner, 1994; Zeichner & Liston, 1996), process of reflection (Richert, 1991), supporting and scaffolding the reflective practice including mentoring (Harford & MacRuairc, 2008; Kullman, 1998; Lee, 2005; Roehrig et al., 2008; Weiss & Weiss, 2001), and pedagogical content knowledge (McDuffie, 2004). In addition to these, some other research studied program features of reflection in the context of several programs (Ross, 1990; Sparks-Langer, 1992).

Lee (2005) investigated how the process of reflective thinking develops in preservice mathematics teachers and revision of the criteria for assessing reflective thinking. Lee performed the study with the participants who registered in a secondary mathematics education program in Korea. The data were collected by interviews, observations and written documents such as survey questionnaires and journal entries in order to assess reflections of preservice teachers from two perspectives, content and depth. Lee (2005) found that reflective thinking of preservice mathematics teachers depended on personal background, field experience contexts, and the mode of communication.

Cavanagh and Prescott (2010) studied beginning secondary mathematics teachers by using three-stage, hierarchical model of reflective practice of Lee (2005). The aim of the study was to investigate how beginning teachers' reflective practices were developed during one-year university teacher education program and concurrent professional observation experience or practicum. The data were collected through the interviews during the practicum and once more in their first year. Results of the study revealed that the participants showed improvement in their ability to reflect on their teaching during the practicum.

Supporting reflective practices of preservice teachers and the roles of mentors in this process was the concern of Roehrig and others' (2008) study. They conducted a grounded theory analysis in order to explore the potential for mentoring to support novice teachers' use of effective teaching practices. The study was conducted with six beginning primary teachers in the U.S. and with their mentors. The data were collected by means of survey, interviews, and observations. The results of data analysis revealed that some factors, other than type of mentoring program, were related to beginning teachers' success in improving classroom practices. It was found that more effective beginning teachers' mentors had more experience as mentors and were more effective teachers than other mentors. In addition to this, more effective beginning teachers communicated more with mentors, more accurately self-reported use of effective teaching practices, and were more open to mentoring.

Kullman (1998) in the same way underlined the roles of mentors in the development of reflective practices of student teachers by focusing on what emerged during a mentor training course in Hungary. This mentor training course involved prospective mentors and student English Language teachers. In the course, role plays proved to be the stimulus for exploring to what extent the common model of mentoring considered contextual factors sufficiently. The study revealed that reflective practice was not only helpful for student teacher mentees, but also applicable for scaffolding in supporting preservice teachers.

In addition to supporting preservice teachers' reflective practices, McDuffie (2004) linked the pedagogical content knowledge and the reflective practices of preservice teachers and developed a pattern between the level of pedagogical content

knowledge and the development of reflection skills of teachers. The case study was conducted with two elementary preservice teachers during their student teaching internship program. She found that the preservice teachers used their pedagogical content knowledge in preventing problematic events and in reflecting on the challenging issues in instruction. She further found that the limited amount of pedagogical content knowledge and lack of confidence had effect on the preservice teachers' reflection while in the act of teaching; therefore, they were more likely to reflect on their practices outside of the act of teaching.

Similar results were presented by Lowery (2003). The results of the study of Lowery (2003) revealed that preservice teachers' reflection can largely be sorted into four themes: (1) knowledge about self, autonomy, self-efficacy; (2) the importance of confidence and competence; (3) the importance of the value of content, coordinating lesson planning, and questioning; and (4) expanding knowledge about children, assessment, relevancy and group dynamics (Lowery, 2003).

The practice of mathematics teaching is related to teachers' reflection processes. Research indicates that (Thompson, 1984; Trigwell & Prosser, 1996) if there is a desire to change and progress teaching practice and enhance students' learning mathematics, in other words, to modify the teachers' practices while they are teaching; there is a need to alter the way of thinking of how children learn mathematics. In fact, this is a substantial learning process for teachers.

From this point of view, teacher education programs play an imperative role in supporting teacher candidates on reflecting on their teaching experiences and students' learning. The same situation is valid for preservice teachers as well. With the intention of providing quality instruction, preservice teachers should be trained to use several standpoints to reflect on teaching circumstances and students' learning. However, several research reported that preservice teachers have regularly disregarded the students' learning during teaching processes (Schussler et al., 2010; Tirosh, 1993). Preservice teachers, especially in their preliminary experiences, ordinarily have concerns about the delivery of the material. In their teaching experiences, they initially consider how to practice techniques, and then they focus

on students' learning and curriculum (Fuller, 1969). Schussler et al. (2010) propose the possible root of such contemplations as the emphasis on content and pedagogy in teacher education programs. Teachers may think that students will eventually learn because they practice in a certain way as a teacher.

2.4 Reflective Practice Studies in Turkey

When the studies performed in Turkey were analyzed, it was seen that the number of studies related to reflective practice was limited. The studies were generally conducted in order to present the development of preservice teachers by means of reflective practices. They showed that the research related to reflective process gave emphasis on development of preservice teachers' reflective thinking skills through reflective practice and reflective practice in the context of problem solving process. Besides, the studies related to reflective practice revealed the need for qualitative studies in order to deeply investigate the reflective practice process of the preservice teachers.

One of the studies, which was focused on relating problem solving and reflective practice and developing reflective thought, was conducted by Kızılkaya and Aşkar (2009). The aim of this study was to develop a reflective thinking skill scale towards problem solving. The reflective thinking skill scale has been applied to 339 seventh grade students and statistical analysis was performed. As a result of confirmatory analysis and the scale contained 14 questions embedded in three dimensions of reflective thinking which are questioning, reasoning and evaluation. These dimensions were generated based on the three main actions in reflective thinking process. On the word of Kızılkaya and Aşkar (2009), this scale could be helpful for teachers in assessing reflective thinking skills of their students and in designing instruction. Besides, researchers could use this scale to plan studies to develop reflective thinking skill.

In another study in Turkey, Baki, Güç and Özmen (2012) investigated the preservice mathematics teachers' reflective thinking skills in problem solving context. Ten elementary mathematics teacher candidates involved in problem solving process, upon which their reflective skills were analyzed. Researchers concluded that

reflection was crucial to improve the preservice teachers' reflective thinking skills towards problem solving process. They further suggested that preservice and inservice training should be planned to develop the reflective thinking abilities of the teachers.

In her study, Tok (2008) investigated the influence of reflective thinking activities on preservice teachers' approaches towards teaching profession, their performance and reflections. She studied with 63 first year student teachers who were taking Introduction to Teaching Profession course. The data were collected via attitudes scale towards teaching profession and two column reflective writings which included two columns, aiming to write learning results in one column and reflections on those learning on the other column. Reflective thinking activities aimed to develop reflective thinking skills in the experimental group. In control group, lecturing and questioning methods were used. The results of the study showed that, the reflective thinking activities had a positive impact on the performances of the student teachers in Introduction to Teaching Profession course. Moreover, the students in the experimental group developed a positive attitude towards teaching profession.

Köksal and Demirel (2008) investigated the contributions of reflective thinking process on preservice teachers' practice teaching period. They performed a case study with 12 fourth year preservice teachers. Though several data collection tools such as observations, interviews, self-evaluation forms, participant journals and lesson plans, development of reflective thought of preservice teachers were displayed. Köksal and Demirel (2008) concluded that reflective thinking process had considerable contribution to preservice teachers' processes related to teaching involving planning, delivery and evaluation.

In a recent study, Erdoğan and Şengül (2014) examined the preservice elementary mathematics teachers' reflective thinking levels in the context of a teacher education program. One hundred and eight preservice elementary mathematics teachers at the third year of their four-year mathematics teacher education program participated in the study. Data were collected in order to determine the preservice elementary mathematics teachers' reflective thinking levels,

by using the “Reflective Thinking Scale” developed by Kember and his colleagues (2000). Based on the several results they gained, Erdoğan and Şengül (2014) suggested that in order to deeply investigate the reflective thinking processes of preservice teachers, qualitative data gathered from tools such as observations and interviews would provide multidimensional point of view for the reflective thinking phenomenon.

2.5 Summary of the Literature Review

The literature review revealed that the theory and practice division is dominant in the literature related to the reflection and reflective practice, and reflective practice is a valuable and important component of teacher development. The heart of reflection is inquiry-based problem solving. The act of reflection is a examination for making meaning mindfully. From this point, it empowers preservice teachers to view their actions from the outside. Through reflection, preservice teachers develop an impartial understanding of themselves as learners. Hence, it is promoted to be included in preservice teachers’ education program as well as inservice teacher development programs.

When we examine the literature from the aspects of tools and methods in order to promote reflective practices, we see that reflective journal writing, use of videos, observations, peer observations, and reflective interviews are the most common preferred ways. In addition to this, from the aspect of underlying principles and theories, the literature relates constructivism, inquiry, experiential learning and problem solving with reflective practices of teachers.

Yet, the literature review on reflective practices of preservice teachers revealed some further research needs. From the literature review, it is seen that reflection is a hallmark for development of teachers and for providing quality in teaching. Therefore, importance should be given to improve teachers both in teacher education programs and professional development programs. Putting reflection to the center, Kılıç (2010) lists the principal element of learner-centered teacher education as;

> "Reflecting on learning experiences that enhances learning and analysis, understanding the events in the classroom, creating a classroom environment that induces critical thinking, organizing activities that aim at developing creative thinking, supervising their own professional development, and reorganizing their teaching-learning environment based on the new concepts" (p.80).

In a learner-centered teacher education program preservice teachers can develop important skills including reflective skills through reflective thinking. Therefore, further studies related to the content and process of the preservice teachers' reflective practices are needed. Besides, it is recommended in the literature that further studies should focus on how preservice teachers use reflection as a part of their developing teaching practices. For that reason, reflective studies in the literature are desired as the most favorable mode of inquiry (LeCompte, Millroy & Preissle, 1992; McDuffie, 2004; Stake, 1995) in order to understand the reflective practice processes of preservice teachers. Based on those issues underlined above, the principal aim of this study is to provide a representative and meaningful understanding about the preservice mathematics teacher's reflection over time, content of those reflections and developments in this reflective practice process.

CHAPTER III

METHOD

The aim of this chapter is providing information on the details of the research method used in this study. The chapter starts with general research layout and presentation of research questions. Upon that, it gives information about research site, participant, research framework, data collection and tools used, and data analysis procedures. Finally, it includes information about the role of the researcher, trustworthiness and limitations.

3.1 Research questions

This study was conducted with a preservice teacher registered to a two-year Teacher Certification Program (TCP) in Turkey in the Fall semester of 2014-2015 academic year. The main focus of the study was to investigate how and about what the preservice teacher, who was attending to the second year of the program, had reflections during observation and teaching periods of first Practice Teaching (PT) course on self-improvement regarding teaching and learning process. The research questions sought in the study are presented below:

How does one preservice mathematics teacher perform reflective practice on self-improvement regarding teaching and learning process in practice teaching?

Sub questions related to the research question are as follows:

1. How does she reflect on her previous experiences and self-improvement regarding teaching and learning process at the beginning of the practice?

1.a. What are the issues she reflects on?

1.b. What is the orientation of those reflections?

2. How does she reflect on her experiences regarding teaching and learning process before her teaching practices?

2.a. What are the issues she reflects on?

2.b. What is the orientation of those reflections?

3. How does she reflect on her experiences regarding teaching and learning process during her teaching practices?

3.a. What are the issues she reflects in?

3.b. What is the orientation of those reflections?

4. How does she reflect on her experiences regarding teaching and learning process after her teaching practices?

4.a. What are the issues she reflects on?

4.b. What is the orientation of those reflections?

5. How does she reflect on her experiences and self-improvement regarding teaching and learning process at the end of Practice Teaching period?

5.a. What are the issues she reflects on?

5.b. What is the orientation of those reflections?

6. How does she reflect on these issues to achieve self-improvement regarding teaching and learning process in practice teaching?

7. How does the preservice teacher's reflective practice change on self-improvement regarding teaching and learning process through the teaching practice?

3.2 Overall research design

The aim of this study was investigating the reflective practices of a preservice mathematics teacher on self-improvement regarding teaching and learning process, who has been attending to a non-typical TCP in Turkey. The study aimed to provide detailed and multi-way information about reflective thinking process of the preservice teacher regarding her teaching experience and it was designed as a case study.

According to Merriam (1998), the case study is defining and analyzing limited system or unit as a whole. Similarly Stake (1995) qualifies the case study as questioning process related to case and product of this questioning as well. Considering these approaches, the reflection process of one preservice mathematics teacher and detailed knowledge about the subjects in those reflections were analyzed in the light of framework related to distinction about the types of reflection proposed by Schon (1983) and further developed by Van Manen (1995). Schon (1983) distinguished between 'reflection-on-action' and `reflection-in-action'. While reflection–in-action can be described as the reflection done during the action, reflection-on-action is done after the action. In a similar vein, the simplest forms of reflection that regularly occur in teacher education take place before, during, and after teaching, and Van Manen (1995) defines them as anticipatory, contemporaneous, and retrospective types of reflection. In this study, reflective process of Miss Çalışkan (pseudonym) was investigated in terms of the processes before, during, and after teaching practice process.

For the analysis of the content and the process of the reflective practices that the preservice teacher made, the fundamentals and common perspectives of the models proposed by Gibbs (1998) and Smyth (1991) were used. In both of the models, the person thinks on the action, then understand what the action means by evaluating and analyzing, thinks on his or her situation and develops an action plan by synthesizing his or her thinking. From this aspect, the commonality of these two models and their cyclical process were used as a framework for investigating preservice teacher's reflective practices in her teaching processes by covering the content of the intensive teaching process. In this work, the reflective thinking

concept was the phenomenon investigated and it was limited to the works of the preservice mathematics teacher, who attended to an intensive non-typical TCP.

Since the aim of case study was developing a deep understanding regarding the case, Merriam (1998) states that the main focus in such studies should be the process, the connections and the exploration instead of a result or confirmation. In this study, the main focus was the investigation of the reflective thinking process of the preservice mathematics teacher who has been experiencing an intensive teaching experience period. The reflective thinking practices of the preservice mathematics teacher were handled especially in the context of Teaching Practice course. The bounded system was both the non-typical TCP and the cooperating school component of the Practice Teaching (PT) Course.

In this study, the teaching experiences and reflective process of a preservice teacher is the case. Since one preservice teacher's teaching experiences and reflective process were investigated, the study is a single-case study. The participant represented the typical student profile in the program.

As a TCP requirement, during the PT course, the preservice teachers generally have their teaching practices in one of four schools which are determined by their faculty. In this respect, one or two of preservice teachers have their teaching practice in the same school. As Merriam (1998) stated, in qualitative research, sample selection is usually nonrandom, purposeful and small. In this study, the researcher preferred to select the preservice mathematics teacher having her teaching experience in the private school where the researcher was working as a teacher, in terms of convenience for conducting the research.

3.3 Research Site

3.3.1. The Teaching Certification Program (TCP)

This research has been conducted with a preservice mathematics teacher who was registered and completed the first year of two-year Master of Arts with Teaching Certification Program (TCP) of Department of Educational Sciences at the Graduate School of Education (GSE) in one of the universities of Turkey. Due to its nature,

TCP has a different structure compared to other teacher training or Master of Arts Programs in Turkey.

TCP accepts students who are graduates of several departments of Faculties of Arts and Sciences at universities and offered the all of the courses in English. Language examination scores of candidates, cumulative graduate points and their intended approach to teaching are main acceptance criteria for the program. The teacher candidates are accepted by means of face to face interview upon evaluation of documents related to their language examination results and their academic records.

Especially School Experience (SE) and PT courses which require being in cooperating schools most of the time consist of several reflective components. In the SE course, which is offered in two semesters in the first year of the program, the preservice teachers stay every Thursday in the cooperating school and mainy observe mathematics lessons of different experienced teachers. While doing observations, for each week, they have different focus such as "classroom management" or "a day of a teacher" for observation. Through the last week of the school experience period, the preservice teachers are expected to have their first teaching experiences in classrooms.

The Practice Teaching (PT) course which is taken in the second year of the program includes lesson observations, teaching practices, departmental activities, and extracurricular school activities. The preservice teachers spend nearly whole working day at the cooperating school and have an opportunity to observe different lessons, as well as department studies, and other educational activities in the cooperating school.

In the scope of PT course, the preservice teachers are expected to perform at least 30 hours teaching. It is required that the preservice teachers provide a lesson plan for each lesson they will teach and share it with the teacher of the class, and the mentor beforehand. One part of the lesson plans requires that the preservice teacher reflects on the lesson she has taught. Apart from that, preservice teachers are responsible for preparing jornal entries, which include responses for some directive questions, regarding their teaching process. Besides, due to the PT requirements, the

preservice teachers keep observing lessons of experienced teachers like in SE course taken in the first year of the TCP. It is expected that they record reflective thinking notes for each lessons they observe and keep those records in the portfolios they formed according to requirements of PT. The teachers, who observe the lessons taught by preservice teachers keep an observation form (running commentary form) for each lesson and share it with the preservice teacher at the end of teaching process. Apart from that, mentor and the preservice teacher conduct weekly or biweekly meetings with a predefined agenda and keep minutes of meeting document.

3.3.2. The Cooperating School

The cooperating school which consists of four divisions, namely pre-school, primary, middle, and high school is a private school. The school is a part of a foundation which is a part of the University that GSE was involved. The schools are integrated into the campus of the University and they benefit from this cooperative affiliation.

The cooperating schools, for this study, middle school and high school, are structured through the national education system. High School has been implementing the abovementioned IB Diploma program. The Middle School and High School have mainly Turkish nationality students. All integrated divisions of the school are companion members of the Council for International Schools (CIS), with the High School also a member of the European Council for International Schools (ECIS).

At the time of the study there were 10 mathematics teachers in High School, teaching different grade levels from 9 to 12. There were 4 mathematics teachers in Middle School teaching from grade 5 to grade 8. Middle School and High School buildings were physically close together in a campus area and the preservice teachers might have lessons in both schools in a single day.

The students in practice school generally have high socio-economic status. Almost one third of students are the children of academic staff of the University that GSE and cooperating school involved as well. The students have had an education in the scope of Primary Years Program (PYP) which is a primary level of IB. Starting

from preschool; an English oriented teaching program is implemented in the cooperating school. In examinations conducted in national level by the end of 8th grade level, the students perform close or better than the aveage of the city in which the school is operating. In high school level, university examination success level is 100%. After high school, especially the students who are involved in IB program prefer education possibilities abroad.

3.4 The participant

The participant of this study, Miss Çalışkan is a second year female preservice teacher in the two-year TCP. Among eight preservice teachers who were attending several cooperative schools, the participant of the study took the PT Course in the cooperating school where I was working.

Miss Çalışkan had a B.Sc. degree of Mathematics from Faculty of Arts and Sciences of a Turkish university in 2012. She was accepted to TCP where this study was conducted in 2013. Miss Çalışkan worked as a teacher in a private school and then private test preparation center in her third year at the university. In both places, she taught or conducted recitation hours for middle school and high school students. Besides, she offered private mathematics lessons for students at several levels.

Miss Çalışkan wanted to be a teacher since the day she registered to Faculty of Arts and Sciences and studied for this goal. She was interested in technology and selected development of technology supported teaching materials and course plans as subject of her Master of Science thesis.

In 2013-2014 academic year, in the first year of the program, Miss Çalışkan had the SE course in the private school where this study was conducted. As a program requirement, during the SE course, the preservice teachers were expected to observe lessons of the teachers in the cooperating school and to write weekly reports on what they had observed. They were expected to share their observation notes and weekly reports with the mentors as well as their instructors in the program. In addition to this, through the end of the SE program, the preservice teachers were expected to teach at least one lesson in cooperating school in which mentor was required to perform a whole observation cycle. In this observation cycle, preservice

teacher and mentor would discuss the lesson plan, and then mentor would observe the lesson. After the lesson, they would meet to discuss the observed lesson and give feedback.

3.5 Data Collection Procedure

In this section, information about data collection tools used in this study and development process of those tools are presented.

3.5.1 Overview of the Data Collection Procedure

Merriam (1998), states that qualitative research design is a developing and flexible process and open to changing conditions. The data collection process of this study reflected the dynamic nature of qualitative research approach.

The data collection tools used in this study were interviews, observations, documents and weekly reflective thinking notes of Miss Çalışkan. Interview is one of the most frequently preferred data collection tools generally in qualitative research and especially in case studies (Merriam, 1998). Two general interviews were conducted as major sources of data collection, one at the beginning of the period as a first interview and one upon the completion of the process as the final interview.

Between those two interviews, several interviews were conducted before the lesson about Miss Çalışkan's lesson plan during her teaching practice period. Miss Çalışkan's lessons were observed and detailed notes were taken in these observations. Upon each lesson, interviews regarding the lesson were conducted. In this study, a total of 30 lessons' pre and post interviews were conducted with Miss Çalışkan.

Besides those, weekly meetings with Miss Çalışkan were conducted. All those interviews have been recorded by her preliminary consent and permission. Data collection procedure started after the necessary permissions were taken from the Applied Ethics Research Center at Middle East Technical University and the university that TCP was offered. The permission document gathered in this study was presented in Appendix A.

All plans prepared by Miss Çalışkan, notes and feedbacks on her observed lessons, reflective thinking notes upon lessons and weekly meeting notes were also collected as data for this study. These documents were used to provide background information about Miss Çalışkan. Apart from those, Miss Çalışkan taught two lessons through the end of the SE lesson at first year of the TCP and in the first interview session Miss Çalışkan's thoughts about those lessons were also asked.

Detailed information about the development phase of data collection tools, piloting process and data collection process is presented in the following subsections. Table 3.1 presents the data collection tools and processes used in this study for each of the aforementioned research questions.

Table 3.1 Data collection tools and processes according to research questions

Research Question	**Data collection process**	**Data collection tool**
1. How does she reflect on her previous experiences and self-improvement regarding teaching and learning process at the beginning of the practice? 1.a. What are the issues she reflects on? 1.b. What is the orientation of those reflections?	First Interview	The First Interview Protocol
2. How does she reflect on her experiences regarding teaching and learning process before her teaching practices? 2.a. What are the issues she reflects on? 2.b. What is the orientation of those reflections?	Lesson Plan Meetings (Pre-observation Meetings) Weekly Meetings	Before Lesson (Lesson Plan) Interview Protocol Weekly Interview Protocol Reflective Journal Entries Running Commentary forms
3. How does she reflect on her experiences regarding teaching and learning process during her teaching practices? 3.a. What are the issues she reflects in? 3.b. What is the orientation of those reflections?	Lesson Observations Reflective journal writing	Running Commentary forms Reflective Journal Entries
4. How does she reflect on her experiences regarding teaching and learning process after her teaching practices? 4.a. What are the issues she reflects on? 4.b. What is the orientation of those reflections?	Post-observation meetings Weekly Meetings	After Lesson Interview Protocol Weekly Interview Protocol Reflective Journal Entries Running Commentary forms
5. How does she reflect on her experiences and self-improvement regarding teaching and learning process at the end of Practice Teaching period? 5.a. What are the issues she reflects on? 5.b. What is the orientation of those reflections?	Final Interview	The Final Interview Protocol
6. How does she reflect on these issues to achieve self-improvement regarding teaching and learning process in practice teaching?	Post-observation meetings Weekly Meetings	After Lesson Interview Protocol Weekly Interview Protocol Reflective Journal Entries Running Commentary forms
7. How does the preservice teacher's reflective practice change on self-improvement regarding teaching and learning process through the teaching practice	Weekly Meetings	Reflective Journal Entries Running Commentary forms

3.5.2 Data collection tools

In this study, several interviews (one first interview, one final interview, before lesson interviews, after lesson interviews and weekly interviews) were conducted in order to gather the major data of the study. In addition to this, observations were done and several documents were used as data collection tool.

The list of data collection tools used in this study are given in Table 3.2.

Table 3.2 The list of data collection tools

Interviews	Observations	Documents
• First interview • Before lesson interviews (pre-observation interviews) • After lesson Interviews (post-observation interviews) • Final interview	• Observations of lessons taught	• Lesson plans with reflection component • Running Commentary Forms • Feedback forms • Reflective Journal Entries • Weekly meeting forms • Documents in portfolio

Some of the tools and strategies used for data collection were the documents for which preservice teachers were responsible to prepare due to the program requirements. These are lesson plans, feedback forms, running commentary forms, reflective journal entries; weekly meeting forms and documents in portfolio. Some of the tools were prepared by the researcher. The first interview and the final interview were the tools that the researcher prepared and implemented. Preservice teachers were expected to share lesson plans before and gather feedback after the teaching process. In this study, the questions for before lesson interviews and after lesson interviews were prepared by the researcher in order to perform these interviews in a

more structured way. By means of those questions, reflective practice of a preservice mathematics teacher was enhanced by the mentor.

3.5.2.1 The First Interview Protocol

I initially prepared 22 questions in the light of literature and my own teaching and mentoring experience. The questions for the first interview addressed participant's experiences, ideas, emotions, and knowledge and background information. The aim was to gather general information about Miss Çalışkan in the context of her teaching, her planning approach, strategies, materials and sources she used, her opinions about teaching, her reflective actions, and actions related to the professional development. Upon preparation of the questions, I grouped them under suitable titles as General Knowledge, Teaching and Professional Development. Interview questions were reviewed by my supervisor in terms of their content and compatibility to Turkish language and syntax. Upon that, the questions were also reviewed by a mathematics teacher who was also a PhD student in the field of education at a different university. Based on those feedbacks, expressions in three questions were slightly changed and the first interview protocol was finalized. Sample questions from first interview were given under related subtitles in Table 3.3.

Table 3.3 Sample questions from the First Interview

General information
1. Did you have any teaching experience before TCP?
2. Which of the courses you have taken made contributions to you the most? Why?
First Observation Experience
3. What are your impressions related to first observations within SE course?
First Teaching Experience
4. How did you prepare for your first teaching experience?
5. Were there any unanticipated problems in your first teaching experience? What were those if you encountered? How did you fix those problems?
General Evaluation
6. Considering the courses you've taken and teaching processes you've done, what are your strengths as a teacher?

Piloting process, by using final version of the first interview protocol, was performed with a preservice teacher who had similar characteristics to Miss Çalışkan. A recent graduate of the TCP program who was working at the cooperating school was recruited for the pilot study. She was informed about the nature of the research and was given a consent form which included information regarding participation based on willingness, and information regarding confidentiality of results of piloting process. During piloting process, clarification was needed in two questions and an explanation was provided for these questions. Upon the piloting process, the first interview protocol questions were revised accordingly and finalized. The final version of the first interview protocol included 23 questions. The first interview protocol is given in Appendix B.

3.5.2.2 The Final Interview Protocol

I prepared the final interview protocol questions in a similar way. Debriefing and peer checking, which were conducted for the first interview protocol, were also conducted for the final interview protocol in same order. The 23 questions for final interview were prepared in order to gain information about Miss Çalışkan's approach

to teaching profession and professional development, and they were grouped as Teaching and Professional Development.

Teaching section included questions about the Miss Çalışkan's ideas about effective teaching and requirements of effective mathematics teaching, how she described her own teaching approach, how she got prepared, the goals she had for her lessons, the materials she used, her development, the improvements she needed, the troubles she had, the evaluation strategies and tools she used, and in which ways the students learned the best. Professional Development section included questions about how she tracked the developments in mathematics teaching, contributions of following those developments to her improvement, the works she did to evaluate the effectiveness of her teaching, how she felt while teaching mathematics, the support she needed while improving her teaching, and whether she had reflective thinking or not.

The revision process for the questions resulted in modification in two questions. Pilot study was done after the whole lesson observation cycle process with the preservice mathematics teacher who recently graduated from the TCP. The preservice teacher was the person who performed the previous piloting process in this study. There were not any problems with the questions during the piloting process. Sample questions from final interview were given under related subtitles in Table 3.4. The final interview protocol is available in Appendix C.

Table 3.4 Sample questions from the Final Interview

Teaching
1. Do you have problems in lessons you teach? What kind of problems do you have?
Professional Development
2. Which type of criteria do you use to evaluate the effectiveness of your teaching?

3.5.2.3 Before Lesson (Lesson Plan), After Lesson Interview Protocols

I prepared the questions of other interviews conducted by Miss Çalışkan throughout the process and had them evaluated externally in similar ways. There

were suggestions which required minor modifications in few questions. The before and after lesson plans were piloted with the pilot study participant on a lesson plan that she prepared and implemented.

In pre-observation interviews, I asked 8 main questions based on Miss Çalışkan's lesson plan. Those questions included subjects such as general aims of the lesson, the importance of the concept in mathematics program, its relation to pre and post learning and to different subjects, the materials to be used, anticipated problems and possible solutions, students with special cases, how to provide learning, organization of the learning, questions to be asked, control of whether goals were reached or not, and the alternative plan.

In the lesson plan format, the first section consisted of subject of the lesson, date, lesson hour, number of students, resources and mathematics aims and objectives regarding the subject prepared by Ministry of National Education (MoNE) and National Council of Teachers of Mathematics (NCTM). In other words, Miss Çalışkan had to highlight not only national context benefits but also NCTM benefits in lesson plans. In the second section of the lesson plan, a main body including parts of 5E Teaching Model existed. It was expected that the preservice mathematics teachers in TCP should plan for Engagement, Exploration, Explanation, Elaboration and Evaluation sections as each separate section of 5E Model. The last section of the lesson plan was Reflection section supporting the reflective thinking of the preservice mathematics teachers. It was expected that the preservice mathematics teachers attending the program should complete this section upon lesson delivery. Sample questions from final interview were given under related subtitles in Table 3.5. The pre-observation meeting protocol is available in Appendix D.

Table 3.5 Sample questions from the Lesson Plan Interview

1. What are the main aims of this lesson?
2. Is there any situation that should be considered while planning? Do you have alternative plan for unexpected situations?

Post-interviews were conducted with 8 main questions which aimed to gather information about Miss Çalışkan's evaluation of how much of the general goals were reached, participation level of students and its indicators, learning process of students, strong points in the lesson, the parts she would change in repetition of the lesson, predicted or unpredicted problems, benefits of the process and intentions regarding the period after the process. Sample questions from after lesson interview were given under related subtitles in Table 3.6. The post-interview protocol is available in Appendix E.

Table 3.6 Sample questions from the After Lesson Interview

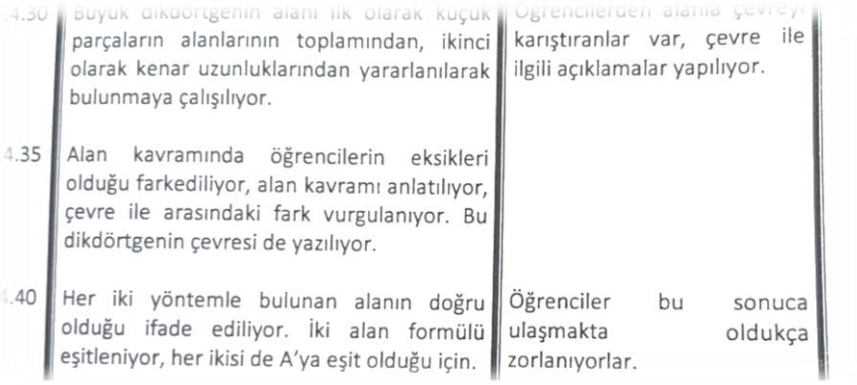
1. To what extent did you achieve your main aims and subsidiary aims?
2. Did your students participate in lesson as you desired? What were the indicators of this?

3.5.2.4 Documents

The written data in the present study were collected by the lesson plan format which Miss Çalışkan used while planning the lessons, the reflection paper format which she used to get reflective thinking notes upon lessons and meeting protocol which was used in weekly meetings. These documents were the standard forms all preservice mathematics teachers should use as a requirement of the TCP they were enrolled. Therefore, the documents Miss Çalışkan was already responsible for preparing were used as data. Apart from that, the reports written by Miss Çalışkan in the first year of the program, lesson plans and other documents were used as supporting documents to have more information about her. Therefore, Miss Çalışkan prepared documents which she was already responsible to prepare for the TCP program, for this study. She did not have additional responsibilities for this study.

As Merriam (1998) asserts, it is important that observations were recorded in terms of detailed descriptive field notes which also includes researchers' comments. I filled out a running commentary form during the observation process. The aim of keeping field notes was to provide evidence for Miss Çalışkan's strengths and areas for further development in her teaching. I kept a running commentary form with a

detailed comment part. This form consisted of two colums; in one column actions of the Miss Çalışkan was noted by minutes, in other column the points regarding to those actions which can be handled in weekly meeting was noted. I used these commentaries during the post observation interview process and during weekly meeting sessions. The observation protocol and the running commentary form are presented in Appendix F. A sample running commentary form entry is given in Figure 3.1. Here, the lack of preliminary information and its effect on learning of students were discussed during the weekly meeting, and the preservice teacher reflected on this issue according to her own practices.



4.30	Büyük dikdörtgenin alanı ilk olarak küçük parçaların alanlarının toplamından, ikinci olarak kenar uzunluklarından yararlanılarak bulunmaya çalışılıyor.	Öğrencilerden alanla çevreyi karıştıranlar var, çevre ile ilgili açıklamalar yapılıyor.
4.35	Alan kavramında öğrencilerin eksikleri olduğu farkediliyor, alan kavramı anlatılıyor, çevre ile arasındaki fark vurgulanıyor. Bu dikdörtgenin çevresi de yazılıyor.	
4.40	Her iki yöntemle bulunan alanın doğru olduğu ifade ediliyor. İki alan formülü eşitleniyor, her ikisi de A'ya eşit olduğu için.	Öğrenciler bu sonuca ulaşmakta oldukça zorlanıyorlar.

Figure 3.1 Sample running commentary form entry

3.5.3 Data collection process

Miss Çalışkan was presented with the consent form for the study in the beginning of the data collection process. The consent form indicated that the interviews would not be conducted if she was not volunteering, she did not have to respond if there was any question she would not want to answer, and the raw data and her identity would be kept as confident. Her permission for audio-recording was asked before each interview. Table 3.7 summarizing the whole data collection period is given below.

Table 3.7 Data collection procedure overview

Time	**Data collection process**	**Tool**
June 2013	First Interview	Interview protocol
Week 1	Lesson plan(s) meeting(s)	Lesson plan form
	Lesson observation(s)	Running commentary form
	Weekly reflection meeting	Journal entry and meeting form(s)
Week 2	Lesson plan(s) meeting(s)	Lesson plan form
	Lesson observation(s)	Running commentary form
	Weekly reflection meeting	Journal entry and meeting form(s)
Week 3	Lesson plan(s) meeting(s)	Lesson plan form
	Lesson observation(s)	Running commentary form
	Weekly reflection meeting	Journal entry and meeting form(s)
Week 4	Lesson plan(s) meeting(s)	Lesson plan form
	Lesson observation(s)	Running commentary form
	Weekly reflection meeting	Journal entry and meeting form(s)
Week 5	Lesson plan(s) meeting(s)	Lesson plan form
	Lesson observation(s)	Running commentary form
	Weekly reflection meeting	Journal entry and meeting form(s)
Week 6	Lesson plan(s) meeting(s)	Lesson plan form
	Lesson observation(s)	Running commentary form
	Weekly reflection meeting	Journal entry and meeting form(s)
Week 7	Final Interview	Interview protocol

3.5.3.1 First Interview

Miss Çalışkan was interviewed at the beginning of the data collection process. The interview was conducted at the GSE where Miss Çalışkan was studying and took approximately 90 minutes. She was informed about the general outline and aim of the research and that there were 23 questions.

3.5.3.2 Lesson Plan Meetings (Pre-observation Meetings)

Miss Çalışkan was also interviewed through the lesson plans. She was responsible for preparing a lesson plan in a predefined format before each lesson that she would teach as a requirement of the program. Pre-observation interviews were conducted based on the lesson plans in the collaborating school where I worked and Miss Çalışkan was a student teacher. The detailed information about timelines of lesson plan interviews and their content were presented in Table 3.8.

Table 3.8 Dates and content of the pre-observation meetings

Date	**Meeting Agenda**
November 5, 2013	Pre-observation meeting of 5A Lesson
November 7, 2013	Pre-observation meeting of 11C lesson
November 11, 2013	Pre-observation meeting of 10B lesson
	Pre-observation meeting of 5A Lesson
November 13, 2013	Pre-observation meeting of 11C lesson
	Pre-observation meeting of 12A lesson
November 14, 2013	Pre-observation meeting of 5A lesson
	Pre-observation meeting of 12A lesson
November 15, 2013	Pre-observation meeting of 12A lesson
November 19, 2013	Pre--observation meeting of 7C lesson
	Pre--observation meeting of 11C lesson
November 20, 2013	Pre--observation meeting of 5A lesson
November 21, 2013	Pre--observation meeting of 10B lesson
November 22, 2013	Pre-observation meeting of 7C lesson
November 25, 2013	Pre-observation meeting of 7C lesson
November 26, 2013	Pre-observation meeting of 9D lesson
	Pre-observation meeting of 5A lesson

3.5.3.3 Lesson Observations

The lessons Miss Çalışkan taught were observed for six weeks during the data collection period. My role during the observation process was being a complete

observer. Miss Çalışkan's lessons were observed in order to understand the general structure of her lessons and provided some particular information about Miss Çalışkan's teaching and reflection. In each case, the lessons were expected to give information about the issues discussed in the interview at the beginning of the process. The list of observed lesson is in Table 3.9.

Table 3.9 Lesson observations' dates, classes and content

Date	**Class**	**Lesson**
November 4, 2013	7C	Patterns and Relationships
November 7, 2013	5A	Problem solving by using natural numbers and operations
November 8, 2013	11C	Trapezoid
November 11, 2013	7C	Multiplying Algebraic Equations
November 12, 2013	10B	Factoring
November 12, 2013	5A	Time Measurement
November 13, 2013	11C	Trapezoid
November 13, 2013	12A	Quadratic Equations
November 14, 2013	5A	Problem solving strategies
November 15, 2013	12A	Graphs of Logarithmic Functions
November 18, 2013	12A	Logarithmic Functions
November 19, 2013	7C	First Order Equations with one unknown
November 20, 2013	11C	Trapezoid
November 21, 2013	5A	Bar Graphs
November 22, 2013	10B	Parametric and Cartesian Equations
November 25, 2013	7C	Problem Solving by using Equations
November 26, 2013	7C	Problem Solving by using Equations
November 27, 2013	9D	Absolute Value
November 27, 2013	5A	Tree Diagrams

The lessons in Table 3.9 were written as a single lesson, whereas some of the lessons were two hours and some of them lasted one lesson hour. A total of 32

lessons were observed during the data collection process. In other words, I observed every lesson which Miss Çalışkan taught.

3.5.3.4 Post-observation meetings

Post- interviews with Miss Çalışkan about the lessons were conducted upon each lesson she taught. I used my notes from my observations of her class and the questions I prepared for these interviews. All interviews were audio-recorded.

During the interviews, I also used the notes Miss Çalışkan took the in the reflection section of the lesson plan besides my notes and the interview questions. The notes in this section were rather daily reflective thinking journal for her. Yinger and Clark (1981) states the benefits of journal writing as "Writing, particularly journal writing, with its focus on personal thoughts, feelings, and reflections, puts writers into a position to learn at least four important things about themselves, (1) what they know, (2) what they feel, (3) what they do (and how they do it) and (4) why they do it" (p.10). In this respect, those notes were used as data supporting the data from Miss Çalışkan's lesson in particular and what she thought about teaching process in general.

The detailed information about timelines of the post-interviews and their content were presented in Table 3.10. There were times that one of the lesson plan interview and post interview related to the previous lesson were conducted successively.

Table 3.10 Dates and content of the post-interviews

Date	Meeting Agenda
November 5, 2013	Post-observation meeting of 7C lesson
November 7, 2013	Post-observation meeting of 5A lesson
November 11, 2013	Post-observation meeting of 7C lesson
	Post-observation meeting of 11C lesson
November 13, 2013	Post-observation meeting of 10B lesson
	Post-observation meeting of 5A lesson
November 14, 2013	Post-observation meeting of 11C lesson
	Post-observation meeting of 12A lesson
November 15, 2013	Post--observation meeting of 12A lesson
	Post-observation meeting of 5A lesson
	Pre-observation meeting of 12A lesson
November 19, 2013	Post--observation meeting of 12A lesson
November 20, 2013	Post--observation meeting of 7C lesson
	Post--observation meeting of 11C lesson
November 21, 2013	Post-observation meeting of 5A lesson
November 22, 2013	Post-observation meeting of 10B lesson
November 25, 2013	Post--observation meeting of 7C lesson
November 26, 2013	Post--observation meeting of 7C lesson
November 29, 2013	Post-observation meeting of 9D lesson
	Post-observation meeting of 5A lesson

3.5.3.5 Weekly Meetings

In weekly meetings, Miss Çalışkan's general feelings and thoughts about the lessons she taught during the week, issues related to level of achievement in general, and related to the aims of the lessons, participation of the students, satisfaction related to the lesson, points to consider for the next week, and evaluation of the lessons in terms of anticipated problems were explored. In addition to this, she was expected to reflect on the issues that she acquired through the week and the issues that she wanted to achieve next week. The weekly meetings were generally

completed in thirty minutes. Some of the weekly meetings were done subsequent to post observation meetings. Table 3.11 shows the dates of weekly meetings.

Table 3.11 Weekly meeting schedule

Date	Meeting
November 8, 2013	Weekly meeting 1
November 14, 2013	Weekly meeting 2
November 21, 2013	Weekly meeting 3
November 29, 2013	Weekly meeting 4
December 3, 2013	Weekly meeting 5
December 12, 2013	Weekly meeting 6

Miss Çalışkan wrote reflective journal entries after teaching her lessons. The journal entries were expected to reflect her learning about both teaching process in the observed lessons during the whole week and about the discussions and recommendations for further self-development. In addition to achieve these, some parts and directive questions were written in the journal entry format. Discussions on the entries in reflective journal were held at weekly meetings. I took a copy of the reflective journal entry pages from Miss Çalışkan at least one day before the meeting. In addition to this, some discussion items in action part of the reflective journal pages were generated as a result of discussion during those meetings.

3.5.3.6 Documents

Apart from the data collection tools mentioned above, a few other documents were used for data as well. One of those documents was the Miss Çalışkan's portfolio that she prepared in the first year of the TCP. Hartmann (2003) suggested that the professional portfolio has the potential for prospective mathematics teachers' professional development to initiate a continuum of professional improvement towards high-quality mathematics teaching. Miss Çalışkan's portfolio included the reports she wrote upon observations in SE courses in both semesters of the first year of the program, the first lesson plan and the teaching experience she had in the last week of that SE course, notes she took upon the process, the feedbacks she got, the

personal statement in which she stated her approach to teaching, and reports prepared in PT courses by her mentors. For this research, those documents in portfolio were used during the data collection period in order to understand how she viewed teaching as a profession and to know her current capabilities.

As a second document, the written feedbacks given by the teachers who observed Miss Çalışkan's lessons during PT course were used in data collection period. Apart from my observations, some of Miss Çalışkan's lessons were observed by other teachers in the collaborating school. During those observations, the teachers who observed the lessons used observation form as a requirement of the program. There were several items to evaluate Miss Çalışkan's teaching process and environment in the observation forms such as classroom management, teaching, communication with students, constructing a positive learning environment, time management and use of the board. The items in lesson observation criteria were prepared in the context of PT course. Those forms, which were shared with Miss Çalışkan after the lessons, were used as supplementary data for her reflection in data collection period.

As a requirement of the program, Miss Çalışkan kept a portfolio during the PT course also in her second year. Another document in Miss Çalışkan's second year portfolio was the observation notes taken not for the lessons she conducted, but for the ones she monitored during the PT course. Those observation notes had few directing questions which supported the preservice teacher in analyzing the observed lesson, inferring results about lessons and teaching, and thinking about how to reflect those to her own teaching. In this respect, these notes were used in data collection period to potentially support reflective thinking process of Miss Çalışkan.

3.5.3.7 Final Interview

At the end of the study, a final interview with Miss Çalışkan was conducted in order to support her in reflecting and in evaluating teaching process until that time including PT course and other courses as well. This interview, in which a total 22 questions were asked about teaching and professional development, conducted after two weeks of PT course completion. The interview was conducted in premises of the

institute of she attended and took approximately 95 minutes. The data collection process was completed by this final interview.

3.6 Data Analysis

According to Merriam (1998), "data analysis is the process of making sense of the data" (p.175). In order to make sense of the data collected in this study, several steps were followed during the data analysis process. The data analysis in qualitative research consists of three main steps. First, data are prepared and organized for the analysis. Then, the data are reduced into themes by means of coding process and finally they are represented in figures, tables or in terms of discussion (Creswell, 2007).

In this study, first of all, the written data from different sources such as weekly meeting notes, observation forms, lesson plans, and reflective form entries, and collected documents from Miss Çalışkan's previous school experience portfolio were organized in a file. I transcribed the first interviews, final interviews and pre and post interviews conducted before and after the lessons verbatim in order to make them ready for the data collection.

Miles and Huberman (1994) define the analysis of the data as the process in which researchers initially launch the preliminary themes or categories and then explore the data for evidence consistent with or disconfirms these themes. Categories used in this study were the main areas that preservice mathematics teacher were expected to be developed by means of PT process in TCP. These main areas were knowledge of subject area, planning, teaching process, classroom management and communication. As being a mentor in collaborating school component of PT and being an experienced teacher as well, I was familiar with these areas related to mathematics teaching profession. Thus, I started to code the data in the light of those categories. In the coding process of this study, the unit of coding was chunks. By following the steps suggested by Miles and Huberman (1994), in order to achieve open coding process, I read the data carefully, identified the statements relating to the categories, and assigned a code. Then, I noted those codes in such a way that each

statement was organized under its appropriate code. Sample descriptive coding was given in Figure 3.2.

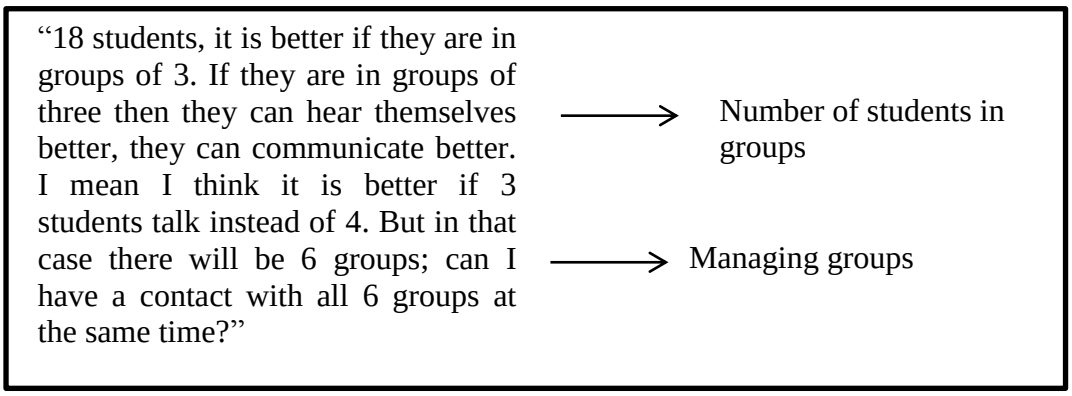


Figure 3.2 Sample descriptive coding

After analyzing the first set of data through the described coding process, categories or first order themes and second order themes (Miles & Huberman, 1994) were generated. Consequently diagrams and tables for data analysis, showing flow from general to specific, were formed. Sample category and subcategory list is given in Figure 3.3.

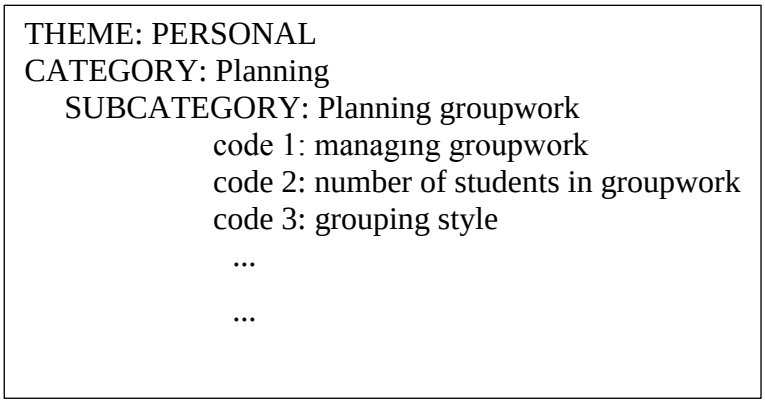


Figure 3.3 Sample categorization of codes

Although I used predefined categories to analyze the data, I was open to new codes while coding the data. For instance, one of those codes was related to "preliminary analysis" referring to the studies that Miss Çalışkan performed before starting to plan her lessons. Although the number of such categories was not high, they were added to coding list and remaining data were coded accordingly.

Coding tables were controlled by a peer who was a teacher at my school and a doctoral student in an Educational Sciences Department of a university in Ankara. In this peer checking process, the general interview and one set of weekly meeting transcripts and running commentary form kept during the observation and one of the journal entries were coded by the peer without giving him any code list. My aim was to see if he reached similar codes. He coded the data and made a list of codes. Then, I encouraged him to categorize these codes to upper themes. We compared our codes and themes and reached on a consensus on the names and descriptions of the codes and themes. Then, we wrote brief descriptions of these codes and themes in order to guide the rest of the coding process. Finally, we coded all data independently and compared our coding. Comparison was completed with almost complete agreement on the existing codes and themes. We discussed the emerging codes and themes after the coding and reached an agreement on the names and descriptions. In summary, the coding process was completed in full consensus after all the undecided and/or different coding was discussed.

As a result of the data analysis on codes and sub codes, some themes and sub themes for reflective thinking of Miss Çalışkan were determined. In this study, while coding the data, Miss Çalışkan's expressions related to reflection were identified as expressions related to the delivery of the lesson, actions of her in the classroom, her observations about students' learning, her planning and assessment processes, decisions for planning and for improvement for further teaching practices and reasons behind those decisions, considerations related to planning, teaching and assessment processes, general ideas related to teaching profession, inquiries related to her teaching processes, and her ideas related to her progress in teaching profession.

Reflective process of the Miss Çalışkan was investigated under the themes of "beginning of the practice", "practice through the semester" and "after the teaching". PT course and reflection process at the beginning of the practice period of this course were analyzed through TCP and its requirements perspective and from teaching process perspective. In the second section, the reflection process of the preservice mathematics teacher through the PT was investigated. In this section, reflections of

the preservice teacher before teaching practices, during teaching practices and after teaching practices were investigated. In the succeeding section, namely, at the end of PT part, the content and the process of reflection was investigated afterwards.

3.7 Trustworthiness

Trustworthiness is defined by Lincoln and Guba (1985), as an answer to question "how an inquirer persuade his or her audiences (including self) that the findings of an inquiry are worth paying attention to, worth taking account of? What arguments can be mounted, what criteria invoked, what questions asked, that would be persuasive on this issue" (p.290). In qualitative research, member checking, triangulation, thick description, peer reviews, and external audits are suggested (Creswell & Miller, 2000) in order to ensure the validity of the study. In this study, to establish this, techniques of triangulation of sources, triangulation of methods, and prolonged engagement in the field, peer reviewing and member checking were used.

3.7.1 Triangulation

"Triangulation is a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study" (Creswell & Miller, 2000, p.126). Patton (2002) discusses four types of triangulation in doing evaluations: "The triangulation of data sources (data triangulation), among different evaluators (investigator triangulation), of perspectives to the same data set (theory triangulation) and of methods (methodological triangulation)" (p.116).

In the present study, data triangulation and methodological triangulation were employed. Several data sources, including interviews, observations, feedbacks given to the preservice teacher to her own reflection notes, and other documents kept in her portfolio, were obtained by various methods during the research. I tried to investigate the reflection process of the preservice teacher in an eclectic model framework, upon synthesizing the different models and frames which have many samples in the literature. Using different data collection methods also served to ensure the dependability.

3.7.2 Prolonged Engagement

LeCompte and Goetz (1982) support the idea of spending long time in the area in which the research is performed and getting familiar as a way of correctly understanding the research area. Creswell and Miller (2000) also address the importance of prolonged engagement in ensuring the validity. I had nearly 12 years of teaching experience and actively participated in teaching period in the cooperating school where the preservice teacher has PT at the time of the study. In this respect, I was familiar to the contents of the first and second years of the program in which Miss Çalışkan registered to, acceptance criteria of the program, expectations of the program and students' profile. Apart from that, I was aware of the content, order and intensiveness of the activities performed by preservice mathematics teachers during the PT course period. However, through the research period, as a researcher, I tried to make sense of the issues more accurately without being a disciplined subjectivity (Erickson, 1985) and without mixing two roles of being researcher and being mentor (LeCompte & Goetz, 1982).

3.7.3 Peer review

Suitability of data collection tools to the aims of the study, scope of the study and process was reviewed by another researcher (peer) who was familiar with the nature of the qualitative case study research. The peer was a teacher and doctoral student in an Educational Sciences Department of a university in Ankara. Apart from assignment related to data collection tools, the peer had the opportunity to review the tasks during the data coding.

3.7.4 Member Check

As Merriam (1998) mentioned, member checks provide feedback on preliminary interview findings. In this study, in addition to peer reviewing, member check process was also conducted. Miss Çalışkan made checks on the spot (Lincoln & Guba, 1985) in and at the end of the interviews as well. In addition to this, when I completed the preliminary analyses, I sent the raw data to Miss Çalışkan via e-mail and wanted her to check and inform me if there was any misinterpretation. Miss Çalışkan responded that she had no correction related to the data.

3.7.5 Thick Description

Thick description is the detailed description of the setting that the study is conducted and of the findings (Merriam, 1998). On the word of Creswell and Miller (2000), the aim of a thick description is that "it creates verisimilitude, statements that produce for the readers the feeling that they have experienced, or could experience, the events being described in a study" (p.128). In order to establish both the transferability and dependability, thick description of the data collection process, data analysis process and other processes were provided in this chapter of the study. Thick description included extensive description of the context being studied. Then, the processes related to data collection such as preparation of data collection instruments, piloting, making revisions and getting the final versions of the documents, the sampling process, and details about the interview, observation, and journal entry sharing processes were described in detail. In addition to these, data analysis processes such as using a coding schema and preparation and revision of that schema were presented.

3.7.6 Confidentiality

In this study, in order to ensure the confidentiality, the following steps were applied. During piloting process of data collection tools and in actual data collection period, a consent form including information about the nature of the research, confidentiality of participation, willingness in participation and warranty of leave when participant does not want to continue, were prepared and shared by the participant at the beginning. Apart from that, it was emphasized that raw data would not be shared by any third party. Besides consent form presented to Miss Çalışkan, a document summarizing the aim and data collection process of the research and one sample of data collection tools were presented to Ethics Commission of the University in which the Miss Çalışkan was registered, and permission was granted. In addition to this, before conducting this study, permission was granted from the University that I was enrolled as a doctoral student.

3.7.7 Researchers' Role

Merriam (1998) defends that the most fundamental data collection tool in case studies is the researcher himself/herself. In this respect, it is useful to highlight different roles of the researcher and emphasize relations among those roles and effect of it on research period. In fact, to establish conformability, researcher bias was clarified.

In qualitative research and specifically in case studies, it is natural and expected that the researcher spends sufficient time in the area the research is being conducted and understands the nature of research environment (Merriam, 1998; Stake, 1995). I had mentoring task for 7 years in the program which Miss Çalışkan attended at the time of the data collection. I was familiar with the coverage, content, students' characteristics and requirements of the program. Besides, my mentoring task was actively continuing during the research period.

Merriam (1998) asserts that it is important to address and monitor possible biases to indicate how they may influence data collection and interpretation of findings. I determined what kind of effect my mentoring experience could have on the process in general and took reflective notes accordingly during the process. Additionally, since I became a good observer through my mentorship experience, I focused to analyze those observations in detail. Besides, the data related to reflective thinking process of Miss Çalışkan were also coded and analyzed by the peer.

I informed Miss Çalışkan that her participation to the process was not related to the program she registered and grading of the courses of that program. In addition to this, I, as a mentor familiar with the content of the program in which Miss Çalışkan registered, performed a smooth data collection period without making the process difficult for her. The tasks, which Miss Çalışkan was responsible to complete as a requirement of the program, were used in data collection period. Besides, processes potential to bring additional loads, such as post observation meetings were planned to take place in the days that Miss Çalışkan had less duties compared to other days.

3.8 Limitations

As researcher working at the private school where the present study was conducted, I involved in the process by having a dual role as mentioned before. I was a part of the study as a mentor as well as being a researcher. Being a mentor required different responsibilities and as a part of this role, I worked with preservice teachers, discussed their lesson plans, observed their lessons, and performed weekly meetings with them.

I applied some procedures related to the research process such as collecting data, coding, analyzing and interpreting data. In these processes, researcher bias potentially might have evolved. I interpreted the data based on multiple instruments and I tried not to conduct the data analysis in a way that the findings were revealed in a desired way. In order to minimize these potential limitations, the processes related to triangulation and peer review were used as discussed before.

Yet, this study can be seen where the progress of preservice teachers' reflective practices is traced, mentors can also have the opportunity to reflect and develop themselves in this issue. In this respect, the study gave information about the both sides of reflection process in the same context, one of which was the reflection processes of preservice teachers and another was that of mentor. Therefore, this would prove useful in increasing the trustworthiness of the study.

CHAPTER IV

FINDINGS

The aim of this study was investigating the reflective thinking process of a preservice mathematics teacher who has been attending to a non-typical TCP in Turkey on self-improvement regarding teaching and learning process. This chapter is devoted to present the findings of this investigation. The findings are organized in three parts namely, findings at the beginning of the practice, practice through the semester and at the end of the semester. Practice through the semester is also divided into three parts namely, before teaching practice, during teaching practice and end of teaching practice. Findings in these three parts are presented in two perspectives, content of the reflections and orientation of reflections.

4.1 Reflections at the Beginning of the Practice Teaching

4.1.1 Content of the Reflections at the Beginning of the Practice Teaching

4.1.1.1 Teacher Certification Program and Its Requirements

According to the results obtained from the first year school experience lesson reports and interviews with her, one of the areas in which Miss Çalışkan reflected on was the *theoretical knowledge* obtained from several lessons. The knowledge obtained in lessons such as Classroom Management, Special Teaching Methods, Testing and Evaluation included both content knowledge and pedagogical content knowledge. In the interview conducted at the beginning of the process, Miss Çalışkan highlighted those points as well.

> I learnt how to prepare a rich content lesson plan for use in future. How we can have authority and how we can make evaluations, those were the topics went through during the lessons.

Another issue that Miss Çalışkan reflected on at the beginning was having a chance of *getting insights from experiences* of expert teachers working on different collaborating schools. Miss Çalışkan benefitted from the experienced teachers in many ways such as "[studying on] lesson materials […] handling student problems and contacting parents," observing how they presented the subjects and how they made evaluations.

Miss Çalışkan reflected on having a chance of *interaction with other preservice mathematics teachers* and sharing their knowledge and observations about teaching experience. In the program, each preservice teacher attended different collaborating school to have their Practice Teaching (PT). Observing different teachers' lessons provided opportunity to observe different teaching experiences and by means of sharing about those observations, preservice teachers gained information from each other.

> We all, as preservice mathematics teachers, were teaching in different classes during our practice lessons in school, so we all were having different experiences.

Miss Çalışkan underlined the importance of *requirements of the program* such as the studies performed during school experience lesson and the tasks assigned by the supervisor of the lesson at the beginning of the practice. Each week supervisor of the lesson required preservice teachers to complete a different task related to the collaborating school component of PT. These tasks provided direction to preservice teachers for their observations and focus for their PT of that week.

> There used to be tasks assigned by supervisor each week. For example, one week we made anecdotal record practice, in another week we had an interview with one student and one teacher.

Miss Çalışkan gained knowledge about issues such as students' characteristics and class level by means of *observing students at different levels* during the practices of school experience lesson at different schools. Through the PT process, she observed several students from several grade levels which yielded her to observe different teaching and learning experiences. At the beginning of the practice she discussed about this issue.

> The schools in which I practiced used to have different class levels. I practiced in a primary school, a secondary school and a high school. I had several observations of different levels, different teaching techniques applied by different teachers, and different teaching techniques at different levels by same teacher.

Detailed lesson plans prepared based on both program requirements and fulfilling the expectations of learning were another issue Miss Çalışkan underlined. Lesson plan draft based on 5E learning model consisted of different sections called as engagement, exploration, explanation, evaluation and enrichment focusing on issues such as introduction to lesson, basic innovation activity, explanation, deepening and evaluation. It was expected that those sections should be handled fluently, not as separate parts but as parts of a whole, following each other and each one built on the previous one.

> Since I was not experienced much, I prepared a very detailed lesson plan. I especially put each and every step I thought into plan to avoid any problem. While preparing the lesson plan I took care of various teaching/learning techniques.

During the lesson plan preparation period, Miss Çalışkan needed to go through *different resources* including books, academic papers, internet sources, and then selected proper materials and adapted them according to requirements of each section. Besides, the plan should have different methods and strategies in place and proper changes should be made whenever a need would arise or upon a feedback.

> I can say that, I did not focus on a specific source but used various sources while preparing lesson plans. I found some books in library, and also searched and found some sources on internet. There were also some lesson books used abroad; I used those books as well. And I also used modified version of some activities and projects related to lesson I found on internet.

Miss Çalışkan actively used several internet resources including virtual manipulative and interactive mathematics learning applications while preparing the lesson plans. Interactive mathematics applications were generally used by her to recognize the content and level of the program when needed and for proper cases.

> There are some interactive web applications such as NLVM. I benefit from them. In addition, I use the lesson plans and applications of an education portal [in Turkey] in order to follow the scope and sequence of the curriculum. I use the web page related to STEM education as well.

The list of underlined issues on which Miss Çalışkan made reflection related to Teacher Certification Program (TCP) and its requirements at the beginning of the practice was given in Table 4.1.

Table 4.1 Underlined issues at the beginning of the practice related to program and its requirements

1. Getting pedagogical content knowledge
2. Meeting with teachers, having insights from their experience
3. Sharing knowledge with other preservice mathematics teachers
4. Fulfilling responsibilities required by the lesson
5. Observing students at different class levels
6. Preparing detailed lesson plans
7. Selecting and using different resources for different purposes

4.1.1.2 Teaching Process

Miss Çalışkan discussed about her teaching process in her first year of the program. One of the issues she underlined during the interview done at the beginning of the practice was making necessary changes in the lesson plan whenever needed, in other words, *taking alternative lesson plan into action*. The reasons for those changes could be new ideas or activities upon preparation of plans, realization of the content of lesson, intent to include technological aspects to the plan, or feedbacks from the ones who viewed the plan.

> For example, I was about to teach factorization to 9^{th} grade students, my lesson plan was ready. Just three hours to start of the lesson, I had some time and thought it might be better to prepare a lesson plan using technology, and prepared a new lesson plan. For another lesson, I had a feedback from my supervisor related to intensiveness of the plan and number of questions to be solved in class; therefore I made a change for that as well.

Gathering information related to the students was another issue on which Miss Çalışkan made reflection at the beginning of the practice. Since there are different levels, characteristics, expectations, needs and learning modes of different levels of students in high school and in middle school for her, she reflected on teaching methods.

> What kinds of methods are more suitable for high school? For example, manipulative seem more suitable for middle school. In high school, the studies and concept was more exam-oriented.

Miss Çalışkan reflected on *time management* for planning and teaching of the lesson. Time management in terms of planning was about issues such as which proportion of the content could be handled in lesson hours and what amount of time needed to be allocated to which sections or topics of the lesson. Time management in terms of teaching was about issues of organization of the time allocated according to students' questions, activities which might take more time than planned, students' needs and unpredicted or not foreseen delays during teaching.

> For instance, how much of the content can I cover in this two lesson hours? I considered this kind of things while planning. For example, in one of my teaching experience last year, I prepared the lesson covering two objectives. However, while teaching, several questions came from students and they had mistakes in their previous knowledge. Those caused to loose extra time and I could not finish my plan in that lesson.

Due to the TCP requirements, it was expected that preservice mathematics teachers planed their lessons according to constructivist learning approach in which students could discover by themselves, improve their conceptual understanding and interact with each other. Thus, Miss Çalışkan made reflections on this issue by discussing her point of view of *constructivism* and applying underlining principles of it to the lesson teaching process.

> We want students construct their own knowledge. Therefore, we should provide learning environment accordingly. I believe that, students learn best when they are actively involved in learning and when they experience, search, discuss, and realize the relationship of mathematics with other disciplines.

Using technology more is another area Miss Çalışkan mentioned. Miss Çalışkan already got support from technology while planning the lessons or while doing preliminary work in pre-planning period such as searching resources, selecting materials and designing proper materials. Besides, she selected the concept of her thesis in relations with the technology and its usage for teaching mathematics. Use of technology and specifically mathematics teaching software such as Geogebra was important for her in teaching process. Thus, she underlined this issue during the first interview.

> I believe that technology is very useful; therefore I try to benefit from technology. This [technology] can be a mathematics program, such as Geogebra, calculators, virtual manipulative. I like to use them as an educational material.

The list of underlined issues on which Miss Çalışkan made reflection related to teaching process at the beginning of the practice was given in Table 4.2.

Table 4.2 Underlined issues at the beginning of the practice related to teaching process

1. Taking alternative lesson plan into action
2. Gathering information about students
3. Managing time
4. Using technology

4.1.2 Orientation of Reflections at the Beginning of the Practice Teaching

At the beginning of the practice, Miss Çalışkan mentioned about several issues related to TCP and its requirements. Orientation of those reflections was generally about evaluating her present situation on these issues. She discussed her gains and her development via completing necessary tasks of the program requirements and teaching experiences within the first year of the program.

Miss Çalışkan reflected on the necessities of TCP program and teaching process by two perspectives. One of them was related to the issues that she felt strong and developed. For example, gathering information from several courses was one of the strong points on which Miss Çalışkan reflected. Besides her strengths, Miss Çalışkan identified the issues that she needed to develop such as time management. She identified those points that she developed and needed for development, by reflecting on the issues and by the help of feedbacks given as a result of observed lessons of her during SE course taken at the first year of the program.

4.1.2.1 Identifying Improvement

According to Miss Çalışkan, TCP provided useful *pedagogical content knowledge* for her in terms of planning lessons, classroom management, assessments and teaching process. These were all related to basics of TCP. At the beginning of the practice, she was unfamiliar with these issues related to teaching profession. By means of TCP and its requirements, Miss Çalışkan improved herself in those areas related to teaching profession.

> Lessons were very contributive. I did not have teaching experience and there were a lot of areas I needed to improve before joining the program. I had a chance to improve myself in many areas by help of this program.

By *having observations in many different schools and getting in touch with many teachers* with different levels of experience, Miss Çalışkan had the opportunity to observe many different teaching and learning practices. According to her, this provided an effective way for Miss Çalışkan in developing herself in teaching. Indeed, she stated how to benefit from such opportunity as much as possible as one of her strong features.

> I can say that my observations during practices were very helpful. Because I practiced with professional teachers and learnt a lot via the experience they transferred.

Miss Çalışkan commented on observations and results of observations of other preservice teachers and by this way, she thought that she developed her teaching. According to Miss Çalışkan, this was a strong point which TCP and its requirements provided for her.

> We were having the opportunity of sharing those different experiences with each other; this was useful for me since I developed myself by this way.

Due to the program requirement, preservice teachers made observations each week and prepared reflective reports related to those observations. Besides, they performed some other tasks related to PT process at the collaborating school. Those studies and tasks as *requirements of PT*, provided an opportunity for Miss Çalışkan to have focused observations, record results of observations and perform reflective

practice about those. This point was another strength she discussed about the requirements of TCP.

> All those tasks were very helpful. I learnt many things by reflecting on those observed lessons.

In addition to those discussed above, she developed in areas such as *preparing lesson plans* including materials, projects and activities depending on the level of students and shaping the subject into a form for easier understanding.

> Yes, I believe I am strong in terms of creativity. It was quite rare that I thought of using an activity on the shelf; I always tried to use the materials and projects I produced. Furthermore, upon teaching of the lesson I am able to add examples, for example metaphors, to content especially for the subjects in which students have difficulty.

4.1.2.2 Identifying Needs for Improvement

As a result of teaching processes within the School Experience lesson taken in first year of the program, Miss Çalışkan identified the issues that she need to develop about her teaching process. One of those issues was related to *having limited information* about the students. She needed to have information about differences in learning paths of the students and information specific to the students she would teach.

> For example, you think that the students can easily solve these questions, but they cannot, or some activities do not work in class. This is related with knowing about students and their current knowledge and skills.

She also stated that she needed to improve *selection of appropriate materials* according to lesson content and subject.

> I believe I need to find more resources and make more research, I mean to be able to form more content rich lessons, and about which activity is suitable for which lesson content. And I need to work more on which type of materials need to be used at different levels. I believe I need to improve myself more and better.

In relation to selection of materials, *preparing activity papers* to be able to track the flow and comfortable teaching of lesson was another issue that Miss Çalışkan needed to improve.

> I have some decisions, yes. For example I did not prepare handouts while conducting lessons on smart board. This was something students have difficulty in following the lesson; if I conducted the same lesson again I would prepare a handout for students to help them follow the flow easily.

By end of first year, *planning and teaching of student-centered lessons* was another area in which Miss Çalışkan needed to improve. Lesson plans prepared in the first year, feedback about those plans, teaching of lessons and views about them seemed to direct Miss Çalışkan reflect on the need to improve planning and teaching of lessons in a more student-centered way.

> To be able to be a qualified mathematics teacher, first of all, I think I should plan more student-centered lessons. I need more improvement in providing interactive self-learning environments for students.

She reflected on the need to improve her knowledge and skills of using technology in the mathematics classroom.

> For example, if it is about integrating technology, I should study on how it would be integrated into which lesson.

Miss Çalışkan reflected on whether she was able to craft lesson plans as required by the program. She was not sure if she could perform such fluency by the end of the first year of the program.

> Engagement is the part we had most difficulty while preparing the lesson plan. We plan that, plan the exploration part as well, but it is hard to say "that is okay; let us pass to the next." It should go like this on my head so I can reflect the entirety to the students.

Miss Çalışkan was aware of the importance of self-improvement about the tasks she was performing. She believed that this improvement should be continuous due to the requirements of teaching profession and emphasized the importance of getting help and feedback from various sources. She also stated that, she needed self-improvement by focusing and working on the problematic or improvement-needed areas.

> As teachers, we are the ones who continuously improve ourselves and because of this we always need support. I believe the sources I went through are helpful and will be helpful. I believe I can get help from my more experienced teachers and I can improve myself, I take care of their feedback and will be keeping so in all along my teaching process.

She thought that she was capable of making necessary changes during the delivery of the lesson. Although she felt developed, this was the issue that the supervisor of the program advised her to improve based on the observations of her lessons.

> My supervisor said that I should be consistent in using one method through the lesson. By saying this, students would become familiar to the method as he mentioned. However, I try to make the concept clear, when they don't understand, by explaining the concept in a different way.

Developed areas and areas that Miss Çalışkan needed to improve based on her reflections at the beginning of the practice were listed in Table 4.3.

Table 4.3 Developed areas and needs for improvement for Miss Çalışkan at the beginning of the practice

Developed areas	Needs for improvement
1. Using pedagogical content knowledge	1. Gathering more information about students
2. Benefiting from experienced teachers' experiences	2. Using several resources
3. Benefiting from other preservice mathematics teachers' experiences	3. Making transitions between phases of the lesson
4. Preparing detailed lesson plans	4. Preparing activity papers
	5. Planning and teaching of student-centered lessons

4.2 Reflections during Practice Teaching

4.2.1 Reflections before Teaching Practices

4.2.1.1 Content of the Reflections before Teaching Practices

Miss Çalışkan made reflections on several issues before her teaching practices. These reflections were presented in this part in terms of planning and teaching process, students' learning process, and assessment process and in-class dynamics.

4.2.1.1.1 Planning and Teaching Process

One of the first things Miss Çalışkan considered before teaching practice was *how the subject was handled* in national and international resources. While she used national program for scope and sequence of the subjects, she used international resources for materials and activities. In addition to this, while preparing the lesson, Miss Çalışkan used knowledge and experience she had in observations in previous lessons either in similar ways or transferred it to other grade levels.

> First I went through the MEB [Ministry of National Education] book. I investigated the activities used, looked at how the subject was explained. There was [also] a foreign resource. Upon that I thought how I can teach the relation between area and algebraic expressions, how I can make it more interesting. At that point I remembered the work we did using manipulative a year before, we used algebra tiles in that work. I thought I can make the lesson more interesting by using that manipulative.

Miss Çalışkan reflected on while *planning about working of groups* and students, tracking of work, rewarding and making those all in a joyful environment in which students would become more active. Since each student had a different speed, set of skills, characteristics and style, Miss Çalışkan tried to conduct *differentiated instruction.*

> When the ones who solved the same problem come together, they will be solving the same problem, this is the negative part of that idea just came to my mind. They will be having the same problem solved at the same time so they will re-roll the dice. They can replace with another group, yes they can replace. Because if one student group solves the green question for example, the question which is on the green side of the cube, another group solves the question on the yellow side of the cube, in that case there must be groups which complete at the same time.

One of the points Miss Çalışkan made reflection on and took care of while planning upon feedbacks especially based on observations of her initial lessons, was *giving directions* during the delivery of the lesson.

> For example, I explain that verbally there, it might be necessary to repeat 2-3 times. In order to ensure that every student understands the directions, I should do something else.

Miss Çalışkan had feedbacks about giving complete directions, getting help from audio-visual prompts, and controlling whether the directions were understood well or not.

> Before the lesson, I thought about how I would give the directions. It is better to give them verbally or write on board. Later, I decided to prepare some papers on which those directions were written and distributing them to each group. But this time when I distributed those directions, I would need to visit each group and make explanations as if they were not reading directions but were working on the problem. I thought this would be a time spent for something not related to lesson.

Extra work that students can make when they finished their tasks was another point Miss Çalışkan handled during the reflection process before teaching practice. She thought to assign an extra work to students or those groups if they finished earlier.

> If one group completed and the others did not, then there must be an additional task to assign to that group, I should plan that as well or I should find another way, I think.

Miss Çalışkan reflected on the rationale behind *posing problems* to students. She aimed to increase difficulty level of problems step by step instead of letting them to face difficult problems suddenly in order give challenge step by step and she quantified this difficulty by number of phases needs to be used in solution. For example, she preferred to handle two step problems first, and then gave them the opportunity of working on solution of three step problems.

> I want all students to solve all problems because they will see the two step problems for the first time in grade 5. For this reason, I want them to see and solve all kinds of questions.

Miss Çalışkan also reflected on *using handout or worksheet*. She prepared several worksheets and handouts for students in order to make the lesson easy to follow, use during revising the subjects taught earlier and ease the flow of the lesson. She reflected frequently on preparing such a document while planning the lesson.

> I think I am going to give the questions on paper written on worksheet. I may give the worksheet, and ask them to answer the questions on the worksheet in groups of two.

The list of underlined issues on which Miss Çalışkan made reflection related to teaching process before teaching practices was given in Table 4.4.

Table 4.4 Reflections related to planning and teaching process before teaching practices

1. Preliminary analysis-resources
2. Planning and conducting group work
3. Diffrentiating the instruction
4. Giving directions
5. Preparing alternative plan for early finishers and differentiation
6. Posing problems to students and rationale behind of this
7. Using handout or worksheet

4.2.1.1.2 Students' Learning Process

Miss Çalışkan reflected on the differences in the level of improvement among students due to gender while constructing the groups. Apart from that, some other measures helped Miss Çalışkan in forming groups, such as having groups consisting of successful and less successful students and both talkative and silent students. She aimed that; students would get maximum benefit from this process and aimed to make the process easier in terms of flow of the lesson. By using strategies which supported having different *student personality and characteristics* together, she planned to provide these issues.

> At this age group, boys and girls are very different. I consider their algebraic and problem solving skills as a first priority. Then, I thought whether they are girls or boys. Two students are good but if they both quiet then it would be a good idea to place an additional active one. Who would activate the group or would herself become quiet?

In addition to considering student characteristics in groups, Miss Çalışkan made reflections on adjusting the number of students in groups and *forming groups* in such a way that each group need not be consisted of fixed number of students. She was flexible especially in number of students in groups depending on the student characteristics, age group and friendship among students, and sometimes by considering students' preferences.

> Not all groups need to have 3 [people]. For the ones who want to work individually [rather than in groups], they can work in a form of two, in case they can get help of.

Letting *students be more active in group work* and have different roles in group, and providing contribution were the important points Miss Çalışkan highlighted.

> I have been wondering; although they will be working on it individually, I am not sure they can learn the activity I am going to conduct. One who passes her turn may not listen to the others and some of them will get a simple task. There will not be equal task distribution. I did not have any other idea of how I can get all students involved.

Miss Çalışkan tried to get some information from other teachers about the current status of students, and had *alternative precautions* such as having chats with students before the lesson, and having pilot practice of the planned activity in a similar age group.

Miss Çalışkan paid attention to *selection of problems* especially while planning lesson processes involving complex skills such as problem solving. According to Miss Çalışkan, one of the most important factors in selection of activities and teaching method was the level of students' mathematical skills, which might affect the learning process of the content. Since she was not able to fully know their current level, the status of their skills and what kind of difficulties they had in learning, she tried to plan in such a way to minimize effect of those possible problems due to this kind of *lack of knowledge about students current level* and not to change flow of lesson especially in initial lessons.

> For example, problem solving needs very different skills which requires thinking. You can get unexpected answers from the students. There are students who might be coming with very different questions. I observed such a situation one day ago and thought as, "How would I answer if they asked me this question?"

She aimed to select problems which required active thinking and strategy developing in which students would have a different experience in each problem instead of routine and similar questions.

> I think when the students solve several questions which are alike; this is not a problem solving process. It is better to solve less number of questions; each of which requires different strategies. For example, I selected 5 problems for this lesson, one of them requires modeling, and the other one requires drawing a picture.

Another issue on which Miss Çalışkan reflected was *students' familiarity* with the content of the lesson, in other words whether the subject was new to students or not. Miss Çalışkan thought that teachers should be more active while teaching the subject which was to be learned for the first time, and she preferred a teaching method in which she could contact each student individually. For her, this meant not to prefer group work.

> I will not be doing group work in next lesson. Although the students can learn from each other in group work, tree diagram is a new subject so I believe it is better to be in contact with students individually.

Apart from that, she considered whether it was a subject that students needed any *prerequisite knowledge*. In other words, the relation of the content with other subjects in mathematics was an important issue.

Her reflections on group work were also blended by her reflections on other aspects of students' learning such as *using manipulative* and having students actively been involved in learning tasks. She supposed that *group work* was more useful especially in activities which needed critical thinking, inquiring and sharing similar to the lessons in which she used manipulative. Furthermore, she worked on how the groups could work in most effective way.

> While I think it is easier with manipulative, there might be problems while playing it in classroom. Because there will be 20 students in the class. I asked myself the question of how I can get all students into game and control whether they all learned or not, although it might have been better if they played in groups. So, I decided to assign tasks to each student.

The list of underlined issues on which Miss Çalışkan made reflection related to students' learning before teaching practices was given in Table 4.5.

Table 4.5 Reflections related to students' learning before teaching practices

1. Grouping strategies and flexible grouping
2. Sharing responsibilities in groups
3. Having knowledge about students current level
4. Planning problem solving process
5. Learning a new concept
6. Teaching a concept that requires prerequisite knowledge
7. Using manipulative and having students actively been involved in learning tasks

4.2.1.1.3 Assessment

Miss Çalışkan mentioned about defining roles for students in the evaluation process of the lesson. She reflected on planning the lesson time allocated for evaluation and preferred a defined time block at the end of the lesson in which the students would take an *active role in evaluation process*. The reason was not to interrupt the flow of the lesson.

> I left self-evaluation to the last 5 minutes of the second lesson, so the content would not be divided.

From the beginning of the process, Miss Çalışkan got support and feedback from the supervisor and mentor in using different and concrete tools for evaluating the learning process of students. She developed different methods such as *using rubrics* for evaluation and revised them upon each practice. Accordingly, she reflected on this issue before the teaching practices.

> After that I really think first to use the rubric that I developed recently. Because it is a very good rubric and I wonder the effect of it once used on students.

The list of underlined issues on which Miss Çalışkan made reflection related to assessment before teaching practices was given in Table 4.6.

Table 4.6 Reflections related to assessment before teaching practices

1. Students' active involvement in evaluation process
2. Using rubrics

4.2.1.1.4 In-Class Dynamics

Miss Çalışkan frequently planned the teaching process through group work. She reflected on the reasons behind *favoring group work* even for her first teaching experience. The main aim was providing opportunity for students to share ideas and knowledge with each other and doing this confidently.

> I wanted to apply group work in my first lesson. It was the first time in that class. I mean when I asked questions individually they can be shy, they may not want to answer, is it true or false? Although they know the correct answer, they may not answer since they are not confident. But if it is a group work, even if they do not ask me, they can ask to their friends and learn from them. And in the lesson I will be observing them during this.

For group work, Miss Çalışkan thought that the groups in class should be small and balanced to provide suitable environment for students to communicate, share and learn from each other. At the same time, she thought that the *number of groups* increased when the groups were small which made her role more difficult. Hence, she reflected on this issue from two perspectives as well.

> Eighteen students, it is better if they are in groups of three. If they are in groups of three then they can hear themselves better, they can communicate better. I mean I think it is better if three students talk instead of four. But in that case there will be six groups. Can I have a contact with all six groups at the same time?

Miss Çalışkan reflected on the classroom management as well. According to Miss Çalışkan, the role of teacher during group work was *managing the groups* by attending each group's progress and needs by observing and guiding. In this respect, there should be an active evaluation, directing and feedback process during the group work.

> Yes, I think I can manage the group work, since my task is walking around the class and among groups, observing and finding out what they do, in which question they have the most trouble, whether they all have trouble in same

> questions or there are different questions on which different students have difficulty.

Once the first aim in group work was providing an environment for students to share, communicate and learn from each other, then while *working on a task, silence* in the class had a different meaning for Miss Çalışkan. She thought that it was normal and even preferred that students would make some noise at a level, and she considered this as meaningful.

> I expect loud noise during group work and this is something I want, because it will be a meaningful noise. I want students to solve the problems by talking and discussing, it is normal to have loud, a bit noise in the class. This will be something I expect for sure.

Miss Çalışkan planned to include practices which would provide opportunity to satisfy *students' need for movement* in forty-minute lesson period. By considering properties of the age group she was teaching, she reflected on this issue and tried to find solution for this. For example, she planned the lesson in a way that students attached the products on the board when they got at the end of each stage of the activity, instead of waiting until the completion of task.

> They can paste it upon solving problems, so they satisfy their needs for movement. They provide self-feedback.

The list of underlined issues on which Miss Çalışkan made reflection related to in-class dynamics before teaching practices was given in Table 4.7.

Table 4.7 Reflections related to in-class dynamics before teaching practices

1. Preferring group work
2. Organizing the number of students in groups
3. Managing group work
4. Working on the task and silence
5. Providing opportunity for movement in classroom

4.2.1.2 Orientation of Reflections before Teaching Practices

4.2.1.2.1 Identifying Needs for Improvement

Miss Çalışkan asserted that the students would be familiar to her teaching method by forming of group work or other practices and thought that lesson flow would be easier. The reason behind this thinking was arranging the lesson time wisely. *Time management* was the issue that Miss Çalışkan thought that she needed to develop. She reflected on time management and her improvement in this issue.

> Yes, as I said I think I need to improve myself a bit more about time management. From now on I am going to pay special care to time management.

Miss Çalışkan also reflected on using materials and activities before the teaching practices. According to her a positive aspect of using worksheets was *shortening the time* students spent in writing. She prefered students think instead of take notes, communicate and criticize, and she also thought that such a document used by all groups would ease tracking the group work.

> I think asking them to write on their notebooks is waste of time. Since there will be a group work, the process needs longer time… I can give worksheet and they can write answers on it in groups and use their time for thinking and sharing their ideas.

The list of main themes regarding orientation of reflections before teaching practices was given in Table 4.8.

Table 4.8 Orientation of reflections before teaching practices

1. Developing on time management issue
2. Taking precautions for time management

4.2.2 Reflections during the Teaching Practices

Miss Çalışkan made reflections while the teaching process was in progress. She did not reflect much; however, I handled her reflections separately and presented under the heading “reflections during the teaching process”. These reflections were

presented in this part under the subtitles related to students' learning and in-class dynamics.

4.2.2.1 Content of the Reflections during the Teaching Practices

4.2.2.1.1 Students' Learning

As Miss Çalışkan became familiar with the students in class, she used this information concurrently in order to *differentiate the lesson due to the students' characteristics*. She prepared the questions to ask beforehand. However, she reflected spontaneously on which question to ask to which student during her practice. She tried to adjust difficulty level of questions according to success levels of students. For example, she preferred to ask more advanced questions to successful students while she asked relatively easier basic questions to students in lower success levels so that they could answer. In addition to this, issues such as students' interest level and participation were some other criteria for Miss Çalışkan.

> I selected quiet and non-focusing students to read or solve the problems, like Student A. I tried to pay attention to their works individually. By this way, I tried to understand whether he was quiet because he did not know the answer or because he liked being quiet and did not want to talk although he knew the answer.

Another case Miss Çalışkan reflected in and taught different than the lesson plan was students' difficulties in learning, and the decisions about changing the method or not. Miss Çalışkan *put the alternative actions into place* from time to time when the activity did not go in the way she wanted. For example, she stopped the group work at one point and made additional explanations. However, in some of the works, she left this responsibility to students and aimed to provide permanent learning by letting them to experience the challenges required by the process.

> I realized during the half of the second lesson that the students had difficulties in questions. At that point I thought ending group work and solving problems by discussing with students. Because, they were having much difficulty and were not able to comment about. Should I cancel the group work? I think the groups can support each other in understanding the problem while discussing and I can control them by walking around them. Then, I gave up, because I thought they had to have some difficulties. Because, aim of problem solving is challenging the students, letting them to think.

The list of underlined issues on which Miss Çalışkan made reflection related to students' learning during the practice was given in Table 4.9.

Table 4.9 Reflections during the teaching practices related to student' learning

1. Differentiating lesson according to student characteristics
2. Changing delivery strategy according to students' reactions

4.2.2.1.2 In-Class Dynamics

Miss Çalışkan was *taking alternative precautions* when the lesson did not go as intended or planned. She tried to use lesson hour more effectively by limiting the practices included in plan, changing the method of practice and making it more practical.

> In fact I had a spontaneous idea to provide them to help each other at the end and gave them color cards as a result.

Miss Çalışkan tried to follow the plan without decreasing the motivation of students and by prioritizing the learning. However, there were times she had to discard the plan completely as well.

> Each student was supposed to be given a color card and the results were supposed to be controlled. There was no time to cycle like this. When I saw there was no time for that, I gave it up. I already had some worries about time before the lesson but I was thinking that at least two tours were possible; I was able to do only one.

Additional point Miss Çalışkan reflected in especially during the teaching of the lessons in lower age groups was how to increase *motivation of students for learning*. She used rewarding from time to time to let students to focus, provide motivation for the completion of the work, especially the ones the students have difficulty such as problem solving. This reward might be in the form of writing names of students on board, presenting the material used in lesson as a gift and giving them stickers.

> I think something like this motivates the students: I wrote the names of students who correctly answered. Because in group work students want to be one who completed first. But this time they are neglecting some of the things. Due to this, to increase their intent of solving problems, I preferred to write

> the names of the students who solved correctly. This is good both for me and for students to see who participated and who did not. I observed that students got happy when I gave them the dice, so if they think that I will present them the dice, then they will perform very well.

A new issue Miss Çalışkan reflected in during the delivery of the lesson was the difference between the groups in group work. Miss Çalışkan had to have alternative precautions and made *extra planning for the differences among groups* in terms of task completion time during the lesson. She had spontaneous decisions during the lesson and had alternative actions such as letting early finishing groups to help other groups or assigning them some other challenging tasks.

> The group of good students was going fast. The group sitting in front was slow. I thought that it would be good to get one student from that good group to the slow group and to get one student from slow group to another group after a while. But this time something else came to my mind. I preferred to get help from the group which finished the task earlier than others. They helped the other groups.

Miss Çalışkan conducted alternative practices as a *precaution for the loss of interest* and decrease of motivation of students. One of the strategies she used for this was getting students on board. She had a one to one contact with students.

> I had decided to let students read and solve questions on board during the lesson; I preferred to select students with concentration problems.

The list of underlined issues on which Miss Çalışkan made reflection related to in-class dynamics during the practice was given in Table 4.10.

Table 4.10 Reflections during the teaching practices related to in-class dynamics

1. Dealing with students' differences
2. Delivering lesson alternatively with precautions for time management
3. Motivating and rewarding students
4. Promoting students who easily loose attention

4.2.2.2 Orientation of Reflections during Teaching Practices

Miss Çalışkan made reflections in teaching process mainly in two ways. One of them was to provide and *maximize the students' learning*. She made alterations

whenever she saw necessary. If needed, she completely put away the lesson plan and delivered the lesson for the improvement of the learning processes of the students.

In addition to maximizing students' learning, Miss Çalışkan mainly used reflection in teaching process to *provide classroom management*. Time management, differentiation, motivating and rewarding students, dealing with early finishers and latecomers and dealing with the students who lost their attention was all related to classroom management issues for Miss Çalışkan. In order to sustain those, she made several actions down to the reflection process.

The list of main themes regarding orientation of reflections during teaching practices was given in Table 4.11.

Table 4.11 Orientation of reflections during the teaching practices

1. Maximizing the students' learning
2. Providing classroom management

4.2.3 Reflections after the Teaching Practices

4.2.3.1 Content of the Reflections after the Teaching Practices

4.2.3.1.1 Classroom Management

One of the most important areas on which Miss Çalışkan made reflection was *giving directions*. Upon feedbacks about giving written directions, reflecting the directions using a projector, explaining and controlling, she reflected that she improved and practiced those solutions.

> I think I am quite clear while these directions are given. And also an effect of this can be a matter. While giving the directions I gave it like giving some responsibility as well, like "you have one minute", like "I am going to tell this once". I put 4-5 sentences and I stopped and controlled in half, I did this for the first time, it was very useful. I completed and controlled the direction before starting to work.

Miss Çalışkan made reflection on *time management*. This was one of her main concerns, especially at the beginning of the PT period. She applied strategies

such as having less time for some parts of the lesson, changing direction giving method, and making some tasks more practical.

> I am happy since I finished just in time. So I am able to do it in time by allocating less time for some of the things. I mean I learned what on I should spend more or less. That made me happy.

The list of underlined issues on which Miss Çalışkan made reflection related to classroom management after teaching practices was given in Table 4.12.

Table 4.12 Reflections after the teaching practices related to classroom management

1. Giving directions
2. Managing time

4.2.3.1.2 Knowledge of Students

During the reflection process upon lessons, Miss Çalışkan mentioned about knowing students. She highlighted the importance of *knowing names of students* and calling them with their names for better classroom management.

> At previous lesson, not knowing names of students caused a mess. The students were talking to each other wondering whether I know their names. I recognized this was an important issue, calling students by their names.

While she was reflecting on lessons, Miss Çalışkan thought about *how many of the students were ready for the activity*. Her lack of knowledge about students caused insufficient information about the status of students' present knowledge base and skills. As another dimension of this case, Miss Çalışkan predicted this kind of problems beforehand and preferred methods that she had more control from time to time. For example, she preferred direct teaching method for some of the concepts.

> I would give less time to exercises. I gave such a time since I did not know how good the students were in algebraic expressions, so I wanted to see their algebraic skills. If I were conducting this lesson after I was familiar with students, I would go through it quickly. But since I am not sure now, I wanted to teach such questions by writing on board.

Miss Çalışkan thought that *familarity of students with group work* was important in teaching process. For example, she expressed that the practice in a class

with students who were familar to group work would be more comfortable compared to a class which would make a group work for the first time. For that reason, she preferred to get some information about experiences and current status of students from collaborating teacher and decided on activities and teaching method accordingly. However, there were lessons she was not able to conduct group work as intended.

> It is not a class who is familiar to group work. I guess that is the most important reason. What if I would conduct a group work in a class who did not have a group work before, how would they respond? I think from this viewpoint.

Miss Çalışkan taught that although she had a demanding observation and teaching experience period in the context of PT, this time might not be enough in understanding students comprehensively. She highlighted the need for knowing them better by being together more with them especially with the purpose of being able to investigate *students' current status in problem solving and in complex processes involving various skills*. Yet, Miss Çalışkan had troubles in changing phases of the lesson and in time management while trying to investigate student's lack of knowledge and trying to make modifications during the teaching of lessons.

> The reason I was not able to conduct other parts of the lesson was students' lack of knowledge of arithmetic. Though students knew more complicated things, they were not able to make cross products; they put multiplication on the other side of the equation. I had not put more time in explore section in the lesson plan; I spent much more time in lesson.

The list of underlined issues on which Miss Çalışkan made reflection related to knowledge about students after teaching practices was given in Table 4.13.

Table 4.13 Reflections after the teaching practices related to knowledge about students

1. Knowing the names of students
2. Being ready for the content
3. Being ready for the group work
4. Having insufficient information about students' differences in skills

4.2.3.1.3 Students' Learning

Due to not having enough information about students' preliminary knowledge, Miss Çalışkan preferred to start lesson with focus on problem solving by reminding problem solving phases in order to contribute students' learning. She reflected on *planning the problem solving process* as in this way. She preferred to practice this by questioning method and tried to have an idea about the phases that students passed without answering.

> I thought it would be good to remind students what the steps of problem solving before starting to solve the problem.

For Miss Çalışkan, *challenging students' cognitively* during the learning process was necessary for continuous learning. In this respect, they should be left in problematic situations from time to time which would force them to inquire research, think and explore. For this reason, Miss Çalışkan prepared worksheets and updated those worksheets upon feedbacks. She reflected on the importance of challenging students in the learning process.

> In my opinion, students should be challenged to be able to learn. While I was preparing this worksheet, I thought they will be challenged. If I use it later, the student will already know most of it. Student will not need arguing, will be doing something routine.

According to Miss Çalışkan one dimension of learning mathematics subjects was conceptual understanding while the other dimension was procedural fluency. Miss Çalışkan had some worries about leaving procedural fluency missing in some lessons in which she deviated from the plan because of unexpected situations or in which she targeted to compensate lack of preliminary knowledge. Although she performed practices to develop conceptual understanding, she was not able to have enough time for exercises. Therefore, she reflected on *providing opportunity for procedural fluency.*

> Upon completion of the lesson I had some worries and I wrote it to my report as well. We discussed the subject with students but we did not make practice. So I was not sure whether the students understood or not. They should have learned since we discussed but they might have not learned since we did not emphasize.

Miss Çalışkan was encouraging *using concrete materials* and manipulative especially in lower class levels. She preferred such a practice since she thought that students at those age groups might have difficulty in visualizing the concepts in their minds. Apart from that, she found it appropriate to use visual aids such as colors and different shapes for lower class levels.

> I preferred so since I thought especially grade 5 students can learn better visually. But since those were grade 5 students, I thought that a few operations on board will let students not enjoy the lesson.

Putting alternative plan into action was another issue Miss Çalışkan mentioned. While conducting lessons, Miss Çalışkan sometimes left the plan out to be able to solve problems about preliminary knowledge or skills students lacked or their misconceptions. In other words, she tried to respond students' needs.

> If I did not insist on the parts students had difficulty, if I said as this was my plan, then the students would have trouble in following lessons. While I was writing my plan, I wrote it in the rationale section. They will be learning equations in future so they need to learn operations related to algebraic expressions.

One of the reflections of Miss Çalışkan related to students' learning was about *using the board.* She expressed her thoughts about this subject from time to time, while she was commenting on how the lessons were going.

> In fact, I observed the students in class a few times but it was because of trying to find who really understood and who did not. For example, when I explained verbally, most of the students were saying that they understood. However, I was writing on board as well.

It was important for Miss Çalışkan to let each student participate actively and involve in the task in a way to *increase the level of learning* for each student in group. She had several precautions to provide this, such as selecting a different group representative each time, assigning solution and control to different students in groups and discussing together.

> Group work was useful in understanding the problem. At the beginning of group work, the students were trying to solve problems by sharing, and then I let a different member of the group to talk each time.

Since students could find many opportunities to learn during the group work, it was one of the reasons Miss Çalışkan used group work frequently. She preferred to facilitate from group work for the reason that students could improve their different skills including communication, and share about different solution ways.

> Since they were working in groups they had an opportunity to share different methods and solutions. Most of them were good at algebraic expressions. I do not think they have much missing knowledge. About thinking speed, they are at different speeds.

The list of underlined issues on which Miss Çalışkan made reflection related to students' learning after teaching practices was given in Table 4.14.

Table 4.14 Reflections after the teaching practices related to students' learning

1. Planning the problem solving process
2. Providing challenging learning environment
3. Providing opportunity for procedural fluency
4. Using concrete materials
5. Putting alternative plan into action
6. Using board
7. Increasing the level of learning

4.2.3.1.4 Teaching Process

One of the themes Miss Çalışkan reflected on was about to what extent the goals were reached. While questioning *whether the goals were reached or not*, she made evaluations with different perspectives such as methods, products and learning of students. Apart from that, Miss Çalışkan evaluated not only knowledge based goals but also goals regarding improvements on other skills.

> A positive behavior of students was the general aim. I think they can solve the problems involving four arithmetic operations now. I think I reached this goal. I think [I reached] the problem solving strategies as well, because we provided that they can express the problem by using their own words. I cannot say we have varieties in terms of problem solving strategies. The method used was modeling.

Miss Çalışkan reflected on *making the concepts more concrete for students* and assessment of the effectiveness of her teaching. Upon lessons, she questioned the effect of using manipulative and visual aids on students' learning in some classes.

> For example, if they were high school students and if we wrote arithmetic operations on the board, that would be meaningful. However, 5th grade students would learn better by modeling and since we use colorful pens, the board would be colorful which will serve students visually.

Miss Çalışkan questioned *the role of teacher during teaching and especially in group work*. She highlighted that the teacher should direct students during the lesson, arrange for suitable learning environment, guide students by letting them to learn from each other and support them to construct the knowledge by themselves, and subsequently improve herself by evaluating the process. Miss Çalışkan had some feedbacks on transferring those ideas into practice and thus she reflected on them.

> Students were asking questions, they were wishing to discuss. I liked that. There were some misconceptions, and there were good answers to them. My mission was letting students understand but understand by themselves. Sometimes I observed students who were not motivated at the beginning of the lesson were more active in questions part of the lesson, so I wanted to give everyone the opportunity of asking questions.

According to Miss Çalışkan, *relating the concepts with other concepts* was important for the learning of students and making it permanent and enjoyable. In this respect, she included practices which had the potential of showing the relationships among mathematical concepts.

> While I was planning this lesson, I was thinking to solve a problem related to real life so they can define the position of points in Cartesian coordinate system, form the lines through those points, understand that they can use coordinate systems not only for mathematics but for geometry as well, and to make the lesson more joyful.

The list of underlined issues on which Miss Çalışkan made reflection related to teaching process after teaching practices was given in Table 4.15.

Table 4.15 Reflections after the teaching practices related to teaching process

1. Reaching the aims and objectives of the lesson
2. Using visual models to make concepts more concrete
3. Considering the role of teacher during group work
4. Relating the concept with other concepts in math

4.2.3.1.5 Assessment

One of the tools Miss Çalışkan used for assessment was *control lists*. Miss Çalışkan developed the control list through the period which she used for getting notes about whether the students completed the work or how successfully they completed. She updated the list, which was initialy in a basic level, according to the results of difficulties faced or different needs, and by using feedbacks upon teaching of lessons. While she used those control lists to record the learning process of students, this kind of recording provided the opportunity of planning and reflection about her own teaching process as well.

> I think most of them learned well about the problems, I noted on the checklist as well and upon that controlled. The aim with checklist was writing down what the students did and did not in first and second group work and then comparing them.

Miss Çalışkan, as stated by her by reason of a habit coming from her own school years, *checking learning of students* by frequently asking the question "Is it understood?" In feedbacks Miss Çalışkan had, it was suggested that she should increase the power of the tools for assessment and should reflect results of evaluation of teaching.

> Is it understood? In fact, I do not think that question is useful, it is a habit coming from my school years, our teachers used to ask us "is it understood?" I do not want to use that as long as it is possible to develop strategies for this purpose. One of them is checklist. Taking notes about performances of students. However, I guess I still have a bit of that habit.

Miss Çalışkan highlighted the evaluation related to *tools and strategies* used. Miss Çalışkan had pretests from time to time to check preliminary knowledge and present situation of the students regarding their skills. Besides, she included posttests

at the end of the lesson. She had evaluations for both practices and decided to make improvements for subsequent lessons.

> For example, I used pretest for my 10th grade lesson. The concept was factorization. I would like to learn students' level on prerequisite knowledge and prepare presets accordingly… After teaching the concept, I used the posttest to evaluate my teaching process.

Another point Miss Çalışkan reflected on regarding evaluation tools and strategies was observation records she used during lessons. Miss Çalışkan advocated that such a recording provided an effective way for gathering information about students' knowledge and skills.

> While dealing with groups, I preferred to take notes about students' solution processes, the questions that they had difficulty while solving, the questions easily solved etc. I observed that [those] anecdotal notes were very useful. Now perhaps since I teach only in a few classes, I am able to remember the things about students, but when I teach in more classes in the future, these notes will be very useful. Since there will be more students, the teacher can go through those notes to see which student is good in which subjects.

Miss Çalışkan found vital that *students' control and verification of their solutions.* She meant checking the accuracy of the arithmetic operations and accuracy of their thinking process all at once. In this respect, while doing this she controlled operations either by backward operations or solving with a different method. By doing this, she provided opportunity to compare the results, and support different students while controlling the thinking process.

> I think it was a good idea to solve with equation and without equation. When I tell class that we need to control, a few students proposed to do proof. Since the point here was emphasizing the importance of control instead of solving with or without equation, I thought that would be possible via proof as well.

The list of underlined issues on which Miss Çalışkan made reflection related to assessment after teaching practices was given in Table 4.16.

Table 4.16 Reflections related to assessment after the teaching practices

1. Using control list
2. Checking learning
3. Using assessment tools and strategies
4. Controlling methods for students' solutions

4.2.3.1.6 Self-Assessment

For Miss Çalışkan the first lesson was very important since she encountered with the students for the first time, so she thought that she was *novice teacher*. She reflected on this concern as well. She stated that she would be much comfortable and would get better results if she taught at a different grade level. Additionally, she believed that the second lesson in that class would be more successful.

> I think I get some of my novice teaching out in 5A. I can make the activities in 5A by getting students more involved. In other classes, I think I can develop activities to know students at first. In that case, I think both that lesson and the lessons after that became more productive.

Especially in the last lesson, Miss Çalışkan preferred to make general evaluations including communications with students instead of reflection related to content and practice. She questioned how she matched to the *ideal teacher* definition in her mind and made reflections about this.

> I had emotional moments since it was the last lesson. Students' happiness made me happy. As a teacher, I have always wanted to be such a teacher. Both having very good communication with students and letting students feel the pressure, having an authority without fear. In this last lesson, I think I am such a teacher.

The list of underlined issues on which Miss Çalışkan made reflection related to self-assessment after teaching practices was given in Table 4.17.

Table 4.17 Reflections related to self-assessment after the teaching practices

1. Being novice teacher
2. Reaching an ideal teacher

4.2.3.2 Orientation of Reflections after the Teaching Practices

4.2.3.2.1 Identifying Strengths in Being a Teacher

Miss Çalışkan stated that it was difficult to practice some activities or methods in class though they might be very successful in theory. Towards the end of the PT period, Miss Çalışkan performed such a practice and had success. She got positive feedback from the teacher who observed the lesson as well. Miss Çalışkan needed to have reflection on such a practice in which she was not expecting to be successful.

> Upon the last lesson I was in mixed emotions. I was very happy since poster presentation was a practice I like, but I thought I could not handle though it was not difficult to practice. It was different from practices I knew and I did, it was like a bit luxury. It was so in terms of time use as well.

Miss Çalışkan had a reflection after teaching practices on the dialog with the students. She tried to know students, understand their different attributes and have a positive communication with them both in and out of the classroom.

> I am happy with the dialog with students. I like learning about them, talk to them.

Miss Çalışkan was more successful preparing lesson plans for certain mathematical concepts which she felt more comfortable while teaching. Many factors affected this, such as how she learned that subjects in her school years, whether she liked it or not, whether she found them concrete enough, and whether different methods should be used or not. The concepts Miss Çalışkan stated that she felt good were the concepts which had rather ordinary procedures such as 'multiplication by algebraic expressions'. Miss Çalışkan expressed that she felt less comfortable in complex processes which involve different skills such as problem solving. This was a reflection about her *strength in being a teacher*.

> I like algebra, I like its source. I find it like a story. I have felt the effect of this in the lesson. However, I might not be able to estimate the questions or the methods of students beforehand. The method of each student might be different. But in grade 7, there is only one method in algebra, multiplication by algebraic expressions. So, I felt myself more comfortable. While I was teaching in grade 5, I had worries like should I tell this way or that way,

> should I use modeling... It was a very wide area and there were many ways of solving the problem. As I mentioned, in grade 7, we focused on a single subject and everybody was thinking in the same way.

4.2.3.2.2 Identifying Needs for Improvement

In general evaluations based on previous teaching experiences and observations, Miss Çalışkan taught that she had weaknesses in using board and needed to improve about it and make plans accordingly in her practices. Feedbacks from teachers who monitored her lessons correspondingly showed that she *needed to improve* this issue. Therefore; she reflected on this point and tried to find solutions for it.

> Sometimes, I have problems related to the use of board in my teaching. When I turn to board, students start to make noise, when I turn but see them at the same time, I could not write on the board. I try to develop myself in this issue.

Miss Çalışkan emphasized that she had troubles about giving directions at the beginning. She used to give verbal directions which were lengthy for students, she was able to see whether the directions were understood or not and had to repeat frequently. Miss Çalışkan felt weakness and had precautions to improve about this from start of the PT period.

> I had to repeat many times while I was explaining the directions. Instead of that I could have done something [else].

Miss Çalışkan had some feedbacks about increasing the effectiveness of group work especially in initial classes. Based on feedbacks suggesting conducting group work so that each student can participate and contribute to the process; Miss Çalışkan tried different methods to improve those.

> I did not define the sequence of the groups' presentations. I decided to give place to the ones who raise their hands and volunteer to present [their work]. However, four students from different four groups raised their hands at the same time. I decided to identify the sequence beforehand.

In addition to this, Miss Çalışkan had some provisions on some subjects in the light of feedbacks about responding to the needs of groups and dealing with each group.

> When he observed my lesson, my supervisor told me that I did not deal with the groups equally. He stated that, I supported some groups and not interested in others.

Upon teaching of lessons Miss Çalışkan had feedbacks about developing the forms she used for observations and about their usage more efficiently. For example, Miss Çalışkan evaluated groups' study process and success of the groups with a single tool and combined item. She got a feedback about this proposing that a tool designed for evaluating students' problem solving and group work processes separately. She developed such a tool, practiced to identify the items which were working as intended and which were not, and developed more for the following practices. Such feedbacks about the need to develop gave direction for Miss Çalışkan's reflections after the teaching practices.

> Upon the process I am going to prepare an observation scale, it is a kind of defense tool against students. "Look it is here, I had told you that, so you keep your promise." We evaluate the students so they can evaluate the lesson.

Miss Çalışkan preferred to get support from the teacher of the lesson to avoid risk of having false impression about students. For example, a case in which a successful student kept solving the problem by using routine operation algorithms while a less successful student already completed solution by using a strategy doing operations in mind showed her that knowing students was not an easy job.

> Some students had better performance at some questions though they had lower performance in some questions. Student A did not seem to solve the problems, but in one question he solved in his mind before Student B completed writing. I can categorize wrongly in such situations. Problem solving is a complicated process, containing a lot of things, skills…

4.2.3.2.3 Improvement for the Next Practices

During reflection process upon teaching of each lesson, Miss Çalışkan had reflection about which *points she would change* if she conducted the same lesson again. Miss Çalışkan had decisions in many areas regarding the following lesson such as decreasing the number of problems to be solved, having more time for some parts of the subject and giving directions before group work.

> I would not solve all "Let's do it together" questions [in the course book] on board, I would be selective. Perhaps, I would not solve all questions which have common features. Apart from that I would not do any changes.

Miss Çalışkan had reflections about students' practice in lesson, control of these works and control method. She had some practices such as controlling the phases during the progress of work from time to time, walking around among students and giving feedback, and stopping the work and sharing the solution with class. She was successful in some of them and observed that some were impractical or had a negative effect on learning. Therefore, she had reflections for following practices accordingly.

> I used this method for the first time in class. I asked students to raise their hands and explain as soon as they solved the question. I decided it was not a good method. Because while they were fully concentrated, one student raises her hand and says she has done. When I say one of your friends solved let us investigate, then students' concentration is broken.

4.2.3.2.4 Identifying as a Learner

During reflection practices upon teaching, Miss Çalışkan emphasized that especially problem solving process was a complex process. She put forward that having some breaks would be worthy since students would be tired due to concentration for long time. She found it appropriate to give such a right to students in such exhaustive work based on her *own experiences as a learner*.

> The problems were difficult, so they were tired, it is normal. When I focused on something for a long time, I gave a break and go to window to look at out trying to free my mind. I think this process similar. The problems were difficult. So, I tolerated students as well. I had empathy with them.

The list of main themes regarding orientation of reflections after teaching practices was given in Table 4.18.

Table 4.18 Orientation of reflections after teaching practices

1. Identifying strength in being a teacher
2. Identifying the areas of needs for improvement
3. Identifying improvement for the next practices
4. Identifying as a learner

4.3 Reflections at the end of the Practice Teaching

4.3.1 Content of the Reflections at the end of the Practice Teaching

4.3.1.1 Planning

According to Miss Çalışkan, *theory and practice* were different from each other. In practice, there might be unexpected results of a theoretical approach.

> For example, knowing what a group work and how it should be are not enough. Whatever the knowledge in theory is, everything is different in practice. For example, for my previous lesson plan, I was thinking that it was a good plan but it needed more work to put in practice.

Miss Çalışkan stated that teachers should plan not only knowledge based on *goals and benefits required by the lesson*, but also goals and benefits on affective and kinesthetic skills while planning the lesson. Apart from that, Miss Çalışkan added some goals to lesson plan such as "Helping students love mathematics" and "Helping students to see joyful side of mathematics" especially in initial lesson plans, but she had to remove them in following plans due to feedbacks she got from the teachers.

> The teachers should write emotional objectives as well while they write the objectives, I think. [They should also have] Kinesthetic skills such as developing fine motor skills.

Miss Çalışkan pointed out the *intensiveness of the curriculum*. She thought that it was not possible to cover the yearly program in a teaching based on constructivist approach.

> In one lesson, for example, we used a method to measure the performance; it would be good to make it in each lesson. Making it with different techniques would be better but I have a plan to conduct and complete.

Miss Çalışkan considered the *grade level* during planning period. During the practice period of teaching experience lesson, which provided an opportunity to observe middle school and high school lessons, Miss Çalışkan was able to work with many students of different characteristics at different grade levels from 5 to 12. She participated mostly at grades 5, 7, 10 and 11 and also had the opportunity of observing grade 9 and grade 12 students from time to time.

Attributable to having students at different age groups and also at different grades and characteristics of similar age groups, Miss Çalışkan needed to have different approaches while planning the lessons for those classes. For example, at grade 12 and even at grade 11, because of being close to national examinations, Miss Çalışkan needed to add techniques for solving multiple choice questions in her planning. Miss Çalışkan took care of *success level of classes* while planning lessons of different classes in same level, for example by increasing the difficulties or the number of questions in examinations.

> Some classes are at a higher level, I think it is better if they are supported by advanced level questions.

Miss Çalışkan took care of *needs and characteristics of students*, their interest in mathematics and familiarity with team work while planning the lesson. Miss Çalışkan tried to conduct more challenging studies in an academically oriented class, whereas she emphasized more interesting and motivation increasing tasks while planning and conducting teaching in classes with less interest in mathematics. In classes familiar with group work, she included group work and she planned accordingly in more self-study oriented classes. Miss Çalışkan thought that these kinds of projections and consequent plans were useful for students and more effective both for students and the teacher.

> Student characteristics and student needs show me the way. While deciding, interest of students is a factor as well. Some classes are more academic oriented; performing activities in those classes might have motivation decreasing effect. It is more useful to prepare a lesson plan in which knowledge is a bit more prioritized. There are some classes where group work is liked and preferred as well. It is very useful to perform team work on those ones. In this way both teacher and students enjoy the lesson.

Miss Çalışkan considered students who did not like mathematics or had fear of mathematics and she tried to inverse the situation of *having fear of mathematics.* According to Miss Çalışkan, to be able to show students that the mathematics was in real life, to be able to change the perception that it was a difficult lesson, and to increase their awareness of the role of mathematics in making life easier, the teacher should add parts regarding those concerns during the teaching.

> In my opinion when we consider mathematics, we see that students have an initial negative approach. This is partially due to the perception in their social context. I think, instead of trying to convince that mathematics is not something to fear, it is better to show that it is something we use in real life by providing examples from real life, even relating it to history in some cases. […] Student perception is that mathematics cannot be done, it is difficult. Because of this, I think it is useful to teach students that mathematics is usable and useful, used everywhere indirectly and directly whenever necessary.

Activities and questions were the main tasks of teaching in planning period for Miss Çalışkan. While planning the teaching, Miss Çalışkan decided on *preparing activities for a good conceptual understanding*, adapted existing activities according to student characteristics, and decided the kind of questions for different situations and reasons. She thought about which kind of questions to ask, which questions can raise different questions and prepared a base for other discussions and planned accordingly.

> The activity performed during the lesson should be related to the lesson content. I think about the students before planning the lesson. Which activity would be better/proper for this class or which questions I should ask? I even prepare those as well. I plan which question I should ask to which student.

It was necessary to add certain tasks into planning that the students could have a concrete understanding of the subject. First of those tasks was *use of materials and manipulative*. Miss Çalışkan reflected on using concrete materials as a tool for improving skills of students. She had various activities in planning to improve not only formal conceptual skills but also skills related to affective domain and psychomotor domain. The material selection was another important part of the plan and Miss Çalışkan needed planning from several viewpoints such as which material would be used in which class level, adaptation of available material according to the aim, and suitability of the material to the content.

> Apart from that I like using things that would improve their hands on experience and skills. I think it is useful, for example, to have cut and paste needed activities… How I use the materials depends on the class level in some sense. I take care of other materials as well, depending on their suitability to lesson content and class levels.

Another planning perspective which was related to material and activity selection was *use of games*. Miss Çalışkan claimed that use of games was an important contribution especially in lower grade levels such as in middle school. Using games served more than one purpose in initiating interest of students, providing active role for students in learning process, and relating multi-way and conceptual thinking subject to learning. In this respect, deciding on which game would serve for which purpose, making adaptations for applications of game, and preparing easy-to-understand directions were other reflections that Miss Çalışkan performed while planning.

> I think some time for mathematics games can be allocated. I select the games which motivate the students in a multi-way thinking, increase the interest of students, suitability to the level and content of the subject and not having complex manuals. I even think it is important whether it is easily portable or not.

The list of underlined issues related to planning at the end of practice was given in Table 4.19.

Table 4.19 Reflections related to planning at the end of the practice

1. Practicing theories
2. Writing objectives of the lesson
3. Handling the intensive curriculum
4. Considering grade level and success level of students
5. Answering to the learning needs and characteristics of students
6. The fear of mathematics
7. Preparing activities for conceptual understanding
8. Using materials and manipulative
9. Using games

4.3.1.2 Teaching process

Miss Çalışkan was positive about *using technology* in teaching. However, she tried to have precautions by thinking there might always be technological problems. She already had such problems during her own teaching practices and put alternative actions into place.

> I mean this is technology at the end of the day, so there might be things you will learn or you might confront with unexpected problems. Because of that, I want to go to lesson earlier and want to start all materials ready upon removal of all troubles.

Miss Çalışkan had reflection on this issue based on the difficulties she had while *practicing in subjects* she had theoretical knowledge. She decided to work more on improving the practice for following lessons and thought about various strategies.

> I evaluated myself upon delivery of the lesson as well; I think there are some points on which I need to improve. Perhaps that is better if I get prepared by doing practice before the lesson by telling the subject to myself, loudly or quietly, by using paper as board, by forecasting the questions student might ask. From now on, I am going to improve myself on practice of those instead of theoretical knowledge.

Miss Çalışkan thought that the teacher should *understand the content* of subject to be taught, differentiate in which scope it should be handled in different class levels, explore the relation of the subject to other subjects in mathematics and work on concepts to provide reflections to daily life and other disciplines, while preparing the lesson. She expressed that she did such a work for all lessons involving new concepts and managed this in the form of a mind map by doing brain storming.

> Before writing in plan format, I wrote it like mind map by using arrows etc. while preparing the lesson plan. Mine is like graphic organizer. We use graphic organizer to establish relations among things. Sometimes it is something like this, for example, while I think about how I prepare my lessons, there are a lot of things coming from a lot of directions. It seems it is hard to combine them, so I need to write them down. When I write them, I write them one by one and then I try to set up connections between them.

Miss Çalışkan claimed that there might be concepts that a teacher would *feel close to subjects* and she would feel relatively away, which might have an effect on

teaching of the lesson. Based on her own experience, she expressed that the teacher could prepare more comfortable, more confident, better quality and joyful lessons on subjects she would feel close: “I like forming graphics as well, so the lesson process was good for me.”

For Miss Çalışkan it was important that the students should aim for the learning and need for learning the concept. She believed that meaningful learning occurs if the student could find an answer to the question of “What is the benefit of learning this?” In this respect, she tried to include tasks which would support the background and rationale behind learning the concept.

> When they have a profession they will not use just mathematics again. I mean even if they will have different professions, they will always use mathematics. Because of this, that might be the answer to the question of why they learn mathematics.

Another point contributing to the teaching process of Miss Çalışkan was *getting help of metaphors*. Miss Çalışkan used metaphors while planning and conducting lessons to help students easily visualize the concept. The point here was that she experienced the utility of metaphors during her own learning process. Therefore, she believed that students benefit from metaphors.

> While teaching mathematics, I often use metaphors. And I tried this in different grade levels to check whether it was useful. For example, while I was teaching factorization I used soldiers as an example and while I was teaching linear equations I used family as an example. This helped students to visualize the concept better.

The list of underlined issues related to teaching process at the end of practice was given in Table 4.20.

Table 4.20 Reflections related to teaching process at the end of the practice

1. Using technology
2. Practicing subject
3. Understanding the content
4. Feeling close to the lesson content
5. Providing environment for meaningful learning
6. Getting help of metaphors

4.3.1.3 Assessment

According to Miss Çalışkan, grading should not be the single way of evaluating students. The teachers should evaluate the students not only in terms of their knowledge, but they should follow a way in evaluation of students' learning and improvements as a whole by using *different assessment tools and strategies.*

> It should be not only the academic knowledge given to the students; in fact, it is something related to teachers. The teachers should not evaluate the expectations from students via grades and let student feel this. The list I prepared for high school students was not so covering but I realized the effect of it.

According to Miss Çalışkan students should *participate actively in evaluation process* as they participated in learning process. In other words, she expected from students to construct the knowledge by themselves, then objectively they should have the opportunity to evaluate their learning process and results. In this respect, Miss Çalışkan tried to provide several opportunities which students could make self-evaluations during teaching experience period, and developed tools for this purpose.

> Apart from this I think self-evaluation forms filled by students are useful both for students and for me. I think students' having a role in evaluation is very important. If we want students to construct the knowledge, then evaluation of how they learned is their right. In my opinion, we direct them to build the knowledge so we need to give them the opportunity to evaluate as well.

Miss Çalışkan used other tools to evaluate learning process and to *motivate the students*. She provided feedback to students about their learning and at the same time motivated them by using strategies such as writing names of students who

completed the work as expected in order of completion time, rewarding the ones who quickly and correctly completed the work, and supporting the slower ones.

> I observed it was highly useful to write down the name of the student on the board. It is a feedback for both teacher and student.

Miss Çalışkan had several practices of *pretests and posttest* which she used for checking preliminary knowledge of students and evaluating effectiveness of learning process upon teaching respectively.

> I think pretest and posttests are very useful both for student and teacher. Using pre and posttest is not only useful for controlling students' existing knowledge about a particular concept, but also provide opportunity for classroom management. For example, in one of the lesson in high school, students, since I said that I would use the result of pretest in marking, answered the questions in pretest more accurately and willfully.

The list of underlined issues related to assessment at the end of practice was given in Table 4.21.

Table 4.21 Reflections related to assessment at the end of the practice

1. Using different assessment tools and strategies
2. Involving students in assessment process
3. Motivating and rewarding students
4. Using pretests and posttests

4.3.1.4 Classroom Management

For Miss Çalışkan, it was important that students contributed to learning environment by performing the works and by having an active role in learning. She thought that students should especially have *expectations about classroom rules*. However, she thought that the teacher first should behave properly based on those rules to support the learning environment.

> Since this is something you expect from your students… Whatever rule you show to your students, you expect it from them. Because of this, I think [it is good] to prepare everything by going earlier.

Another subject Miss Çalışkan had reflection upon teaching of lesson was silence of the class. According to Miss Çalışkan, there must be *communication* and students must be able to have proper environment to share their ideas and to ask questions in an inspiring learning environment.

> It is good if the class is quiet but I am not sure whether learning occurs. It is important that students can be on board, have courage to share their ideas. Quietness is good but more of it can block the things that can be questioned. I would wish students be comfortable in my class but there would be a limit on this comfort.

The list of underlined issues related to classroom management at the end of practice was given in Table 4.22.

Table 4.22 Reflections related to classroom management at the end of the practice

1. Providing essential agreements
2. Learning by communicating

4.3.1.5 Students and Their Learning

Tracking students' learning process, finding solutions to the cases in which they have difficulties in understanding and leaving the plan aside if necessary was important for Miss Çalışkan. She believed that it was better to conduct a *modified plan responding students' needs* instead of conducting the lesson plan strictly as it is, since the main aim was the optimum learning of the students.

> I did so yesterday, for example, I did it feeling really good upon conducting the lesson. Perhaps I was not loyal to plan but I was sure that students understood well. I was happy when I saw the students answered the questions asked upon the lesson yesterday.

Miss Çalışkan highlighted while doing reflection the need to have detailed information about *current knowledge and skills of students*. Miss Çalışkan emphasized the importance of having such information while planning the lesson and saw that information as a factor shaping the learning process.

> I think it is better to handle the subject with all aspects. While preparing the lesson plan, I need to know the current status of students as well. Those are the things which shaped conducting the lessons.

On the word of Miss Çalışkan, the most important attributes that students should have in the process of learning mathematics was *not being afraid of mathematics.* Other expectations of Miss Çalışkan about the students were their awareness related to necessity and use of mathematics in daily life, reflecting learning of mathematics concepts to other lessons and solutions to real life problems, and having an active role in learning process. Miss Çalışkan alleged that if the students became active learners at the center of learning process, then their interest and mathematics would increase as well, and this issue can be supported by various activities, games and materials.

> Not everyone needs to like mathematics, but I want my students to know that mathematics make life easier, satisfy their needs and they will use it in daily life even if they do not like it. By the activities I perform, I try to make students like and even feel the mathematics… I believe a student likes mathematics in time by finding things while researching and being in the center of learning with games and activities.

Maintaining positive communication with students and providing a *comfortable learning atmosphere* were other attributes Miss Çalışkan developed. She claimed that positive communication with students not only in classroom but also out of class provided contribution to lesson teaching.

> Except for that I think my communication with students is good. This is valid for communication while teaching in class as well.

The list of underlined issues related to students and their learning at the end of practice was given in Table 4.23.

Table 4.23 Reflections related to students and their learning at the end of the practice

1. Modifying lesson according to student needs
2. Knowing more about students' current knowledge and skills
3. Abolishing the fear of math
4. Providing a positive learning environment

4.3.1.6 Teaching Profession

While evaluating her first lesson, Miss Çalışkan pointed out that she did not know much about students and students did not know about her either. She thought that this might have made them anxious and she had some worries as well. She revealed that while making the *first lesson preparation*, she did some planning related to letting them feel more comfortable.

> Even at the first lesson, although I do not know the students, I think I should consider the situation of them as well, they do not know me either. At that moment I am in a position to manage them. If I feel like this, it is very normal for students feeling stressed. I targeted to prepare an environment both good looking and students can feel comfortable in expressing themselves.

Miss Çalışkan declared about *being excited* while planning the lesson and she felt the same during the lesson as well. She told that she imagined the students and lesson while planning the lesson and negative situations such as not being able to answer a question or to teach the concepts, caused her be worried. Miss Çalışkan tried to provide solutions to this problem by time as she experienced different class environments and by the help of feedbacks she received.

> I am excited before every lesson, even now while talking about this I am excited. It happens whenever I plan the lesson. While preparing the lesson plan, several questions related to teaching process in class come to my mind such as "If one of the students asks that question, how should I answer? What happens if I don't know the answer?…" Before each lesson, I think those kinds of things… Shall it go in this way forever; shall I be excited before each lesson?

While evaluating her *last lesson*, Miss Çalışkan expressed that she was happy and stated that the reason for this happiness was feedbacks from students.

> I do not expect I will forget the lesson of last week. It was the best lesson in terms of my teaching, positive feedbacks from students made me very happy.

Miss Çalışkan expressed her thoughts about when she would be a *good teacher*. She thought that she would be a good teacher when she would feel herself more comfortable and able to conduct the lesson as planned, adapt activities according to needs and student characteristics, improve her teaching upon the

feedbacks, develop learning products and make practices which would provide a base for new ideas and new learning.

> I think I will be a good teacher when I confidently start the lesson, when I complete in a more timely fashion. I am getting progress in a path of being a good teacher now. What if the students cannot learn the subject? I think adjusting activities according to class, applying feedbacks, planning according to student needs; at the same time forming products, knowing which activity to use where open the way to become a good teacher.

Miss Çalışkan pointed out the importance of sharing the knowledge that she had with students and defended that being a teacher could be considered as a theatrical art in this respect. She thought that being a teacher was, in fact, acting and the teacher had many roles.

> Teaching is very good. Sharing something you learn with students. At that moment you are the authority of the class. I think classroom as a podium and being teacher is acting.

What is more, Miss Çalışkan asserted that being teacher was not a profession but a bigger thing which contained some parts of many other professions in different ways.

> Being teacher is not a single profession, being actor/actress, being psychotherapist. It contains the features of many professions.

Miss Çalışkan had a reflection about the necessity of a teacher manner which included the words she used and even her outfit. She highlighted the details such as language in communication with students and words used, and defended all those were effective in how students would see the lesson and in their learning process.

> I think it is important to use a positive language about the behavior expected from students. In fact, everything is important, from words you use to your clothes. I think everything is important, spontaneous behaviors, the tone of voice…

At the end of the PT period, Miss Çalışkan reflected on the role of teacher as well. According to Miss Çalışkan, the role of the teacher in teaching was directing and guiding. Either in group work or in self-studying works or in all class works, the one who directed the process, and who provided the environment and opportunities for students to construct the knowledge themselves was the teacher for her.

> In my opinion, the teacher should be the one who provides the environment. The teacher should provide the learning environment, should provide resources but give students the opportunity to reach the knowledge by themselves.

Miss Çalışkan expressed that feeling herself as a candidate teacher and *feeling like the real teacher* of that class were different especially during the teaching of initial lessons. During the first teaching experiences, she tried to feel herself as the teacher of that class as a way of overcoming the worries she had, by getting help from the teachers who were monitoring the lesson.

> Perhaps I will remind myself this: You are not in this class as a preservice mathematics teacher, you are here as a real teacher... Today I decided to behave other way around and I felt the lesson was more effective when I felt myself more like a real teacher.

At the end of the process, Miss Çalışkan associated *effective teaching* with student centered teaching approach. Miss Çalışkan thought that it was a permanent and effective building block for effective learning when students considered knowledge as something they can reach and teacher only provided guidance so they could learn themselves by searching, querying and constructing the knowledge in learning environment.

> In my opinion, effective teaching is student centered teaching. Instead of transferring all knowledge (information) to students, letting students to build (form) that knowledge themselves and leaving may be not all but most of it to the students is one of the building blocks of an effective teaching.

The list of underlined issues related to teaching profession at the end of practice was given in Table 4.24.

Table 4.24 Reflections related to teaching profession at the end of the practice

1. Planning the first lesson
2. Being anxious in class while teaching
3. Feeling about last lesson
4. Being a good teacher
5. Feeling like the real teacher
6. Teaching effectively

4.3.1.7 Personal Characteristics

According to Miss Çalışkan, one of the most important personal strengths which contributed to her improvement during teaching period was *being patient.* This helped her in handling student problems during the teaching of lessons, dialogs with students when the lesson did not go well as intended, and planning highly intensive teaching period.

Miss Çalışkan had a passion for research. Examples of how Miss Çalışkan used this strength to support teaching process were her studies related to planning, searching for activities, designing, adapting and developing materials by wondering and searching.

Apart from loving research, desire *to learn a subject of interest widely and deeply*, and reading a lot were other strengths of Miss Çalışkan contributing to the teaching process. By using those strengths, she increased the possibility of answering variety of questions from students and at the same time had the opportunity of sharing recent learning.

Miss Çalışkan thought that the most important personal strength which contributed to her teaching experience and future professional life was her *fighting spirit.* She thought that having this fighting spirit made her resistant to many difficulties both during teaching experience and future teaching period.

> I think I am patient. I never give up researching; this is another attribute I am strong in. I like researching, going into deeper parts of the subject, learning and sharing what I learnt with students. Since I do a lot of research and read a lot, I think I am helpful to students in mathematics. I am not an easily broken kind, I know it needs fighting to be in a better position; I already start by knowing this. I think this fighting spirit has a contribution to my mathematics teaching.

The list of underlined issues related to personal characteristics at the end of practice was given in Table 4.25.

Table 4.25 Reflections related to personal characteristics at the end of the practice

1. Being patient
2. Having desire to learn deeply and widely
3. Having a fighting spirit

4.3.1.8 Requirements of the Teacher Certification Program (TCP)

For Miss Çalışkan, *participation in and continuity of lesson* were important factors for the success of her practices. Although she had a demanding PT process due to the requirements of TCP, being a teacher contributing to all lessons of a class had many advantages such as getting familiar with students. During the reflection process at the end of the practice, she highlighted that TCP was one of the programs which supported the continuity the most, compared to many other programs.

> If I had a fixed class, if I were just teaching to that class, if I fully knew them then, I would be able to balance both doing activities in lesson and letting student participate in lesson. For example, last year we were doing teaching practices once in two months. Although we were able to observe the class, we were not able to provide continuity.

She stated that it was very advantageous *to be in the schools where they practiced whole week* except a half day due to requirements of TCP. Miss Çalışkan highlighted that she was able to see the missing points during a lesson, then developed and corrected them in the next lesson by the help of such an opportunity provided by the program.

> I do evaluate myself sometimes. Today, for example, I realized this; I realized I am going fast. I mean it is useful if we come to lessons and teach consecutively. We even used to teach one lesson and then after a long time we used to teach another lesson. I mean we are doing something in one lesson, upon that I am planning to make something and I do have an opportunity to test it.

During teaching, Miss Çalışkan was observed from time to time by the teacher of the lesson due to the requirements of the program. She stated that, she was worried about *being observed* in those lessons due to thoughts of supervisor or teacher and she felt the pressure of showing what she learned from the teacher of the

lesson or the supervisor. She also expressed that she worked on lesson plan in more detail and it was transferred to the practice as well.

> I could have been more comfortable if I were monitored by the teachers who did not know me. Was I able to show what I learned? That made me stressed.

The list of underlined issues related to requirements of the program at the end of practice was given in Table 4.26.

Table 4.26 Reflections related to requirements of the program at the end of the practice

1. Participating lesson continuously
2. Being in the collaborating school all week
3. Being observed in the lesson

4.3.2 Orientation of Reflections at the end of the Practice Teaching

4.3.2.1 Identifying Improvement

At the end of teaching experience period Miss Çalışkan had strong personal attributes as well as improvement for needed ones. She reflected on several issues in which she identified developed areas and those she improved by means of PT process.

One of the areas she was developed was *planning and conducting group work.* She planned and conducted variety of group work in several grade levels, and also in same grade levels in different classes during the PT period. She planned and conducted various tasks such as group work evaluation criteria, measures for forming groups, and re-planned these tasks by evaluating the positive and negative issues of the previous performances.

For example, in one group work, she grouped students based on their success and observed that finishing time was different for each student. In addition to this, opportunity to learn from each other decreased. Hence, in the next group work, she preferred to form groups consisting of successful students, students with medium success levels and less successful students, to have more balanced groups.

> I think I am good in group work now. During my practice period I did a lot of group work and tried a different method in each, in the last one I was very good. I cannot say best because there is always better but I thought I was really good.

It was seen that Miss Çalışkan prepared lesson plans according to a variety of factors based on the *preliminary tasks considered in pre-planning period*. First of all, as mentioned in evaluations before planning, relating mathematics to daily life was one of the subjects Miss Çalışkan paid attention. Based on this, Miss Çalışkan searched about the relation of the concepts with daily life, areas of use in real life and use of those in different occupations and disciplines, and then adapted these ideas according to grade level.

> I support triggering the intent to learn first and doing this not only for mathematics but related to daily life and other disciplines.

Another point Miss Çalışkan paid attention was *motivating and initiating the learning interest in students*. She mentioned that she had improvement on this issue. She found it appropriate to include several games into plans, getting help from technology, interactive applications, virtual manipulative and activities touching to different senses of students. Miss Çalışkan also thought that mentioning about history of mathematics from time to time depending on the suitability of subject had positive contribution on increasing the interest of students. Therefore, she sometimes included some parts from history of mathematics in planning.

> I think technology is very useful. So I try to use technological tools. Those can be mathematics programs/software, calculators, manipulative over the internet; I use all of those as support materials…For example, I like to facilitate from the history of mathematics. While preparing lesson plan, I had a chance to learn about history of mathematics and in addition to this, I realized that students became motivated through the lesson when I incorporate history of mathematics into the lesson.

In line with Miss Çalışkan, another important topic in planning was *designing activities for students which would challenge them* to improve, think, research and work in collaboration. She reflected that she improved her teaching from this aspect.

The most important theme in deciding reachable goals was sufficient knowledge of Miss Çalışkan about *scope, sequence and limitations of the subjects*

and concepts to be covered at the defined grade level. Miss Çalışkan had improvements about this while gaining experience during the teaching period and while studying on reading and understanding the mathematics curriculum.

> Now I have more ideas about what to teach and what not to. I felt this when I realized I wrote more objectives for the lesson while I was viewing the goals of the lesson. For example, I prepared the last plan beforehand but when I reviewed it I thought it was much for two lesson period and decreased the objectives. We were just able to come to that point in lesson.

At the end of the process, the other strength of Miss Çalışkan was being capable of evaluating the learning process of students by using rubrics she developed for different reasons through the teaching experience. She had information about learning process by *developing several tools to evaluate students* in terms of learning and studying processes, found opportunity to give them feedback, also had an idea about what to change and improve in her own teaching process.

> Now I think I highly improved myself in giving directions, giving thinking time and preparing rubrics, I am aware of some of the things as well.

4.3.2.2 Identifying Needs for Improvement

There were some areas Miss Çalışkan reflected that she needed to improve by the end of the teaching experience period. The first one was *selection of activities.* Although Miss Çalışkan had selected several activities for different practices during the planning process, selecting new activities due to new teaching concepts and processes was challenging. The needs of students diverged for each grade level and even for different classes at the same grade level. Because of this, Miss Çalışkan needed to progress more in selection of activities for new groups of students and for different situations.

> I think I need to improve myself about activity selection. I think it will improve by teaching and by selecting activities for the classes I teach.

Further area that Miss Çalışkan needed to improve was *preparation of frequently used metaphors* in detail during the planning phase. Miss Çalışkan used several metaphors to make concepts easier for students to understand during the lesson and she generally used them spontaneously while answering questions of

students about the unclear concepts. Although the aim of using metaphors was making the concepts more visual and easy to understand, it also carried a risk of causing confusion, incorrect learning or misconceptions due to being spontaneous. On account of this the metaphors; lessons should be planned in detail by Miss Çalışkan before the lesson.

> Those [metaphors] are spontaneous allegories that I use during the lesson. For example, I symbolized exponents of 10 by the soldiers division in army. According to me, using this kind of metaphors is useful but should be prepared beforehand.

One more area Miss Çalışkan needed to improve was *studying about content knowledge.* To be able to provide correct and satisfactory answers to questions especially at higher grade levels, and to plan the teaching which would not result in misconception, Miss Çalışkan needed to improve her content knowledge and she studied as if she was learning that subject while preparing for the lesson and used visual organizers such as conceptual maps for preparation. She tried to consider herself as a student and looked for an answer for the question "How would I learn in a best way?" She also needed to work in preparing several activities especially for higher achievers in mathematics. Miss Çalışkan needed to be prepared for possible challenging questions especially from those distinguished students.

> I believe I should work harder on subjects. And I need to improve myself about predicting where the students can make mistakes. Since there are some students with really creative questions, it is not possible to answer those questions at that time. For this reason, I need to go through books more often.

Miss Çalışkan needed to improve her *knowledge of mathematics terminology in Turkish*. Miss Çalışkan had an undergraduate degree in mathematics. Since the TCP was in English, she learned the terms and notations in English. Because of this, she needed to improve in using correct terminology especially in lessons she taught in Turkish.

> I need to be more confident in mathematical concepts. Besides, I need to be more confident in mathematical concepts in Turkish, since I had an education in English for two years.

Miss Çalışkan needed to improve deciding on achievable goals while planning and conducting the lesson. She had many problems including *time*

management while trying to deliver highly rigorous plans because of trying to get many learning outcomes at the same time instead of focusing on basic fundamental concepts. Other problems were not being able to deepen the learning, to provide transition between activities and to enable meaningful learning.

> I think still I have problems related to time management. This is related to trying to cover many objectives in a limited time. Preparing too much learning outcomes is not realistic. Instead, I should decrease the number of learning outcomes for the particular lesson and try to combine them by means of meaningful activities I think.

Miss Çalışkan generally walked around in classroom and monitored the time spent by students, during individual and group work. Upon that, she emphasized on points where students faced problems, sometimes by getting students on board about the problems encountered and asking them to solve the problem by help of their friends.

> I give questions to students and want them to solve those by themselves in 10 minutes. It is useful for assessment and evaluation. It also gives an idea about which student you need to choose for solution. I think it is better to get the student who had trouble in question to the board and provide help. Student solves once more and gets it better.

In addition to those mentioned above, Miss Çalışkan needed to improve in reflecting on the learning of students for her own teaching process. For example, presenting sample of expected learning products contributed to *learning process of students* especially for those in mid or low success levels. Miss Çalışkan needed to make preparation for this. Observation records and feedbacks stated that Miss Çalışkan needed to improve much to be able to present correct examples. She thought that this was a point she needed to get improvement in as well.

> Especially the students at moderate levels want to see more correct things to be taught. I should work on this.

Developed areas of Miss Çalışkan and needs for improvement for her at the end of the practice were listed in Table 4.27

Table 4.27 Developed areas and needs for improvement for Miss Çalışkan at the end of the practice

Developed areas	Needs for Improvement
1. Using pedagogical content knowledge 2. Benefiting from experienced teachers' experiences 3. Benefiting from other preservice mathematics teachers' experiences 4. Preparing detailed lesson plans 5. Creating and constructing teaching and learning tools which considers students learning levels and interest 6. Planning and conducting group work 7. Doing good preliminary work for planning 8. Motivating and initiating the learning interest in students 9. Designing activities for students which will challenge them to improve 10. Having knowledge of scope, sequence and limitations of the subjects and concepts 11. Developing tools for assessment purposes	1. Selecting appropriate activities 2. Using metaphors to make content meaningful 3. Using content knowledge appropppriately 4. Deciding on realizable and achievable goals 5. Managing time 6. Evaluating the students' working processes and learning

4.4 The Way of Doing Self-Improvement Regarding Teaching And Learning Process in Practice Teaching

One of the ways that Miss Çalışkan improved herself regarding teaching and learning process in practice teaching was reflecting by referring back to the lesson plan. She reflected on the issues related to teaching practices by referring the lesson plan that she planned before the lesson. In addition to this, Miss Çalışkan reflected on the implementation of the lesson. Especially during the reflective practices performed after the teaching practices, she reflected on both planning and the implementation of her lessons in order to achieve self-improvement regarding

teaching and learning process. She sometimes discussed on what she would change when she would have an opportunity to plan or implement this lesson again.

Miss Çalışkan also improved herself regarding teaching and learning process by reflecting on courses taken and their requirements. She had several perspectives on this issue such as gaining insight from experenced teachers' experiences or getting pedagogical content knowledge.

Other two main areas that Miss Çalışkan made self-improvement regarding teaching and learning process in practice teaching was reflecting by thinking of weaknessess and reflecting by thinking of strengths. Miss Çalışkan underlined several issues in order to develop herself as a teacher. By means of reflections on the strenghts and weaknessess she showed improvement on many of those several issues.

The initiators of Miss Çalışkan's reflections were most of the time related to subjective reasons such as implementing first lesson with the students from a particular grade level, concerns related to classroom management and being familiar with terminology in Turkish. She started reflection from her teaching process most of the time and tried to make improvement regarding teaching and learning process.

Besides, supervisor's comments and sugestions and feedback from the mentors or other teachers who observed her lessons were initiators of reflections. Sometimes those reflections were related to immediate solutions such as changes in planned lesson, and sometimes were related to action steps that she should take in order to achieve self-improvement regarding teaching and learning process.

4.5 Change of Preservice Teacher's Reflective Practices through the Practice Teaching

Especially at the beginning of the PT, Miss Çalışkan had difficulties in constructing the format of group work, planning provision of equal opportunity for each student while handling the general control of the groups and whole class. Upon some lesson observations at the beginning of the process, Miss Çalışkan had some feedback about differentiating whether the noise was due to groups' working process or about subjects not related to the content of the lesson. Therefore, she decided to

get some alternative precautions to be able to control the group work better. Additionally, she had some feedback at the end of the process about the need for improvement in giving shorter and clearer directions especially in lower grade levels.

Though Miss Çalışkan needed improvement at the beginning of teaching experience, she had progress and used various supplementary tools along the process. Along with this, she was improved in practices such as giving both verbal and written directions, projecting the directions on board, presenting the directions at the beginning of group work and asking them to express it with their own sentences.

Another area Miss Çalışkan improved herself was giving directions. At the beginning of the practice, she had problems of lengthy and verbal directions and not checking whether the directions were understood or not. However, Miss Çalışkan improved those during the teaching experience period. She preferred to use visual aids as well as audio ones by writing directions on board or projecting them from time to time. She controlled whether the directions were correctly understood by asking students to summarize the work needed to be done.

Miss Çalışkan improved giving directions as well was giving time to students for thinking by the end of process. Allowing students to think widely about the questions without answering with the first thing that came to their minds and letting them to explain their answers with reasons can be thought as the indicators of this strength.

Although she had improvements during the teaching experience period, one of the areas which Miss Çalışkan still needed improvement was time management at the end of PT period. Miss Çalışkan had planned lessons more properly in terms of time management as she got familiar with the students. She started to make better decisions about how much it was possible to proceed in one or two lesson hours, or about how much of the lesson content could be completed. However, it was still possible for Miss Çalışkan to have similar problems about time management while dealing with non-familiar grade levels, students' success levels and new subjects to be taught. In this respect, time management was accounted as one of the areas Miss Çalışkan needed to improve.

> I used to have problems about time management at the beginning but now I realize that I do not have this problem. I think getting familiar with students gradually was effective on this. For new students, I may have problem with this issue.

Similarly, there were some issues of classroom management which needed to be improved by Miss Çalışkan at the beginning of the practice. One of them was use of blackboard. Miss Çalışkan needed to have some precautions during the process such as loosing classroom control while writing on board, being only in contact with the student on board and not the rest of class, or inversely not being in contact with student on board while controlling the rest of class. Miss Çalışkan might need improvement on those by variety of precautions.

> Sometimes I have problems about class management in mathematics lessons. When I turn back to the board to write down, the class becomes noisy. When I turn in half this time the image is not good and I write wrong or not readable. I am trying to improve myself on this. This seems as a little detail, seems as something manageable but it is not easy. Even the class does not feel it. I think it should be in that way.

While evaluating herself in terms of the teaching processes, Miss Çalışkan stated that she improved asking questions to students and teaching concepts. Classroom management was an area she needed the most improvement.

> I think I am a bit better in asking them to solve the problems, teaching the subject. I used to make lengthy explanations, now I think I make the introduction better as well. I think I improved myself about those. I should work on classroom management a lot.

Other two points Miss Çalışkan needed to improve were relating learning with other learning and asking correct questions which open the way to correct results. As stated by Miss Çalışkan, students learned concepts and subjects better when they related the learning to other disciplines and also to daily life. Besides, supporting students with correct and appropriate questions provided support in reaching the intended learning results. From this point of view, it was seen that Miss Çalışkan needed to improve those issues.

> And one more thing, I realized that students learn better if the subject is related to other things and by asking questions which will guide the student to the result while teaching mathematics.

When we look at the whole process in terms of changes in the content and process of the reflections that Miss Çalışkan made, we saw that she reflected on mostly the points she should improve and the ones she improved. This improvements and needs for improvements appeared due to the feedbacks she was given after the observations of her lessons, at times she realized those needs and sometimes I as a mentor made her realize those needs.

As the process continued, Miss Çalışkan's reflection content and her teaching were changed due to her improvement in several issues. In each week, in addition to the issues handled in before and lesson interviews, weekly interviews served as a catalyzer on Miss Çalışkan's reflection practice. These weekly interviews were an obligation of TCP, whereas the issues touched within those meetings made Miss Çalışkan think about and reflect on the issues that she had problems during the teaching process of that week.

In addition to problems, all the meetings and interviews gave Miss Çalışkan the opportunity to realize her strong points in teaching and the points she needed to consider developing. She had a chance to look back her current status and progress thoroughly.

Another facilitator for the reflective practice of Miss Çalışkan was related to the tasks given as requirements of PT process of TCP. Miss Çalışkan prepared several documents, which assisted her development during the reflective process, such as reports, documents of personal statements, reflection papers, and observation records within the PT process. Even lesson plans were influential in the reflective process of Miss Çalışkan. In addition to the feedbacks given as a result of preparing these documents, preparation process of them was also inspiring for her to make reflection on.

Undeniably, not only the tasks, feedbacks given by the observers, mentor or supervisor, and teaching itself were influential on Miss Çalışkan's reflective practice process, but also the overall structure of the TCP and structure of its collaborating school component influenced Miss Çalışkan's reflection process. This was realized by Miss Çalışkan as well.

Miss Çalışkan expressed her thoughts about the help of the reflection processes she had and how she thought in this process. In this respect, she had reflection on reflection. According to Miss Çalışkan, during the PT process, reflective thinking on the lesson plans allowed her to recognize positive and negative points of her ideas and analyzing them in depth.

> In fact, I think, thinking on my lessons is very helpful for me. For that reason, by this way, I analyze the things better. I think I know and evaluate the pros and cons of ideas I try to apply.

In addition to analyzing positive and negative points of her ideas while having reflection on the lesson plans, she highlighted the practices contributed by reflection on teaching processes.

> While thinking on them just spontaneously, I am having the opportunity of looking at a deeper level to my applications in the lesson. Perhaps, if I sit down and think about [these] alone, it will not be in such detail, but it is an opportunity to recognize both myself and activities I mentioned about.

The thoughts of Miss Çalışkan about reflection practices along the whole process were in the form of understanding of what was important for students and how the students were affected during the teaching process.

> I think this process contributed to me a lot. I experienced once more how important knowing students is, how students are affected from your behavior, importance of calling students by their names and group work is a good thing.

CHAPTER V

CONCLUSIONS, DISCUSSION AND IMPLICATIONS

The aim of this study was investigating reflective practices of one preservice mathematics teacher, who has been attending to a non-typical TCP in Turkey, on self-improvement regarding teaching and learning process during Practice Teaching (PT). In this study, the reflection "implies an active concern with aims and consequences, as well as means and technical efficiency; it was applied in a cyclical or spiraling process, in which teachers monitor, evaluate, and revise their own practice continuously" (Pollard et al., 2005, p.15). The term reflective practice was used for reflection process of the preservice mathematics teacher during PT. The research question sought in the study was "How does one preservice mathematics teacher perform reflective practice on self-improvement regarding teaching and learning process in practice teaching?" In the light of this main research question, the study aimed to find answers about content and orientation of reflections of a preservice mathematics teacher on her previous experiences at the beginning of the practice, before, during and after her teaching practices and at the end of the PT period. Besides, the preservice mathematics teacher's (Miss Çalışkan) reflections related to reflective practices in the program and change in her reflective practices through the teaching practices were investigated.

The data collection tools used in this study were interviews, observations, documents and weekly reflective thinking notes of Miss Çalışkan. The focus of this chapter is to discuss the main research findings relevant to research questions and six sub-questions derived from the research question. In addition to this, implications for practice, for further research and for my future career were presented.

5.1 Conclusions and Discussion

In this part, the aim is to present and discuss the findings of this study in light of related literature. This part is organized under the subtitles “Reflections at the Beginning of the Practice”, “Reflection during Practice Teaching” and “Reflections at the end of the Practice Teaching”. Reflections within PT period are divided into before, during and after teaching practices and the last part aimed to look the reflective practices throughout the PT period.

5.1.2 Reflections at the beginning of the Practice Teaching

During reflection processes at the beginning of the practice, Miss Çalışkan underlined some issues related to *Teacher Certification Program (TCP) and its requirements*. Those issues were getting pedagogical content knowledge, meeting with teachers, having insights from their experience, sharing knowledge with other preservice mathematics teachers, executing tasks assigned by supervisor and fulfilling responsibilities required by the lesson, observing students at different class levels, preparing detailed lesson plans and selecting and using different resources for different purposes. Research suggest that teachers view their practicum experiences as an extremely important and essential component of their induction into the profession (Zeichner & Gore, 1990). Similarly, for Miss Çalışkan, the courses that she took in the first year of the TCP provided remarkable contribution to her as a future teacher. Among several courses, School Experience (SE) course in the first year of the TCP had great contribution to her from several aspects. One of those aspects was the opportunity to observe several classes, grade levels and teachers. Observations and peer observations (Frid, 2000; McDuffie, 2004; Nicholas, 1994) are ways that preservice and inservice teachers can use in crafting reflection on their teaching practices. One can draw little or learn a great deal from one’s experiences, however, how much we learn from these experiences and how they affect our ideas about practice vary (Zeichner & Liston, 1996). Miss Çalışkan tried to use the information and experience that she gathered by observing other teachers in her teaching process in the second year PT course period as best as she could. Besides, she benefited from the other preservice teachers’ experiences, which have been suggested as a valuable learning resource for other preservice teachers (Zeichner &

Liston, 1996). Miss Çalışkan did not only gain information by means of observing other teachers, but she also used the other preservice teachers' experiences for her development.

In addition to the issues related to TCP and its requirements, Miss Çalışkan emphasized some topics related to *teaching process* such as taking alternative lesson plan into action, gathering information about students, managing time, selecting appropriate materials, using activity paper, using technology. Miss Çalışkan reflected on those issues with regard to the teaching process within SE lesson taken in the first year of TCP. She might have reflected on these issues most probably because preservice mathematics teachers tend to reflect based on their personal background, field experience contexts, and the mode of communication (Lee, 2005). Miss Çalışkan's reflections about teaching processes could be considered as consequences of her previous experiences as a prospective teacher.

Miss Çalışkan tried to differentiate her actions as those she was successful and felt developed and those she needed further development in her reflections. Miss Çalışkan mentioned about those points at the beginning of the practice as using pedagogical content knowledge appropriately, benefiting from other teachers' experience, preparing detailed lesson plans and being creative in preparing appropriate materials for maximizing students learning. In addition, she discussed the needs for improvement at the beginning of the practice on using several resources, making transitions between phases of the lesson, taking alternative lesson plan into action, gathering information about students, managing time, selecting materials for different purposes and using technology. These notions were sometimes the comments of mentors who observed her lessons in SE period in the first year and sometimes consequences of her thoughts on the lessons she taught. Teacher mentors support, model and sustain useful classroom practices (Darling-Hammond, 1997). The comments that mentors gave to Miss Çalışkan based on her observed lessons were supportive for her in sustaining more effective lesson delivery.

5.1.2 Reflections during Practice Teaching

Schon (1983) called the reflection which occurs before and after an action as reflection-on-action and called the reflection which occurs during the action as reflection-in-action. Reflection both in and after action is vital in order to weigh instinctive practices (Griffiths, 2000). Once the outputs of the study were evaluated, it was seen that Miss Çalışkan generally made reflection before or after the teaching processes. Although she had reflective practice while the active teaching process continues, her reflections during the delivery of the lesson were relatively less in number and in variety, compared to before and after lesson reflections.

When the reflections of Miss Çalışkan before lesson interviews were reviewed, it was realized that she had reflections on planning, decisions and reasons behind them, teaching in general, and about the points she considered in pre-planning period. Miss Çalışkan's reflections related to *planning and teaching process* before teaching practices were related to preliminary analysis-resources, planning and conducting group work, rewarding students, giving directions, preparing alternative plan for early finishers and differentiation, posing problems to students and rationale behind of this, using handout or worksheet.

The baseline for the reflections made by Miss Çalışkan before lessons consisted of results obtained in previous lessons, the positive issues, and the issues which needed improvement. In addition to those, the reflection process before teaching contained consequences of the reflections which were underlined after lesson interviews and consequent action steps of those reflections. This finding is consistent with Schön's (1983) assertion about reflective thinking process which is initiated by the perception of something troubling or promising, and it is determined by the production of changes one finds satisfactory or by the discovery of new features which give the situation new meaning and change the nature of questions to be explored. Indeed, preservice teachers have been reported to use their pedagogical content knowledge in anticipating problematic events and in reflecting on problematic events in instruction (McDuffie, 2004).

Reflective thinking is a process with a cyclic nature (Clark, 1995; Dewey, 1933; Lee, 2005; Pollard et al, 2005; Schon, 1983). It is a continuous and active procedure and is related to classroom enquiry, teaching experience, and beliefs. Dewey (1993) defined the reflection process which is cyclic in nature as a kind of problem solving process and defined the anticipated problems as initiators of reflective action of teachers. Reflective thinking process of Miss Çalışkan was performed in this way. When she had problem in one of her lessons, she used this problem as a starting point for new lessons. In other words, that problem was a preliminary consideration for her in next planning period.

Miss Çalışkan reflected on *students' learning* before teaching practices with focus on grouping strategies and flexible grouping, sharing responsibilities in groups, defining factors affecting the selection of activities and teaching method, planning problem solving process, learning a new concept, teaching a concept that requires prerequisite knowledge, using manipulative and having students actively been involved in learning tasks. Teachers target to develop effective teaching practices through the reflective process (Dewey, 1933; Lee, 2005; Schon, 1987; Sparks-Langer & Colton, 1991). Miss Çalışkan's reflections on student learning seemed to exemplify her quality concerns as they focused on teaching conceptually for understanding, making connections within content (Shepard et al., 2005) and directing attention through student engagement (Marzano et al., 2001). By observing the students' work and reflecting on their learning processes, constructions and understanding, she was able to provide variety for the learning environment in ways that were more appropriate for the students.

In addition to area of reflections aforementioned, Miss Çalışkan made reflections before teaching practices related to *assessment* and *in-class dynamics* as well. Reflections related to assessment were on students' active involvement in evaluation process and using rubrics. There is an emphasis on the literature that reflection is strongly related with experience, in other words, practice. As stated in the literature, teachers can engage in these reflective practices in any time they need to progress (Frid 2000; Jaworski, 2006). Developing rubrics for assessing the learning of students was one of the points that Miss Çalışkan expressed that she

needed improvement. As a consequence, she tried to find ways to develop rubrics for several assessment purposes.

Reflections related to *in-class dynamics* before teaching practices were; preferring group work, organizing the number of students in groups, managing group work, working on the task and silence, providing opportunity for movement in classroom. Group work provides students to improve their problem solving skills; furthermore, their way of expressing themselves becomes better (Koçak, Bozan & Işık, 2009). Miss Çalışkan benefitted from it and declared the reasons of using group work in the same dispositions in the literature.

Miss Çalışkan reflected on her teaching practices in relation to identify the areas of needs for improvement. One of those main areas was developing and subsequently taking precautions for time management. According to Dewey (1933), initiator of the process of reflection for teachers is the moment that they experience a difficulty, wearisome event, or experience that cannot be immediately fixed. For Miss Çalışkan, time management problem was one of the initiator of her reflection. Acting on reflections distinguishes reflective practice from just thinking back and may be an important aspect in the development of teaching (McDuffie, 2004). Miss Çalışkan, not only realized this problematic issue, but also performed some actions in order to make it better through her reflection as indicated in the literature.

The factors affecting the reflections of Miss Çalışkan were sometimes related to concerns about her own teaching. The main themes under those worries were related to issues about the delivery of the lesson such as providing environment for the students' learning. Research reported that preservice teachers have regularly disregarded students' learning during teaching processes (Schussler et al., 2010; Tirosh, 1993). Preservice teachers, especially in their preliminary experiences, ordinarily have concerns about the delivery of the material. In their teaching experiences, they initially consider how to practice techniques, and then they focus on students' learning and curriculum (Fuller, 1969). However, the present study findings showed that when a preservice teacher was involved in reflective practices, she focused on issues of students' learning in relation to her teaching more, rather than soley her practice.

In addition to this, Miss Çalışkan desired students to love mathematics and to be able to answer the questions asked during the lesson correctly. The answers given by the students and unintentional situations during teaching process were some initiators on what Miss Çalışkan made reflection. Reflections during the teaching practices related to student' learning were differentiating lesson according to student characteristics and changing delivery strategy according to students' reactions. Her reflections during the teaching practices related to in-class dynamics were delivering lesson alternatively with precautions for time management**,** motivating and rewarding students**,** dealing with students' differences and promoting students who easily lost attention. Miss Çalışkan reflected in the action and tried to find solutions immediately to fix anticipatory problems occurred while teaching process was going on.

Most of the reflections that Miss Çalışkan performed on actions occurred after lesson interview period. In general, she discussed about and reflected on the actions of her during the teaching process, its positive parts and issues needed improvement, and decided on the actions for the following teaching practices accordingly. Jaworski (1998) defines reflective practice as "a rather thoughtful way of teaching, evaluating what occurs and feeding into future planning without a demand for overt, critical, knowledgeable action" (p.7). For Miss Çalışkan, after lesson interviews served in some way as the opportunity for future planning. The intent of reflective practice is to increase the quality of practiced performance (Osterman & Kottkamp, 1993). Miss Çalışkan, by means of benefiting from the results of reflections on taught lessons, had effective reflections and planned her future lessons in a better way.

Miss Çalışkan's reflections after the teaching practices related to *classroom management* were giving directions and managing time. In addition to those, she made reflections on *knowledge about students* by means of knowing the names of students, being ready for the content, being ready for the group work and having differences in skills. Reflections after the teaching practices related to *students' learning* were planning the problem solving process, providing challenging learning environment, providing opportunity for procedural fluency, using concrete materials, putting alternative plan into action, using board, and increasing the level of learning.

Reflections after the teaching practices related to *teaching process* were reaching the aims and objectives of the lesson, using visual models to make concepts more concrete, considering the role of teacher during group work, and relating the concept with other concepts in mathematics. Jaworski (1992) offers a teaching triad which synthesizes three elements that are involved in the creation of opportunities for students to learn mathematics: the management of learning, sensitivity to students, and the mathematical challenge. When the findings related to Miss Çalışkan's reflections were analyzed, it was seen that these three themes were main concerns for her as well. Therefore, it can be said that Miss Çalışkan's reflections might have helped her attend more to providing better learning opportunities for her students.

Reflections related to *assessment* after the teaching practices were using checklist, checking learning, using assessment tools and strategies and controlling methods for students' solutions. Stein et al. (2009) suggest that when designing a mathematics task, the teacher should consider the learning goals of student performance as well as the appropriate level of challenge for their students' cognitive ability. Miss Çalışkan habitually considered the learning goals and tried to incorporate challenging activities during planning periods of her teaching. It might be the case that reflective practice process supported her assessment practices during her teaching.

Reflections related to *self-assessment* after the teaching practices were being novice teacher and reaching ideal teacher. By means of the reflection on their classroom practices, teachers and teacher candidates would have a chance to observe their inclination toward teaching and environment within which they work (Zwozdiak-Myers, 2009). Self-assessment was an issue in which Miss Çalışkan discussed her self-development based on particular teaching processes. Orientation of reflections of Miss Çalışkan after teaching practice were identifying strength in being a teacher, identifying the areas of needs for improvement, identifying improvement for the next practices and identifying as a learner. In reflection models the person thinks on the action, then understands what the action means by evaluating and analyzing, thinks on his or her situation and develops an action plan by synthesizing his or her thinking. It is necessary to emphasize the recursive

character of these phases and the cyclic structure of the reflective thinking process (Lee, 2000; Dewey, 1933; Eby & Kujawa, 1994; Schon, 1987). Miss Çalışkan reflected on several issues during PT process and used the results of those reflections for improving her future teaching practices. This usage was action steps for her reflections and by means of those actions, reflections became meaningful and useful.

Miss Çalışkan tracked her own improvement and made reflections on her development as a teacher throughout the PT. In constructivist approach, the learner constructs knowledge and meaning from their experiences by engaging and working together with the content (Fosnot, 1996; Piaget, 1967; Steffe & Gale, 1995; Vygotsky, 1982). Learning is an ongoing process of trying to make sense and to construct meaning based on their individuals' own experiences and connections with the environment in which they are engaged (Zaslavsky & Leikin, 2004). Miss Çalışkan's engagement with the students, the mathematics she taught, the PT course environment especially at the collaborating school, and the feedbacks she got upon observation of her previous lessons made her realize that she needed to improve certain issues and she was able to make sense of her teaching through reflections in the constructivist sense. Those reflections provided opportunities for Miss Çalışkan to learn how to teach effectively. Miss Çalışkan's reflection practices upon her taught lessons might have long lasting desirable results because she was "concerned in analyzing, critiquing, reflecting upon, and improving their own classroom practice" (Harnett, 2012, p.382).

The main motives triggering Miss Çalışkan's reflection process were problems she had during the planning or delivery of the lesson, her worries about transferring her theoretical knowledge into practice in class and completing the lesson as she planned from time to time. Yet, the learning levels of students was also a concern for Miss Çalışkan some other times. Bussis et al. (1985) defined reflection as the intellectual arrangements that the individual develops in, or stems from his or her learning environment (Bussis et al., 1985). For Miss Çalışkan, each teaching process was a learning environment about several matters such as students' learning and a place for her development in teaching profession.

Teacher reflection provides a way of authoring the teacher's self into a justification of pedagogy and, hence, is a way of stimulating change. Köksal and Demirel (2008) asserted that reflective thinking process had considerable contribution on preservice teachers' processes related to teaching such as planning, delivery and evaluation. There are some commonalities and also some differences in before, during and after reflection processes of Miss Çalışkan. Before lesson interviews, she mentioned mostly about issues such as skill development, nature of mathematics teaching, different grade levels, differentiation, assessment and evaluation, teaching methods, materials, students' characteristics, giving directions, managing group work, interests and current skills of students. During teaching process, reflections of Miss Çalışkan were focused on the issues of maintaining classroom management and responding student's learning needs in a better way. Miss Çalışkan's reflections on lessons after the teaching process focused on self-evaluation and improvements as a result of reflections and practices done in advance. Success of teaching, learning levels of students, and teaching the lesson as planned and intended were the main issues underlined by Miss Çalışkan within the after the lesson interviews.

The common issues of reflections at those three processes that I defined as before, during and after teaching processes were Miss Çalışkan's intent and focus towards providing an effective teaching as planned and intended, and maintaining suitable environment for the students' learning. From the beginning of PT period, Miss Çalışkan traced her development in teaching process and made reflections on the areas she developed, the areas she improved and the areas in which she still needed improvement. Her conscious reflection upon all teaching before, during, and after a lesson seemed to have a great value for the quality of student learning (Burrows, 2012) which might be an indicator for Miss Çalışkan's classes effective reflective practices because they involved careful consideration of both seeing and acting to enhance the possibilities of learning through experience.

5.1.3 Reflections at the end of the Practice Teaching

At the end of the Practice teaching, Miss Çalışkan reflected on several issues such as planning, teaching process, assessment, classroom management, students and

their learning. These issues were parallel to the ones that she handled during one or more of the parts of practice teaching. Reflections related to *planning* at the end of the practice were practicing theories, writing objectives of the lesson, handling the intensive curriculum, considering grade level and success level of students and answering to the learning needs and characteristics of students. Reflections related to *teaching process* at the end of the practice were using technology, practicing subject, understanding the content, feeling close to the lesson content, providing environment for meaningful learning and facilitating by metaphors. Reflections related to *assessment* at the end of the practice were using different assessment tools and strategies, involving students in assessment process, motivating and rewarding students, using pretests and posttests. Reflections related to *classroom management* at the end of the practice were providing essential agreements and learning by communicating. Reflections related to *students and their learning* at the end of the practice were modifying the lesson according to student needs, knowing more about students' current knowledge and skills, abolishing the fear of mathematics and providing a positive learning environment.

In addition to the subjects handled during practice teaching period, Miss Çalışkan pointed out some further topics. These were reflections related to teaching profession, personal characteristics and the requirements of TCP. Reflections related to *teaching profession* at the end of the practice were planning the first lesson, being anxious in class while teaching, and feelings about last lesson, being a good teacher and effective teaching, and feeling like the real teacher. Reflections related *to requirements of TCP* at the end of the practice were participating lesson continuously, being in the collaborating school all week and being observed in the lesson. Harnett (2012) asserts that when teachers engage in reflective opportunities, they are "pulled out" of the "automatic pilot" mode to be become grounded in deep understanding of their own teaching and learning (p.379). For Miss Çalışkan, the intensive structure of the TCP was challenging, however the requirements of the PT period and fulfilling those responsibilities provided sufficient occasions for Miss Çalışkan to envision alternative plans, working together with children, and attempt for new approaches (Ebby, 2000).

Reflections related to *personal characteristics* at the end of the practice were being patient, having desire to learn deeply and widely and having a fighting spirit. As Dewey (1933) states, "reflection involves intuition, emotion, and passion and is not something that can be neatly packaged as a set of techniques for teachers to use" (p.9). It is not only what a teacher does in the classroom that affects the quality of student learning. Research has also shown that the qualities that a teacher brings into the classroom, for example, enthusiasm, energy, self-awareness, and open-mindedness, have a tremendous influence on students and their learning (Burrows, 2012). Findings of this study have addressed that Miss Çalışkan's personal characteristics contributed to her teaching profession and most probably to students' learning.

Developed areas that Miss Çalışkan reflected at the end of the practice were using pedagogical content knowledge, meeting with teachers and having insights from their experience, sharing knowledge with other preservice mathematics teachers, executing tasks assigned by supervisor and fulfilling responsibilities required by the lesson, observing students at different class levels, preparing detailed lesson plans, creativity, planning and conducting group work, doing good preliminary work for planning, motivating and initiating the learning interest in students, designing activities for students which will challenge them to improve, having knowledge of scope, sequence and limitations of the subjects and concepts, and preparing rubrics for assessment purposes. Miss Çalışkan identified the issues she needed to develop at the end of the practice as selecting appropriate activities, preparing metaphors beforehand, studying about the content knowledge, having knowledge of mathematics terminology in Turkish, deciding on realizable and achievable goals, managing time and evaluating the students' working processes and learning. In a reflective approach, rather long-term development is essential (Dewey, 1933) and it should be considered as a habit that can be advanced over time (Harford & MacRuairc, 2008). From this point, the issues that Miss Çalışkan still needed improvement may evolve in time, to the extent that she will gather experience in teaching.

Zeichner and Liston (1996) listed five key features that they developed related to reflective practitioner as examining, framing and attempting to solve predicaments of classroom practice; being aware of and enquiring the suppositions and values he or she brings to teaching; being attentive to the instructional and cultural circumstances in which he or she teaches; taking part in program of study improvement and is involved in school change efforts; and taking responsibility for his or her own professional development. The results of study showed that Miss Çalışkan had most of the attributes that a reflective thinking teacher should have. Either at the beginning of PT or during the PT, one of the areas on which Miss Çalışkan had reflections was finding solutions to problems she faced in her own teaching practices. Apart from that, she tried to shape her plans and implementations considering the requirements of the cooperating school, students' characteristics, and success level of the students, different grade levels, and effect of these on teaching and learning. She focused on self-evaluating and improving her own teaching and tried to do it by means of reflective practices.

5.2 Implications

In this part, implications of the conclusions are presented under two titles; implications for practice and implications for further research.

5.2.1 Implications for Practice

Darling-Hammond (1997) have identified what is required from teachers to be effective as knowing the subject matter, possessing knowledge of pedagogy and child development, understanding differences among students, understanding motivation, knowing about learning processes, and demonstrating a command of teaching strategies. Teachers must also know about collaboration, analysis, reflection, curriculum resources and technologies to assess the effect of their teaching, and the refinement needed to improve their instruction. The findings of the study showed that these could be achieved to a great extent through reflection in a teacher education program. Thus, preservice and inservice training should be planned to develop the reflective thinking abilities of the teachers (Baki, Güç & Özmen, 2012) in order to provide effective teaching.

Since reflection is reported to "be the key to teacher learning and development" (Shulman & Shulman, 2004, p.264) the fundamentals of teacher training programs should involve opportunities for preservice teachers' reflections on teaching. The structure and requirements of Teacher Certification Program (TCP) that Miss Çalışkan enrolled seemed to provide those kinds of opportunities. In such an intensive program, pre-service teachers would have a chance to reflect on several issues which subsequently make them progress in the teaching profession. As McCutcheon and Jung (1990) asserted, it is unlikely that they will construct theory appropriate to their circumstances, unless trainees are given the opportunity to reflect meaningfully on their experiences. Therefore, when the structure of the TCP's are reflective oriented, then preservice teachers can find opportunity to develop themselves as effective teachers.

Lowery (2003) asserts that, through reflection, preservice teachers become able to evaluate their teaching, make trajectory about their learning, and project their own learning in courses such as practice teaching course which employs constructivist approach and in a school context in which preservice teachers easily have access to the inservice teachers and students. Even though the role of reflection in teaching is considered important, reflective action in preservice and inservice teachers is either inhibited by isolation of teachers or by structure of courses and schools (Feiman-Nemser & Buchmann, 1986). Therefore, not only the structure of TCP, but also the requirements and structure of PT course and the structure of cooperating school are essential in providing room for the reflection. Although teachers' practices are influenced in many different ways by their practical theories, their practices are also undoubtedly influenced by the contexts in which they are involved as teachers. (Zeichner & Liston, 1996). School managers, teacher educators, and inservice teachers have important roles in stimulating the improvement of preservice teachers in reflective practice (Lowery, 2003). The reflection and reflective practice process are significant in the training of preservice teachers (Cumyn, 2010) and both PT course and cooperating school component of this course are crucial.

Long-term success for many novice teachers is delayed because of the lack of professional supervision, provision, and chances to reflect (Veenman, 1984). Thus mentors as expert teachers play pivotal roles in supporting the development of reflective teachers. This study showed that mentors have influential role in directing reflections of preservice teachers.

It is seen as a result of this study that how preservice teachers use reflection as a part of their emerging teaching practice is essential in order to develop reflective practitioners. With the intention of engaging in reflective practice as outlined in the stronger version, the preservice teachers must systematically gather data about their practice and act accordingly for the enhancement of their teaching practices. Low levels of reflective thinking can be attributed to lack of understanding about their own strengths and weaknesses as teachers (Van Manen, 1977). Thus, in order to increase the level of reflective thought, preservice teachers should be involved in continuous reflective practices.

The results of the study revealed that, being observed and evaluated in a specific way in the TCP contributed to preservice teachers' reflective practices. Mewborn (1999) argued that to facilitate reflection, it is essential to provide a non-evaluative atmosphere for preservice teachers and relationship with cooperating teachers. By doing so, the preservice teachers would have a chance to produce assumptions and to work out on problematic events related to classroom practices without fear of judgment (McDuffie, 2004). Thus, in order to provide realistic improvement, there should be enough room for preservice teachers to reflect on their progress without a fear of being judged.

The issues discussed and the questions handled during before and after lesson interviews with Miss Çalışkan along the process might support the reflection process of her. It was a matter of fact that the preservice teacher thought about those kinds of questions after a while and prepared plans and evaluations accordingly. In this respect, this study can be an example for Teaching Certification Programs by showing how the meetings by mentors can scaffold the reflection process of the preservice mathematics teachers.

Apart from that, the intensive PT period, which is one of the most important features of the TCP, provided the opportunity for the preservice mathematics teacher to see the effects and the results of her teaching, developing solutions to the problems she faced and transforming them to the actions, which is possibly the most important component of the reflective process. In a PT course in an ordinary TCP, preservice teachers do not have the possibility of having several and frequent teaching processes and they can most possibly track the continuity of their practices after they start to teach. However, during PT courses in scope of TCP, the preservice teachers were able to track even whole subsequent lessons of a class for many weeks. Regarding PT, the quality of the lesson observed and taught is given importance, not the quantity. In this respect, once a reflection-oriented Teaching Certificate Program is intended, then it is important that the preservice teachers should have opportunity to teach as much as possible and have consecutive teaching experience processes in the field in the cooperating school.

This study, although focused on reflection practices of a preservice teacher in the scope of PT course, gives an idea about the structure of the SE course and its effects on reflective thinking process of preservice mathematics teachers. The preservice mathematics teacher in the study observed different teachers in SE course, found opportunity to share her own experiences and ideas, and gained some experience during the SE. Therefore, for the institutions that intend to provide a reflection-oriented Teaching Certification Program, it is better to incorporate tasks and processess supporting and building reflective thinking not only in PT course but also in SE course as well.

In a reflection-oriented Teaching Certificate Program, the cooperating school, in which the teaching practices are performed, should have proper environment for the preservice teacher. In this study, the preservice mathematics teacher was provided the opportunity of observing lessons of different teachers in both high school and middle school, teaching in different grade levels and being involved in different activities. The preservice teacher's reflection process was sometimes shaped by the problems faced while applying the requirements in the cooperating school. In this respect, it is more proper for the institutions, who intend to provide a

reflection-oriented Teaching Certification Program, to have cooperation with practice schools which can share and support their reflection focus.

The TCP that Miss Çalışkan enrolled accepted 8 students on average each year at the time of the study. The requirements and responsibilities of the TCP is high in number and intensive compared to other TCPs. Based on the studies done either by the researcher using data collection tools or as the requirements of the program, it can be concluded that such a program should be done with a less number of students to be able to support reflection process of the preservice mathematics teacher. In this respect, whether the studies based on the reflection in TCPs can reach to the intended goals is closely related to opportunuties provided to mentors and supervisors to let them closely track and support the development of preservice teachers.

In this study, although it is not a main focus, there were some hints in the results about the role of mentor in the reflection process of the preservice mathematics teacher, and about the contributions and directions in realizing the reflection process. Based on either the issues handled in weekly meetings or in before or after lecture meetings, it was seen that the mentor had certain facilitating roles in reflection process of the preservice teacher such as differentiating the issues in reflections or highlighting the succesful parts in teaching. In this respect, examples related to the role of mentor in this study can be used for building mentor development principles in other TCPs.

5.2.2 Implications for Further Research

The reflective practice literature is important since it provides opportunities for us to understand the stories of how teachers live through reflective practice (Brookfield, 1995). In order to deeply investigate the reflective thinking processes of preservice teachers, qualitative methods would provide firsthand accounts from teachers of their reflective thoughts (Burrows, 2012; Erdoğan & Şengül, 2014). This study confirmed that qualitative data gathered from tools such as observations and interviews would provide multidimensional point of view for the reflection phenomenon of a preservice teacher and further studies might improve these tools.

The improvement of mathematics learning in classroom is fundamentally related to development in teaching, and that teaching develops through a learning process in which teachers and others grow into the practices in which they engage. In this study, the point of view is that if research is to contribute understanding of teacher change and learning, it is essential to "provide framework necessary for considering ways of bringing about change in teaching practice that is significant and worthwhile" (Richardson, 1990, p.18). Based on those issues underlined above, this research study therefore, provided a representative and meaningful understanding about the preservice mathematics teacher's reflection over time, content of those reflections and developments in this reflective practice process. Yet, reflective practice takes place along a continuum, where "people vary in opportunity, ability, or propensity to reflect" (Copeland et al., 1993, p.348). Change in instructional practice is not an easy task and it may take extra time and reflection for some teachers to be able to demonstrate any change at all (Guskey, 2002). Therefore, the studies that track the development of preservice teachers in a long time and possibly in their first year of being actual teacher would provide useful information.

The present study was conducted by a mentor teacher in the TCP. I, as a researcher and mentor at the same time, also had the opportunity to reflect and develop myself in the reflective practice. The study investigating the role of mentors in reflective practice process of a preservice teacher would provide useful information in understanding the reflective process from another side and in designing effective teaching practice period. On the other hand, whether or how mentors conduct reflective practice of mentorship when they support a preservice teacher could be a focus of research.

Reflective practice comes about when preservice teachers volunteer to take the role of reflective practitioner, question their personal theories about teaching and learning, account for their actions in the classroom, and keep on to progress their teaching practices (Farrell, 2008; Jay & Johnson, 2002, Valli, 1997). Since it is related to lifelong learning, preservice teachers' self-studies about their reflection process would be useful in their development. By this way, they engage in a continuing process of self-education (Schon, 1983). In addition to this, research

proposes that there is a vigorous relationship between teachers' conceptions and their classroom practices (Ball, 1990; Pajares, 1992; Prawat, 1992; Thompson, 1992). It is recommended to do research about how teachers' beliefs and conceptions are related to their reflective practices and what are the consequences of those reflections related to classroom practices.

5.2.3 Implications for my Future Career

The results obtained from this study have provided insight for my own development as a teacher who has been teaching for 12 years. The first one of those is the need for using some tools and strategies to be able to organize the reflection process. I can self-evaluate the effectiveness of my plans and implementations by using the fundamental tools and strategies used in this study, to be able to improve my reflection skills and reflect on the results of this reflection process for better learning of my students.

Additionally, this study gives idea about the role of mentor, effectiveness of this role on reflection process of the preservice mathematics teacher, and the responsibilites of the mentor in such an intensive program. It might be possible to state that one of the items which has a role in the development of the preservice teacher is own development as the mentor. As a teacher who has been mentoring for eight years in TCP, I had the opportunity of reviewing the requirements of my role during the study. Apart from that, being involved in such a reflection process forwarded me to have directly or indirectly reflective thinking regarding my own practices as a mentor. I can use this knowledge in the best way in my next practices as a mentor.

Beside all those, I as a researcher, believe that there should be long term studies about reflection which is a complex phenomenon developing in a long time and related to many factors as emphasized in the literature. I think I can study as a researcher on the reflection related areas and contribution of them to the improvement of the preservice mathematics teachers and also how the preservice teachers conduct the reflection process in their first and following years of their profession.

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Appendix A Ethics Form

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
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19 Şubat 2013

Gönderilen: Yrd.Doç.Dr.Çiğdem Haser
İlköğretim Bölümü

Gönderen : Prof. Dr. Canan Özgen
IAK Başkan Yardımcısı

İlgi : Etik Onayı

Danışmanlığını yapmış olduğunuz İlköğretim Bölümü Doktora öğrencisi Zerrin Toker'in "Matematik Öğretmen Adaylarının Dönüşümlü Düşünme ile Öğrenme Süreçleri" isimli araştırması "İnsan Araştırmaları Komitesi" tarafından uygun görülerek gerekli onay verilmiştir.

Bilgilerinize saygılarımla sunarım.

Etik Komite Onayı

Uygundur

19/02/2013

Prof.Dr. Canan ÖZGEN
Uygulamalı Etik Araştırma Merkezi
(UEAM) Başkanı
ODTÜ 06531 ANKARA

Appendix B First Interview Protocol

İLK GÖRÜŞME PROTOKOLÜ

Değerli öğretmen adayı,

Orta Doğu Teknik Üniversitesi (ODTÜ) Eğitim Fakültesi İlköğretim Bölümü'nde yürüttüğüm doktora çalışmalarım kapsamında Öğretmenlik Deneyimi dersi uygulamaları kapsamında olan öğretmen adaylarının yansıtıcı düşünme süreçlerini ve uygulamalarını araştırıyorum. Yapacağımız bu görüşme bu çalışma kapsamında gerçekleştirilmektedir. Çalışma için daha önce gönüllü olduğunuz halde şu anda görüşmeyi yapmak istemiyorsanız lütfen belirtiniz. Gönüllü olmanız görüşmeyi mutlaka tamamlamanız gerektiği anlamına gelmez, istediğiniz zaman görüşmeyi bitirebilirsiniz. Görüşme sırasında cevaplandırmak istemediğiniz bir soru olursa lütfen belirtiniz. Bu görüşme sırasında sağladığınız analiz edilmemiş bilgi bölümünüz, okul yönetimi, öğrencileriniz, velileriniz ya da diğer kuruluşlarla paylaşılmayacaktır. Bize sağladığınız bilgilere sadece araştırmacı olarak benim erişimim olacaktır. Bu araştırma ile ilgili herhangi bir yayında kimliğinizi ortaya çıkaracak hiçbir bilgi verilmeyecektir.

Bu görüşmede 23 ana soru vardır ve bu soruların doğru ya da yanlış olarak nitelendirilebilen bir cevabı yoktur. Eğer izin verirseniz bu görüşmenin ses kaydını almak istiyorum. Görüşmenin tamamının ya da belli bir bölümünün ses kaydının alınmasını istemiyorsanız lütfen çekinmeden belirtiniz. Bu görüşmenin yaklaşık olarak 1 saat süreceğini düşünüyorum.Teşekkür ederim.

Zerrin Toker

GENEL BİLGİLER

1. Bu programda kaçıncı yılınız?

2. Daha önce bitirdiğiniz okul hangisi?
3. Bu program öncesinde herhangi bir öğretmenlik deneyiminiz oldu mu?
4. Bu programa başvurmaya ne zaman ve neden karar verdiniz? Bu programı tercih etmenizin nedenleri neler?
5. Bu programdan mesleki beklentileriniz neler?
6. Programda ilk dönemde hangi dersleri aldınız?
7. Bu derslerin kapsamını kısaca açıklar mısınız?
8. Bu derslerin size ne gibi katkıları olduğunu düşünüyorsunuz? Neden? veya
9. Bu derslerden hangisinin size en çok katkısı olduğunu düşünüyorsunuz? Neden?
10. İlk dönem aldığınız dersleri, öğrendiklerinizi bu program içerisinde nasıl kullanacağınızı düşünüyorsunuz?
11. İlk dönem aldığınız dersleri, öğrendiklerinizi öğretmenlik deneyiminde nasıl kullanacağınızı düşünüyorsunuz?

İLK GÖZLEM DENEYİMİ

12. İlk staj dersinizdeki gözlemleriniz ile ilgili izlenimleriniz neler?
13. Staj boyunca kaç farklı öğretmenin dersini gözlediniz?
14. Bu öğretmenler arasında benzerlikler ve farklılıklar var mıydı? Varsa nelerdi?

İLK ÖĞRETİM DENEYİMİ

Planlama:

15. İlk öğretim deneyiminize nasıl hazırlandınız?

-Hangi kaynaklardan yararlandınız?

-Planlamada neleri göz önünde bulundurdunuz?

-Planınızda uygulamadan önce değiştirdiğiniz şeyler var mı? Varsa bu değişiklikleri neden yaptınız?

-Planlamadan önce planınızı başka biriyle paylaştınız mı? -Herhangi bir geribildirim aldınız mı?

-Aldıysanız bu geribildirimlere göre planınızda ne tür değişiklikler yaptınız?

-Değişiklik yapmadıysanız neden yapmamayı uygun buldunuz?

Uygulama ve Değerlendirme

16. Uyguladığınız dersle ilgili neler hissediyorsunuz?

17. Beklediğiniz ve beklemediğiniz durumlarla karşılaştınız mı? Karşılaştıysanız sizce bunların nedenleri neydi ve nasıl çözümlediniz?

18. Uyguladığınız dersle ilgili neler düşünüyorsunuz?

-Dersin iyi giden yönleri nelerdi? -Geliştirilebilir yönleri nelerdi?

19. Bu dersi bir daha yapsanız neleri değiştiridiniz?

20. Bu ders sonrasında planlama, öğretim, değerlendirme adına aldığınız kararlar var mı?

GENEL DEĞERLENDİRME

21. Şu ana kadar aldığınız dersler ve öğretmenlik uygulamalarını göz önünde bulundurduğunuzda;

-Hangi alanlarda kendinizi güçlü hissediyorsunuz? -Hangi alanlarda desteğe ve gelişime ihtiyaç duyduğunuzu düşünüyorsunuz?

22. Bu gelişimi nasıl sağlayacağınızı düşünüyorsunuz? Kimlerden, hangi kaynaklardan, nasıl yararlanabileceğinizi düşünüyorsunuz?

23. Bunların dışında eklemek istedikleriniz var mı?

Appendix C Final Interview Protocol

SON GÖRÜŞME PROTOKOLÜ

Değerli öğretmen adayı,

Orta Doğu Teknik Üniversitesi (ODTÜ) Eğitim Fakültesi İlköğretim Bölümü'nde yürüttüğüm doktora çalışmalarım kapsamında Öğretmenlik Deneyimi dersi uygulamaları kapsamında olan öğretmen adaylarının yansıtıcı düşünme süreçlerini ve uygulamalarını araştırıyorum. Yapacağımız bu görüşme bu çalışma kapsamında gerçekleştirilmektedir. Çalışma için daha önce gönüllü olduğunuz halde şu anda görüşmeyi yapmak istemiyorsanız lütfen belirtiniz. Gönüllü olmanız görüşmeyi mutlaka tamamlamanız gerektiği anlamına gelmez, istediğiniz zaman görüşmeyi bitirebilirsiniz. Görüşme sırasında cevaplandırmak istemediğiniz bir soru olursa lütfen belirtiniz. Bu görüşme sırasında sağladığınız analiz edilmemiş bilgi bölümünüz, okul yönetimi, öğrencileriniz, velileriniz ya da diğer kuruluşlarla paylaşılmayacaktır. Bize sağladığınız bilgilere sadece araştırmacı olarak benim erişimim olacaktır. Bu araştırma ile ilgili herhangi bir yayında kimliğinizi ortaya çıkaracak hiçbir bilgi verilmeyecektir.

Bu görüşmede 22 ana soru vardır ve bu soruların doğru ya da yanlış olarak nitelendirilebilen bir cevabı yoktur. Eğer izin verirseniz bu görüşmenin ses kaydını almak istiyorum. Görüşmenin tamamının ya da belli bir bölümünün ses kaydının alınmasını istemiyorsanız lütfen çekinmeden belirtiniz. Bu görüşmenin yaklaşık olarak 1 saat süreceğini düşünüyorum.Teşekkür ederim.

Zerrin Toker

SON GÖRÜŞME SORULARI

A BÖLÜMÜ: Öğretim

5. Sizce etkili bir öğretim nasıl olmalıdır? Siz öğretim yaklaşımınızın nasıl olduğunu düşünüyorsunuz? (Neleri göz önünde bulunduruyorsunuz? Nelerin öncelikli olduğunu düşünüyorsunuz?)

6. Sizce etkili bir matematik öğretimi nasıl olmalıdır? Siz matematik öğretim yaklaşımınızın nasıl olduğunu düşünüyorsunuz? (Neleri göz önünde bulunduruyorsunuz? Nelerin öncelikli olduğunu düşünüyorsunuz?)

7. Matematik öğreteceğiniz derslere nasıl hazırlanırsınız?

8. Matematik derslerinizle ilgili ne tür amaçlarınız vardır?

9. Matematik derslerinde materyal kullanıyor musunuz? Kullanıyorsanız genellikle ne tür materyaller kullanıyorsunuz? Hangi materyali kullanacağınıza nasıl karar veriyorsunuz?

10. Matematik dersleri ile ilgili olarak öğrencilerinizden beklentileriniz neler?

11. Matematik öğretirken güçlü yönleriniz nelerdir?

12. Matematik öğretirken geliştirmeniz gerektiğini düşündüğünüz yönleriniz nelerdir?

13. Matematik derslerinde sorunlar yaşıyor musunuz? Yaşıyorsanız ne tür problemler yaşıyorsunuz?

14. Matematik derslerinizde ne tür değerlendirmeler kullanıyorsunuz? Bu değerlendirmeleri nasıl kullanıyorsunuz?

15. Öğrenciler sizce en iyi nasıl öğrenir?

16. Sizin derslerinizdeki öğrenci profilini tanımlar mısınız? (Katılımları, hazırbulunuşlukları, derse ilgileri vb.)

B BÖLÜMÜ: Profesyonel Gelişim

17. Matematik öğretimindeki gelişmeleri takip ediyor musunuz? Nasıl? Takip ediyorsanız bu gelişmelerin sizin matematik öğretiminize ne gibi katkıları olabileceğini düşünüyorsunuz?

18. Matematik öğretiminizin etkililiğini değerlendirmek için ne tür kriterler kullanıyorsunuz?

19. Matematik öğretirken kendinizi rahat hissediyor musunuz? Neden?

20. Matematik öğretimi konusunda gelişiminiz için yardıma ihtiyacınız oluyor mu? Oluyorsa ne tür bir ihtiyaç hissediyorsunuz? (Kişilerden yardım alma, kaynaklar, birlikte planlama gibi)

21. Matematik öğretimi konusunda yaptığınız uygulamalar üzerinde düşünüyor musunuz? Bu konuda başkalarıyla paylaşımlarınız oluyor mu? Oluyorsa nasıl?

22. Şu ana kadar ele almadığımız ve bahsetmek istediğiniz bir konu var mı?

Appendix D Pre-Observation Protocol

DERS PLANI GÖRÜŞME PROTOKOLÜ

Değerli öğretmen adayı,

Bu görüşme izleyeceğim ders öncesinde derse yönelik hazırlıklarınız konusunda detaylı bilgi almak amacıyla yapılmaktadır. Görüşmede ders için hazırlamış olduğunuz plan üzerinden gidilerek gözlemlenecek ders ile ilgili kapsamlı bilgi alınması amaçlanmıştır. Bu süreçte gözlemler programın işleyişi ile ilgili bilgi edinmek amacıyla yapılacak olup, gözlem süreci için ek bir hazırlığa ya da işleyişte değişikliğe gerek yoktur. Daha önce yapmış olduğumuz genel konuları içeren görüşme için geçerli olan gizlilik hakları ve şartlar bu görüşme için de geçerlidir. Bu görüşmede 8 ana soru vardır ve bu soruların doğru ya da yanlış olarak nitelendirilebilen bir cevabı yoktur. Eğer izin verirseniz bu görüşmenin ses kaydını almak istiyorum. Görüşmenin ses kaydının alınmasını istemiyorsanız ya da belli bir kısmının ses kaydının alınmasını istiyorsanız lütfen çekinmeden belirtiniz. Bu görüşmenin yaklaşık olarak 30 dakika süreceğini düşünüyorum. Teşekkürler.

Zerrin Toker

Ders planı Görüşme Soruları

1. Dersin genel amaçları nelerdir?

2. Bu dersin konusunun matematik programındaki yeri nedir? Önceki ve sonraki derslerle bağlantısı, farklı ders konuları ile bağlantısı gibi.

3. Derste görsel-işitsel araçlar veya başka materyaller kullanacak mısınız?

4. Dersle ilgili öngördüğünüz problemler var mı? Varsa olası çözümleri nelerdir?

5. Gözlem sürecinde bilinmesi gerektiğini düşündüğünüz özel bir durum ya da öğrenci var mı? Varsa bu tür öğrenciler için farklı bir planınız var mı?

6. Öğrencilerin öğrenmelerini nasıl sağlayacaksınız? Öğrenme deneyimlerini nasıl organize edeceksiniz? Öğrencilerin öğrenmelerini yönlendirmek amacıyla ne tür sorular soracaksınız?

7. Öğrencilerinizin dersin amaçlarına ulaşıp ulaşmadıklarını hangi yollarla anlayacaksınız?

8. Dersin erken bitmesi ya da planladığınızdan uzun gitmesi gibi beklenmedik durumlara karşın alternatif bir planınız var mı? Varsa, nasıl?

Appendix E Post-Observation Protocol

DERS SONRASI GÖRÜŞME PROTOKOLÜ

Değerli öğretmen adayı,

Bu görüşme izlediğim ders sonrasında derse yönelik görüşleriniz konusunda detaylı bilgi almak amacıyla yapılmaktadır. Daha önce yapmış olduğumuz genel konuları içeren görüşme için geçerli olan gizlilik hakları ve şartlar bu görüşme için de geçerlidir. Bu görüşmede 8 ana soru vardır ve bu soruların doğru ya da yanlış olarak nitelendirilebilen bir cevabı yoktur. Eğer izin verirseniz bu görüşmenin ses kaydını almak istiyorum. Görüşmenin ses kaydının alınmasını istemiyorsanız ya da belli bir kısmının ses kaydının alınmasını istiyorsanız lütfen çekinmeden belirtiniz. Bu görüşmenin yaklaşık olarak 30 dakika süreceğini düşünüyorum. Teşekkürler. Zerrin Toker

Gözlem Sonrası Görüşme Soruları

1. Genel olarak dersiniz ile ilgili nasıl hissediyorsunuz? Dersiniz amaçlarına ulaşmada ne kadar başarılı idi?

1a. Genel amaçlarınıza ve alt amaçlarınıza ne ölçüde ulaştınız?

2. Öğrencileriniz derse planladığınız şekilde ve ölçüde katıldı mı? Bunun göstergeleri nedir?

3. Öğrencilerin bu dersteki öğrenmeleri ile ilgili ne söyleyebilirsiniz?

4. Ders ile ilgili memnun kaldığınız durumlar nelerdir? Nedenleri ile açıklayınız.

5. Bu dersi tekrar yapma imkanınız olsaydı öğrencilerinizin gelişimini arttıracak yönde ne gibi değişiklikler yapardınız?

6. Dersiniz ile ilgili öngördüğünüz ve/veya öngöremediğiniz sıkıntılar açısından bir değerlendirme yapınız.

7. Bu süreçten edindikleriniz nelerdir?

8. Bu sürecin ardından yapmak istedikleriniz nelerdir?

Appendix F Observation Protocol

GÖZLEM PROTOKOLÜ

Aşağıdaki form 40 dakikalık ders gözlem sürecinde dersin akışını takip etmek için gözlemci tarafından doldurulacaktır. Dersin aşamalarının ve bu aşamalarda gerçekleşen öğretmen ve öğrenci faaliyetlerinin gözlemci tarafından ayrıntılı bir şekilde yazılması gerekmektedir. Bunun yanısıra ders sonrası için kanıt oluşturacak somut ifadelerin (öğretmenin kullandığı bir soru, öğrenci yanıtı gibi) not alınması gereklidir.

DERS GÖZLEM FORMU

Sınıf: **Tarih:**

Öğretmen: **Saat:**

ZAMAN	ETKİNLİK	YORUM

Appendix G Curriculum Vitae

ZERRİN (GÜL) TOKER

PERSONAL INFORMATION

Surname, Name: Toker, Zerrin
Nationality: TC
Date and Place of Birth: 7 October 1980, Manisa
Marital Status:Married
Phone:05303146114
Email:zerring@bilkent.edu.tr

EDUCATION

Degree	Instutition	Year of Grad.
MS	Middle East Technical Universitiy, Turkey	2008
BS	Middle East Technical Universitiy, Turkey	2004

WORK EXPERIENCE

Year	Enrollment	Place
2010-...	Head of Mathematics Department	İDF Bilkent Schools
2013-2014	MoNE Mathematics Course Book Writer	Tubitak and MoNE
2011-2014	Professional Development Coordinator	İDF Bilkent Schools
2008-2009	Mathematics Course Book Writer	SEK Publications
2004 - ...	Mathematics Teacher	İDF Bilkent Schools

FOREIGN LANGUAGES

Fluent English, Beginner Spanish

PUBLICATIONS

Milli Eğitim Bakanlığı 5. Sınıf Matematik Ders Kitabı (Komisyon) (2013). Milli Eğitim Bakanlığı Yayınları: Ankara.

Toker, G. Z (2012). 4. sınıf öğrencilerinin problem çözme sürecinde düşünme şekillerini görsel olarak ifade etme ve açıklama süreçleri (Proj. Dan. E. Çakıroğlu)

Toker, G. Z (2009). Matematik 7 Ders kitabı, Öğretmen Kitabı ve Öğrenci Çalışma Kitabı. SEK Yayınları: Ankara.

Toker, G. Z (2008). *The effect of using dynamic geometry software while teaching by guided discovery on students' geometric thinking levels and geometry achievement.* Unpublished master's thesis. Middle East Technical University, Turkey.

Toker, G. Z (2007). Matematik 7 Yardımcı Kitabı. SEK Yayınları: Ankara.

Toker, G. Z., & Tuti, S., (2007). *Bilişim teknolojileri destekli matematik projeleri*: "Bilgim@tik". 7. Uluslararası Eğitim Teknolojileri Konferansı Bildiri Kitabı, Yakın Doğu Üniversitesi, Kıbrıs.

Appendix H Turkish Summary

TÜRKÇE ÖZET

MATEMATİK ÖĞRETMEN ADAYININ ÖĞRETİM UYGULAMALARI KAPSAMINDA ÖĞRETİM VE ÖĞRENME İLE İLGİLİ GELİŞİMİ ÜZERİNE YANSITICI DÜŞÜNME UYGULAMALARI

Öğretim, sınıf içinde öğretmenlerin eylemleri yoluyla etkili hale geldiğinden, kaliteli ve etkin öğretme ve öğrenme etkinliklerinin şekillenmesinde öğretmenler önemli bir role sahiptirler. Etkili öğretim hakkında yapılan araştırmalar etkili uygulamalarla, sorgulama, yansıtıcı düşünme ve sürekli profesyonel gelişim arasında ilişki olduğunu göstermektedir (Harris, 1998). Dewey (1933) yansıtıcı düşünmeyi, "aktif, kalıcı ve onu temelleri ışığında destekleyen ve daha ileri sonuçlara taşıyan, herhangi inanç ya da varsayılan dikkatli düşünme şekli olan bilgi" şeklinde tanımlamaktadır (s.9).

Öğretmenin yansıtıcı düşünmesi, öğretmenin kendi pedagojisini doğrulamaya yönelik bir güç ve bununla beraber gelişmeyi teşvik eden bir yol sağlar. Yansıtıcı düşünmeye yönelik öğretim, öğretmenlerin öğretim ve öğrenme üzerine kendi algılarını ve inançlarını denetlemelerini ve böylelikle sınıf içinde eylemlerinde daha fazla sorumluluk almalarını gerektirir (Korthagen, 1993). Buna bağlı olarak, yansıtıcı düşünme "teknik etkinlik kadar amaç ve sonuçların ilgisini belirtir; öğretmenlerin kendi sürekli uygulamalarına gözlem, değerlendirme yaptıkları ve revize ettikleri çevrimsel ve döngüsel süreçlere uygulanır" (Pollard vd., 2005, s.15). Çeşitli araştırmalar yansıtıcı düşünme uygulamasının, öğretmenlerin kararlı şekilde yansıtıcı düşünen rolü aldıklarında ve sınıf içinde kendi eylemlerine tam ilgi gösterdiklerinde

ve öğretme uygulamalarında ilerleme gösterdiklerinde oluştuğunu göstermektedir. (Farrell, 2007; Jay ve Johnson, 2002; Valli, 1997). Bundan dolayı, yansıtıcı düşünme öğretmen gelişiminde anahtar niteliğindedir (Richards, 2000).

Bu nedenle, bu çalışma hizmet öncesi bir matematik öğretmeninin yansıtıcı düşünme sürecine açıklamalı bir model sağlamak amacıyla gerçekleştirilmiştir. Çalışmada diğer bir amaç ise öğretmen eğitimine yönelik çeşitli yansıtıcı düşünme entegrasyonları içeren öğretmen eğitimi programları için örnekler sunmaktır.

1.1 Çalışmanın amacı ve araştırma soruları

Bu çalışma, 2014-2015 akademik yılı güz döneminde iki yıllık Öğretmenlik Sertifikası Programı'na (ÖSP) kayıtlı hizmet öncesi bir öğretmen ile gerçekleştirilmiştir. Çalışmanın ana odağı ÖSP'nin ikinci yılındaki hizmet öncesi öğretmenin gerçek bir sınıf ortamında Öğretim Uygulamaları (ÖU) dersi kapsamındaki gözlemler ve ders öğretimi sırasındaki yansıtıcı düşünme sürecini ve içeriğini ortaya koymaktır.

Bu bağlamda araştırma aşağıdaki soruya odaklanmıştır:

Bir hizmet öncesi matematik öğretmeni ÖU kapsamında öğretim ve öğrenme ile ilgili gelişimi üzerine yansıtıcı düşünmeyi nasıl gerçekleştirebilir?

Araştırma sorusu ile ilgili alt sorular aşağıdaki gibidir:

1. Uygulamaya başlarken önceki deneyimleri ile öğretim ve öğrenme ile ilgili gelişimi üzerine nasıl yansıtıcı düşünmektedir?

1.a. Yansıtıcı düşünme yaptığı konular nelerdir?

1.b Bu yansıtıcı düşünceler neye yönelmektedir?

2. Öğretim uygulaması öncesi öğretim ve öğrenme ile ilgili deneyimleri ile ilgili nasıl yansıtıcı düşünmektedir?

2.a. Yansıtıcı düşündüğü konular nelerdir?

2.b Bu yansıtıcı düşünceler neye yönelmektedir?

3. Öğretim uygulaması sırasında öğretim ve öğrenme ile ilgili deneyimleri ile ilgili nasıl yansıtıcı düşünmektedir?

3.a. Yansıtıcı düşündüğü konular nelerdir?

3.b Bu yansıtıcı düşünceler neye yönelmektedir?

4. Öğretim uygulaması sonrası öğretim ve öğrenme ile ilgili deneyimleri ile ilgili nasıl yansıtıcı düşünmektedir?

4.a. Yansıtıcı düşündüğü konular nelerdir?

4.b Bu yansıtıcı düşünceler neye yönelmektedir?

5. Öğretim Uygulaması dönemi bittiğinde deneyimleri ile öğretim ve öğrenme ile ilgili gelişimi üzerine nasıl yansıtıcı düşünmektedir?

5.a. Yansıtıcı düşündüğü konular nelerdir?

5.b Bu yansıtıcı düşünceler neye yönelmektedir?

6. Bu konular üzerine öğretim ve öğrenme ile ilgili gelişimini sağlamak üzere nasıl yansıtıcı düşünmektedir?

7. Hizmet öncesi öğretmenin öğretim ve öğrenme ile ilgili gelişimine yönelik yansıtıcı düşünme uygulaması öğretim uygulaması süresince nasıl değişir?

Yukarıda yer alan araştırma soruları öğretim uygulaması okul bileşeni kapsamında ortaya çıkarılmıştır.

1.2 Çalışmanın Önemi

Yansıtıcı düşünme uygulaması literatürde önemli bir yere sahip olup öğretmenlerin ve hizmet öncesi öğretmenlerin profesyonel gelişimlerinin ana bileşenlerinden biridir (Calderhead, 1989; Ghaye ve Ghaye, 1998; Pollard vd., 2005). Yansıtıcı düşünme uygulaması ile ilgili çalışmalar hizmet öncesi öğretmenlerin yansıtıcı düşünme uygulama süreçlerini derinlemesine araştırmak için nitel çalışmaların ihtiyacını ortaya çıkarmıştır.

Bu çalışmada, öğretme ve öğrencilerin öğrenmesi üzerine öğretmenin kendi yansıtıcı düşünme süreçleri hakkında bilgi toplamak için hizmet öncesi bir matematik öğretmen adayının yansıtıcı düşünme süreci incelenmiştir. Daha önce

belirtilen konulara dayanarak, bu araştırma çalışmasının ana amacı hizmet öncesi matematik öğretmeninin (öğretmen adayı) zamanla gerçekleşen yansıtıcı düşünmesi, bu yansıtıcı düşünme uygulama sürecindeki yansıtıcı düşünceleri ve gelişimi hakkında bir örnek ve bakış açısı sağlamaktır.

Hizmet öncesi matematik öğretmeninin yansıtıcı düşünmesinin gelişme süreci yoğun öğretim uygulaması ele alarak belirlenmiş ve çalışmanın sonuçları bu gelişme sürecinin detayları hakkında bilgiler sağlamıştır. Bu yolla, bu çalışmanın sonuçları hizmet öncesi matematik öğretmenlerinin gelişimi hakkında bütüncül bir veri sağlamaktadır.

Matematik öğretmeni adayının öğretme ve öğrencilerin öğrenmesi üzerine yansıtıcı düşünme süreci hakkındaki bulgular, gelecekte Türkiye'deki öğretmen eğitimi programlarının yapısının şekillendirilmesine ve hatta öğretmenlere yansıtıcı düşünme eğitimi sağlama konularında katkıda bulunabilir. Özellikle, çalışma yansıtıcı düşünmeye odaklı ÖU derslerindeki aday öğretmenlerin gelişimi ile ilgili temel konulara değindiğinden öğretmen eğitimcileri, ana amacı öğretmen adaylarının öğretim becerilerini ve yansıtıcı düşünme yoluyla öğrencilerin öğrenmeleri ile ilgili öğretmen farkındalıklarını geliştirmek isteyen ÖU derslerinin yapısını şekillendirmede çalışmanın sonuçlarından yararlanabilir.

Buna ek olarak, bu çalışmada katılımcı okulların rolleri ve yapıları, Eğitim Fakülteleri ile ortaklık ve okullardaki işbirliği ilkelerini tanımlamada yararlı bilgiler sağlayabilir. Bu yönde, çalışmanın süreci ve sonuçları böyle bir yapılanmada danışmanın rolleri hakkında yararlı bilgiler sağlayabilir.

2. Literatür Taraması

2.1 Yansıtıcı Düşünme ve Yansıtıcı Düşünme Uygulaması

Yansıtıcı düşünme uygulaması hem öğretmenlerin hizmet içi eğitim programlarında hem de hizmet öncesi öğretmen eğitim programlarında kullanılmaktadır. Yansıtıcı düşünmenin, öğretmen eğitimi sürecinde en önce anlaşılması gereken kavramlardan biri (Tabachnick ve Zeichner, 1991) ve sürecin çok önemli bir bileşeni (Calderhead, 1989; Pollard vd., 2005) olduğu belirtilmiştir.

Kimi araştırmacılar, yansıtıcı düşünmeyle öğrenme arasındaki güçlü ilişkiye dikkat çekmiş ve yansıtıcı düşüncenin öğretim ve öğrenimin güçlü unsurlarından biri olduğunu söylemişlerdir (Goodell, 2000; Mewborn, 2000).

Yansıtıcı düşünme konusunda zengin bir literatür olmasına karşın, terimin anlamı konusunda bir fikir birliği yoktur. Literatürde, yansıtıcı düşüncenin birkaç tanımı ya da yorumu bulunmaktadır (Dewey, 1933; Schon, 1983) ve yansıtıcı düşünme uygulamasıyla ilgili literatürde kuram-uygulama ayrılığı önemli bir konu olarak yer almaktadır (Schon, 1983; van Manen, 1995).

Öğretmenin yansıtıcı düşünmesi, kendisinde uyguladığı öğretimin gerekçesini bulmaya yönelik bir değişim yaratmanın bir yoludur. Aslında, hem hizmet içi hem de hizmet öncesi öğretmenler için yansıtıcı düşünme, "öğretim hakkında düşünme"dir (Artzt ve Thomas, 2002, s.7). Schon'a (1983) göre, yansıtıcı düşünme iki ayrı zaman çerçevesi içinde görülebilir. Bu çerçeveleri Schon (1983), eylem sırasında yansıtıcı düşünme ve eylem üzerine yansıtıcı düşünme olarak tanımlar. Eylem üzerine yansıtıcı düşünme, eylemin öncesinde ve sonrasındaki yansıtıcı düşünmeyi kapsar.

Aslında yansıtıcı düşünme uygulaması, deneyimi incelemeye yönelik bir rutin, yapı ya da tekrar yaratmaktan ibarettir (Amulya, 2004) ve bu düzen, yapı ya da tekrar, zaman içinde geliştirilebilir. Öte yandan yansıtıcı düşünme uygulaması, daha dinamik bir şekilde sonuçta bir başarı ortaya konmasını gerektiren bir şey olarak görülebilir. Yansıtıcı düşünme uygulamasının amacı, gösterilen performansın kalitesini artırmak olduğu için (Osterman ve Kottkamp, 1993), yansıtıcı düşünme uygulaması geniş bir anlamda öğretim ve öğrenim sürecinin temel ilkesi olarak kabul edilir (Brookfield, 1995; Zeichner ve Liston, 1987).

Benzer bir şekilde Zeichner ve Liston (1996), yansıtıcı düşünme uygulaması yapan kişide bulunan beş özelliği sıralamıştır. Bu özellikler, sınıf uygulamasındaki sorunları inceleme, bir çerçeveye oturtma ve çözmeye çalışma; eğitime getirdiği varsayımların ve değerlerin farkında olma ve bunları sorgulama; öğretimin içinde gerçekleştiği eğitim koşullarıyla kültürel koşullara dikkat etme; çalışma programının iyileştirilmesine ve okuldaki değişim çabalarına katılma; ve kendi mesleki gelişiminin sorumluluğunu almadır. Bu şekilde, yansıtıcı düşünceye dayalı öğretim,

öğretmenlerin sınıf içindeki eylemlerinin sorumluluğunu daha fazla alabilmeleri için, öğretim ve öğrenimle ilgili uygulamalarını etraflıca incelemelerini gerektirir (Korthagen, 1993).

Çeşitli araştırmalar, yansıtıcı düşünme uygulamasının, öğretmen, yansıtıcı düşünme uygulaması yapan kişi rolünü kararlı bir şekilde üstlendiği, öğretim ve öğrenimle ilgili kendi uygulamalarını sorguladığı, sınıf içindeki eylemlerini tam anlamıyla dikkate aldığı ve öğretim uygulamasını geliştirmeye devam ettiği zaman gerçekleştirdiğini ortaya koymaktadır (Farrell, 2007; Jay ve Johnson, 2002; Valli, 1997). Öte yandan öğretmenler, hedeflerini, değerlerini, öğretim bağlamlarını ve varsayımlarını sorgulamadıkları zaman, öğretimleri yansıtıcı düşünceye dayanmıyor demektir (Zeichner ve Liston, 1996). Yansıtıcı düşünmeye dayanan öğretim, öğretmenler için vazgeçilmez bir beceridir ve başarılı öğretimin güçlü bir bileşenidir (Mewborn, 2000). Dolayısıyla, öğretmen gelişiminin kilit unsurlarından biridir (Richards, 2000).

Yansıtıcı düşünme ve yansıtıcı düşünmeye dayanan öğretimin birkaç tanımı çözümlendiğinde, ortak kullanılan ifadeler ve bakış açıları daha iyi görülmektedir. Tanımlardaki ortak özelliklerden biri, yansıtıcı düşünme uygulamasının döngüsel ya da sarmal doğasıyla ilgilidir. Ek olarak, bu tanımlar, yansıtıcı düşünme sürecini, süreklilik arz eden ve etkin işlemler olarak tanımlamıştır ve bunlar, sınıf içinde sorgulama ve öğretim deneyimi ile ilgilidir. Tanımlardaki bir başka ortak nokta da, yansıtıcı düşünmenin zamanıyla ilgilidir; yansıtıcı düşünme uygulaması, eylemden önce, eylem sırasında ve eylemden sonra gerçekleştirilebilir. Böylesi bir yansıtıcı düşünme ve geri bildirimden yalnızca öğretmen adayları değil, deneyimli öğretmenler de yararlanabilir (Curtis ve Szestay, 2005).

Yansıtıcı düşünmenin kavramsal temeli, bilişsel psikoloji alanlarında bulunabilir ve literatür, yansıtıcı düşünmeyi ve uygulamasını, yapılandırmacılık, sorgulama ve deneyime dayanan öğrenimle ilişkilendirir (McIntyre ve O'Hair, 1996; Osterman ve Kottkamp, 1993). Yapılandırmacı bakış açısına göre, öğrenim, süreklilik arz eden bir anlamlandırma ve bireyin kendi deneyimlerine içinde bulunduğu çevreyle bağlantılarına dayanarak anlam vermesi sürecidir (Zaslavsky ve Leikin, 2004). Yapılandırmacı kuram, yansıtıcı düşünmeyi öğretim ve öğrenim

sürecinde çok önemli bir unsur olarak tanımlar (Farrell, 2008; Osterman ve Kottkamp, 1993).

2.2. Yansıtıcı Düşünmeyi Oluşturma

Literatürde, yansıtıcı düşüncenin deneyimle, bir başka deyişle, uygulamayla yakından ilişkili olduğu vurgulanır. Öğretmenler, ilerleme göstermeye gereksinim duydukları herhangi bir zaman yapılandırmacı bir şekilde bu yansıtıcı düşünme uygulamalarıyla uğraşabilirler (Frid, 2000; Jaworski, 2006). Günlük uygulamalarında öğretmenler, sınıf içinde ve dışında pek çok sorunla karşı karşıya kalırlar. Dewey'in ifadesiyle (1933), öngörülen bu sorunlar, öğretmenlerin yansıtıcı düşünceye dayanan eylemlerinin tetikleyicileridir.

Literatürde yer alan birkaç dönüşümlü düşünme modeli incelendiğinde (Gibbs, 1998; Symth, 1991) bazı ortak bakış açıları olduğu görülür. Başlangıçta yansıtıcı düşünce bir model sunar, kişi eylem hakkında düşünür, sonra değerlendirme ve çözümleme yaparak eylemin ne anlama geldiğini anlar, kendi durumu hakkında düşünür ve kendi düşüncelerini sentezleyerek bir eylem planı oluşturur. Bu aşamaların tekrarlayıcı ve yansıtıcı düşünce sürecinin döngüsel yapıda olduğunu vurgulamak yerinde olacaktır (Dewey, 1933; Lee 1994; Schon, 1987). Her model aşamaların tekrarlanmasını az ya da çok vurgular ve bu da her bir adımın kendinden önceki bütün adımlara dayandığı anlamına gelir. Aslında, Dewey (1933) tarafından geliştirilen ve deneyim, betimleme, yorumlama ve eylem arasındaki ilişkiyi gösteren dört parçalı deneyimsel-yansıtıcı düşünmeye dayalı döngü, bu modellerin bütün ortak yönleri için yol gösterici bir çerçeve olarak kullanılabilir.

Yansıtıcı düşünme uygulaması, öğrenime karşı bütüncül bir yöntem benimser; bireysel eylemlerle başlar ve onunla ilgili olan her şey sürecin bir parçası haline gelir (Osterman ve Kottkamp, 1993). Bu açıdan, modellerin ortak yönü olan döngüsel süreçler ve bütüncül yaklaşımlar, hizmet öncesi öğretmenlerin öğretim süreçlerindeki yansıtıcı düşünme uygulamalarını incelemek için bir çerçeve olarak kullanılabilir. Gelişimsel değişim, kullanıma konan kuramda yatan önceden farkında olunmayan geleneklerin, farkına varılmamış düzenli etkinliklerin ve bu etkinliklere

ilişkin farkına varılmamış istenmedik sonuçların farkına varılmasından ortaya çıkar (Osterman ve Kottkamp, 1993).

2.3 Hizmet öncesi öğretmenlerin yansıtıcı düşünme uygulamalarının gelişimi

Öğretmen eğitimi programlarının amacı, öğretmen adaylarını kaliteli eğitim vermelerini sağlayacak çeşitli şekillerde eğitmek ise, eğitimleri birkaç bakış açısından ele alınmalıdır. Kaliteli eğitim, üç temel özelliğe sahiptir: Anlayış sağlamaya yönelik kavramsal öğretim, içerik içinde bağlantılar kurmak (Shepard vd., 2005) ve öğrenci katılımı yoluyla dikkati yönlendirmek (Marzano vd., 2001). Bu açıdan öğretmen eğitimi, hizmet öncesi öğretmenlerin, öğrencilerin öğrenimi konusundaki bilinçlerini artırmada çok önemli bir rol oynayabilir. Bu vurgu, pek çok öğretmen eğitimi programının kalbinde yatan yapılandırmacı bir öğretim ve öğrenim yaklaşımıyla da uyumludur (McIntyre, Byrd ve Foxx, 1996).

Yansıtıcı düşünme yaklaşımında, oldukça uzun süreli bir gelişim vazgeçilmezdir (Dewey, 1933) ve bu gelişim, zaman içinde ilerletilebilecek bir alışkanlık olarak görülmelidir (Harford ve MacRuairc, 2008). Sonuç olarak literatür, hizmet öncesi öğretmenlerin yalnızca yeni öğretim fikirleri geliştirmek için değil, öğretmen eğitim programından ayrıldıktan sonra da mesleki gelişimlerini devam ettirmek için yansıtıcı düşünme uygulamalarıyla meşgul olduklarını doğrulamaktadır. Öğretmen eğitiminde yansıtıcı düşünmenin genel amacı, hizmet öncesi öğretmenlerin öğretim ve öğrenim konusundaki düşüncelerini genişletmek ve derinleştirmektir (Posner, 1996). Öğretmen eğitimcileri, öğretmen eğitim programlarında öğretmen adaylarını yansıtıcı düşünmeye hazırlamakla ilgilenirler (Tabachnick ve Zeichner, 1991) çünkü yansıtıcı düşünme, öğretmen adaylarında doğru pedagojik uygulamaları nelerin oluşturduğu konusundaki bilgileri açısından daha üstün bir anlayış sağlayabilir.

İlgili literatürde, hizmet öncesi matematik öğretmenlerinin yansıtıcı düşünceleri konusundaki çalışmaların başlıca odak noktaları, yansıtıcı düşünmenin içeriği ve öğretmen eğitim programları bağlamında yansıtıcı düşünme becerilerinin geliştirilmesidir. Yansıtıcı düşünen bir öğretmen yetiştirmek zor bir iştir ve hizmet öncesi öğretmenlere, öğretmenlerin ve öğrencilerin rolleri hakkındaki düşüncelerinde

nasıl bir dönüşüm yaratmaları gerektiğinin öğretildiği öğretmen eğitim programlarının birkaç yönüyle birden ilgilidir (Ostorga, 2006). Yansıtıcı düşünme ve yansıtıcı düşünme uygulaması süreci, hizmet iç öğretmenlerin eğitiminde önemlidir (Cumyn, 2010) ve yansıtıcı düşünmede hizmet öncesi öğretmenlerin gelişimini canlandırmada okul yöneticilerine, öğretmen eğitimcilerine ve hizmet içi öğretmenlere önemli görevler düşmektedir (Lowery, 2003).

Hizmet öncesi öğretmenlerin yansıtıcı düşünmelerini konu alan çalışmalar şimdiye kadar ortaklaşa yansıtıcı düşünme (Weiss ve Weiss, 2001), yansıtıcı düşünmenin bağlamı (Basile vd., 2003), yansıtıcı düşünmenin içeriği (Liston ve Zeichner, 1987; Valli, 1997; Zeichner, 1994; Zeichner ve Liston, 1996), yansıtıcı düşünme süreci (Richert, 1991), yansıtıcı düşünme uygulamasının desteklenmesi (Harford ve MacRuairc, 2008; Kullman, 1998; Lee, 2005; Roehrig vd., 2008; Weiss ve Weiss, 2001) ve pedagojik içerik bilgisi (McDuffie, 2004) üzerine yoğunlaşmıştır. Bunlara ek olarak, diğer araştırmalarda çeşitli programlar bağlamında yansıtıcı düşünmenin programa özel özellikleri incelenmiştir (Ross, 1990; Sparks-Langer, 1992).

Türkiye'de gerçekleştirilen çalışmalar, yansıtıcı düşünme süreciyle ilgili araştırmaların, yansıtıcı düşünme uygulaması ve sorun çözme bağlamında yansıtıcı düşünme ile öğretmen adaylarının yansıtıcı düşünme becerilerinin geliştirilmesi üzerine vurgu yaptığını göstermektedir. Ayrıca, yansıtıcı düşünme uygulamasıyla ilgili çalışmalar, öğretmen adaylarının yansıtıcı düşünme uygulaması sürecini derinlemesine araştırmak için nitel çalışmalar yapılmasına ihtiyaç olduğunu ortaya koymuştur.

Literatürü, yansıtıcı düşünme uygulamalarını desteklemek için kullanılan araçlar ve yöntemler açısından incelediğimizde, en sık olarak tercih edilen yöntemlerin, yansıtıcı düşünme günlüğü yazma (Farrell, 2007, Schweiker-Marra vd., 2003), akran gözlemleri (Frid, 2000; McDuffie, 2004; Nicholas, 1994) ve yansıtıcı düşünme görüşmeleri (Alozie, 2009; Cavanagh ve Prescott, 2010; Curtis ve Szestay, 2005; Frid, 2000; Heng ve Khim, 2004; Lowery, 2003; McDuffie, 2004; Nicholas, 1994; Roehrig vd., 2008; Tok, 2008) olduğunu görürüz. Ayrıca altta yatan ilkeler ve kuramlar açısından, literatür, öğretmenlerin yansıtıcı düşünme uygulamalarını

yapılandırmacılık, sorgulama, deneyimsel öğrenim ve sorun çözmeyle ilişkilendirmektedir (McIntyre ve O'Hair, 1996; Osterman ve Kottkamp, 1993).

Bundan dolayı, hizmet öncesi öğretmenlerin yansıtıcı düşünme uygulamalarının içeriği ve süreci konusunda daha ileri düzeyde çalışmalara ihtiyaç vardır. Ayrıca literatürde daha ileri düzeyde çalışmaların, hizmet öncesi öğretmenlerin yansıtıcı düşünmeyi öğretim uygulamalarını geliştirirken nasıl kullandıkları konusuna odaklanması önerilmektedir. Dolayısıyla literatürdeki yansıtıcı düşünme çalışmaları, hizmet öncesi öğretmenlerin yansıtıcı düşünme uygulaması süreçlerini anlamak için, en çok tercih edilen sorgulama şeklini tercih etmişlerdir (LeCompte, Millroy ve Preissle, 1992; Mc Duffie, 2004; Stake, 1995). Yukarıda değinilen konular ışığında, bu araştırmanın başlıca amacı, hizmet öncesi matematik öğretmeninin öğretim uygulamalarına yönelik yansıtıcı düşünceleri, bu yansıtıcı düşüncelerinin içeriği ve yansıtıcı düşünme uygulaması sürecinde zaman içindeki gelişimi konusunda bir örnek ve bakış açısı sunmaktır.

3. Yöntem

Çalışmanın amacı, Türkiye'de tipik olmayan bir Öğretmenlik Sertifikası Programı'na devam eden bir hizmet öncesi matematik öğretmeninin (öğretmen adayı) yansıtıcı düşünme sürecini incelemektir. Çalışma, hizmet öncesi matematik öğretmeninin öğretim deneyimi açısından ayrıntılı ve çok yönlü bilgi vermeyi amaçlamaktadır ve bir olgu çalışması olarak tasarlanmıştır.

Çalışmada, hizmet öncesi matematik öğretmeninin yansıtıcı düşünme uygulamalarının içerik ve süreç çözümlemesi için, Gibbs (1998) ve Smyth'in (1991) öne sürdüğü modellerin temel ilkeleri ve ortak bakış açıları kullanılmıştır. Modellerin her ikisinde de kişi, eylem üzerine düşünür, sonra değerlendirme ve çözümleme yaparak eylemin ne anlama geldiğini anlar, kendi durumu hakkında düşünür ve düşüncelerini sentezleyerek bir eylem planı yapar. Bu açıdan, bu iki modelin ortak yönü ve döngüsel süreci, hizmet öncesi matematik öğretmeninin öğretim süreçlerindeki yansıtıcı düşünme uygulamalarını dahil olduğu yoğun öğretim sürecinin içeriğini de kapsayacak şekilde incelemek için çerçeve olarak kullanılmıştır. Bu çalışmada incelenen durum, yansıtıcı düşünme kavramıdır ve

Türkiye şartlarında tipik olmayan bir Öğretmenlik Sertifika Programı'na (ÖSP) dahil olan bir hizmet öncesi matematik öğretmeninin çalışmalarıyla sınırlıdır.

Bu çalışmanın odak noktası, yoğun bir Öğretmenlik Deneyimi (ÖD) sürecinden geçen hizmet öncesi matematik öğretmeninin yansıtıcı düşüncelerinin incelenmesidir. Hizmet öncesi matematik öğretmeninin yansıtıcı düşünme uygulamaları özellikle Öğretmenlik Deneyimi (ÖD) dersi ve uygulama okulundaki öğretim deneyimleri bağlamında ele alınmıştır.

3.1 Araştırma Alanı

Araştırma, Türkiye'deki bir üniversitenin Eğitim Bilimleri Enstitüsü'nün (EBE) Eğitim Bilimleri Bölümü'nde Öğretmenlik Sertifikası Programına katılarak yüksek lisans yapan ve programda birinci yılını tamamlamış bir hizmet öncesi matematik öğretmeniyle yapılmıştır. ÖSP, doğası itibarıyla, Türkiye'deki diğer öğretmen eğitimi ya da yüksek lisans programlarından farklı bir yapıdadır. Bu program üniversitelerin Fen Edebiyat Fakültelerinin öğretmenlik sertifikası vermeyen bölümlerinden mezun olan öğrencileri kabul etmektedir. Program, Öğretmenlik Sertifikası, Uluslararası Bakalorya (UB) Öğretmen Ödülü ve Yüksek Lisans Derecesi olmak üzere üç bölümden oluşmaktadır.

ÖU dersi, hizmet öncesi öğretmenlerin dönem içinde birbirini izleyen altı hafta boyunca yarım gün dışında haftanın tamamını katılımcı okulda geçirerek öğretmenlik uygulaması yaptıkları yoğunlaştırılmış bir derstir. Söz konusu yarım günde öğretmen adayları, ÖSP'de ÖU dersinin kuram ve tartışma kısmına katılırlar. Dersin gerekleri nedeniyle, hizmet öncesi öğretmenlerin ilk haftadan itibaren aktif olarak matematik öğretimi yapmaları beklenir. Altı hafta içinde öğretmenlerin en az otuz saat öğretim yapmaları programda hedeflenmektedir. ÖU dersi ayrıca ders gözlemleri, öğretim uygulamaları, bölüm faaliyetleri ve müfredat dışı okul etkinliklerini içerir.

Anaokulu, ilkokul, ortaokul ve lise olmak üzere dört kısımdan oluşan katılımcı okul, özel bir okuldur. Okul, EBE'nin bağlı olduğu üniversiteyi de içine alan bir vakfın parçasıdır. Okullar, üniversite kampusunda yer almakta ve bu işbirliğine dayalı ilişkiden yararlanmaktadır. Bu çalışmada katılımcı okullar olan

ortaokul ve lise, ulusal eğitim sisteminin düzenlemelerine tabidir. Lise, çalışma yapıldığı sırada UB Dünya Okulları arasında yer almaktadır ve yukarıda sözü edilen UB Diploma Programını uygulamaktadır. Ortaokul ve Lisede ağırlıklı olarak Türk öğrenciler, görece az sayıda da başka milliyetten öğrenciler öğretim görmektedir.

3.2 Katılımcı

Çalışmanın katılımcısı olan Bayan Çalışkan (takma isim), iki yıllık ÖSP'nin ikinci sınıfına devam eden hizmet öncesi bir öğretmendir. Çeşitli katılımcı okullara devam etmekte olan sekiz öğretmen adayı arasından, bu çalışmanın katılımcısı, ÖU dersini, çalışmakta olduğum katılımcı okulda almaktadır.

Bayan Çalışkan, lisans derecesini Türkiye'deki bir üniversitenin Doğa Bilimleri ve Sosyal Bilimler Fakültesi'nin Matematik bölümünden 2012 yılında almış, 2013 yılında bu çalışmanın gerçekleştirildiği ÖSP' na kabul edilmiştir.

3.3 Veri Toplama Süreci

Bu çalışmada kullanılan veri toplama araçları, görüşmeler, gözlemler, belgeler ve Bayan Çalışkan'ın haftalık yansıtıcı düşünme notlarıdır. Tablo 3.1 yukarıda verilen araştırma sorularının her biri için bu çalışmada kullanılan veri toplama araçları ve süreçlerini göstermektedir.

Tablo 3.1 Araştırma sorularına göre veri toplama araçları ve süreçleri

Araştırma Sorusu	**Veri toplama süreci**	**Veri toplama aracı**
1. Uygulamaya başlarken önceki deneyimleri ile öğretim ve öğrenme ile ilgili gelişimi üzerine nasıl yansıtıcı düşünmektedir? 1.a. Yansıtıcı düşünme yaptığı konular nelerdir? 1.b Bu yansıtıcı düşünceler neye yönelmektedir?	ilk Görüşme	İlk Görüşme Protokolü
2. Öğretim uygulaması öncesi öğretim ve öğrenme ile ilgili deneyimleri ile ilgili nasıl yansıtıcı düşünmektedir? 2.a. Yansıtıcı düşündüğü konular nelerdir? 2.b Bu yansıtıcı düşünceler neye yönelmektedir?	Ders Planı Toplantıları (Gözlem Öncesi Toplantılar) Haftalık Toplantılar	Ders Öncesi (Ders Planı) Görüşme Protokolü Haftalık Görüşme Protokolü Yan. Düş. Günlüğü Kayıtları Ders Gözlem formları
3. Öğretim uygulaması sırasında öğretim ve öğrenme ile ilgili deneyimleri ile ilgili nasıl yansıtıcı düşünmektedir? 3.a. Yansıtıcı düşündüğü konular nelerdir? 3.b Bu yansıtıcı düşünceler neye yönelmektedir?	Ders Gözlemleri Yan. Düş. Günlüğü Yazımı	Ders Gözlem formları Yan. Düş. Günlüğü kayıtları
4. Öğretim uygulaması sonrası öğretim ve öğrenme ile ilgili deneyimleri ile ilgili nasıl yansıtıcı düşünmektedir? 4.a. Yansıtıcı düşündüğü konular nelerdir? 4.b Bu yansıtıcı düşünceler neye yönelmektedir?	Gözlem sonrası toplantılar Haftalık Toplantılar	Ders Sonrası Görüşme Protokolü Haftalık Görüşme Protokolü Yan. Düş. Günlüğü kayıtları Ders Gözlem formları
5. Öğretim Uygulaması dönemi bittiğinde deneyimleri ile öğretim ve öğrenme ile ilgili gelişimi üzerine nasıl yansıtıcı düşünmektedir? 5.a. Yansıtıcı düşündüğü konular nelerdir? 5.b Bu yansıtıcı düşünceler neye yönelmektedir?	Son Görüşme	Son Görüşme Protokolü
6. Bu konular üzerine öğretim ve öğrenme ile ilgili gelişimini sağlamak üzere nasıl yansıtıcı düşünmektedir?	Gözlem sonrası toplantılar Haftalık Toplantılar	Ders Sonrası Görüşme Protokolü Haftalık Görüşme Protokolü Yan. Düş. Günlüğü kayıtları Ders Gözlem formları
7. Hizmet öncesi öğretmenin öğretim ve öğrenme ile ilgili gelişimine yönelik yansıtıcı düşünme uygulaması öğretim uygulaması süresince nasıl değişir?	Haftalık Toplantılar	Yan. Düş. Günlüğü kayıtları Ders Gözlem formları

Görüşme, nitel araştırmalarda ve özellikle de olgu çalışmalarında en sık tercih edilen veri toplama araçlarından biridir (Merriam, 1998). Veri toplama sırasında, birinci görüşme olarak başlangıçta ve sürecin tamamlanması üzerine yapılan son görüşme olmak üzere iki genel görüşme yapılmıştır. Bu iki görüşme arasında, Bayan Çalışkan'ın öğretmenlik uygulaması döneminde ders planı hakkında ders öncesinde görüşmeler yapılmıştır. Öğretmen adayının dersleri gözlenmiş ve bu gözlemler sırasında ayrıntılı notlar tutulmuştur. Her bir dersten sonra, o dersle ilgili görüşmeler yapılmıştır. Bunların yanı sıra Bayan Çalışkan ile haftalık toplantılar yapılmıştır. Bu görüşmelerin hepsi, öğretmen adayının onay ve izni alındıktan sonra, kaydedilmiştir. Veri toplama süreci, Orta Doğu Teknik Üniversitesi'nin Uygulamalı Etik Araştırma Merkezi ve Öğretmenlik Sertifikası Programı'nı uygulayan üniversiteden gereken izinler alındıktan sonra başlatılmıştır.

Bayan Çalışkan'ın hazırladığı tüm planlar, gözlenen dersleriyle ilgili notlar ve geri bildirim, dersler sonrasındaki yansıtıcı düşünce notları ve haftalık toplantı notları da bu çalışmada veri olarak toplanmıştır. Bu belgeler, Bayan Çalışkan hakkında artalan bilgisi sunmak için kullanılmıştır. Ayrıca Bayan Çalışkan, ÖSP'nın ilk yılında Okul Deneyimi (OD) dersinin sonuna doğru iki ders işlemiştir ve ilk görüşme seansında kendisine bu derslerle ilgili düşünceleri de sorulmuştur.

Yukarıda sözü edilen veri toplama araçlarına ek olarak, birkaç başka belge de veri olarak kullanılmıştır. Bu belgelerden biri, Bayan Çalışkan'ın ÖSP'nın ilk yılında hazırladığı portfolyosudur. Hartmann (2003) mesleki portfolyonun geleceğin matematik öğretmeninin mesleki gelişimi açısından kaliteli matematik öğretimine uzanan bir mesleki gelişim sürecini başlatma potansiyeli olduğunu ileri sürmüştür. Bayan Çalışkan'ın portfolyosunda, programın ilk yılında her iki dönemdeki OD derslerinde yaptığı gözlemler üzerine yazdığı raporlar, OD dersinin son haftasındaki ders planı ve öğretmenlik deneyimi, süreç hakkında tuttuğu notlar, aldığı geri bildirim, öğretim yaklaşımını açıkladığı kişisel ifadesi, danışmanları tarafından ÖU dersinde hazırlanan raporlar yer almaktadır. Bu araştırma için söz konusu portfolyodaki belgeler, veri toplama sürecinde, öğretmen adayının öğretmenliği meslek olarak nasıl gördüğünü anlamak ve mevcut yeterliliklerini görmek amacıyla kullanılmıştır.

İkinci bir belge olarak, ÖU dersinde Bayan Çalışkan'ın derslerini gözleyen öğretmenlerin verdiği yazılı geri bildirimler, veri toplama döneminde kullanılmıştır. Araştırmacı olarak benim gözlemlerim dışında, Bayan Çalışkan'ın bazı dersleri, katılımcı okuldaki diğer öğretmenler tarafından gözlenmiştir. Bu gözlemlerde gözlem yapan öğretmenler, programın bir gereği olarak gözlem formu kullanmışlardır. Gözlem formlarında Bayan Çalışkan'ın öğretim süreci ve ortamına ilişkin, sınıf yönetimi, öğretim, öğrencilerle iletişim, olumlu bir öğrenim ortamı yaratma, zaman yönetimi ve tahta kullanımı gibi çeşitli maddeler yer almaktadır. Ders gözlemi ölçütleri arasındaki bu maddeler, ÖU dersi bağlamında hazırlanmıştır. Derslerden sonra Bayan Çalışkan'la paylaşılan bu formlar, veri toplama sürecinde öğretmenin yansıtıcı düşünceleri hakkında ek veriler olarak kullanılmıştır.

Programın gereklerinden biri olarak Bayan Çalışkan, ikinci yılında da ÖU dersinde bir portfolyo tutmuştur. Bayan Çalışkan'ın ikinci yıl portfolyosunda yer alan bir diğer belge, ÖU dersi sırasında işlediği dersler için değil, izlediği dersler için tuttuğu gözlem notlarıdır. Bu gözlem notlarında öğretmen adayını gözlediği dersi çözümlemede, dersler ve öğretim konusunda sonuç çıkarımlarında bulunmada ve bunları kendi derslerine yansıtmada yönlendirmek üzere tasarlanmış birkaç yönlendirici soru bulunmaktadır. Bu açıdan söz konusu notlar Bapan Çalışkan'ın yansıtıcı düşünme sürecini destekleme potansiyeli nedeniyle veri toplama döneminde kullanılmıştır.Tablo 3.2'de veri toplama döneminin tamamı özetlenmiştir.

Tablo 3.2 Veri toplama sürecinin genel görüntüsü

Zaman	Veri Toplama Süreci	Araç
Haziran 2013	İlk Görüşme	Görüşme protokolü
1. Hafta	Ders plan(ları)ı toplantı(lar)ı	Ders planı formu
	Ders gözlem(ler)i	Ders Gözlem formu
	Haftalık dön. düş. toplantısı	Günlük kaydı ve toplantı form(lar)ı
2. Hafta	Ders plan(ları)ı toplantı(lar)ı	Ders planı formu
	Ders gözlem(ler)i	Ders Gözlem formu
	Haftalık dön. düş. toplantısı	Günlük kaydı ve toplantı form(lar)ı
3. Hafta	Ders plan(ları)ı toplantı(lar)ı	Ders planı formu
	Ders gözlem(ler)i	Ders Gözlem formu
	Haftalık dön. düş. toplantısı	Günlük kaydı ve toplantı form(lar)ı
4. Hafta	Ders plan(ları)ı toplantı(lar)ı	Ders planı formu
	Ders gözlem(ler)i	Ders Gözlem formu
	Haftalık dön. düş. toplantısı	Günlük kaydı ve toplantı form(lar)ı
5. Hafta	Ders plan(ları)ı toplantı(lar)ı	Ders planı formu
	Ders gözlem(ler)i	Ders Gözlem formu
	Haftalık dön. düş. toplantısı	Günlük kaydı ve toplantı form(lar)ı
6. Hafta	Ders plan(ları)ı toplantı(lar)ı	Ders planı formu
	Ders gözlem(ler)i	Ders Gözlem formu
	Haftalık dön. düş. toplantısı	Günlük kaydı ve toplantı form(lar)ı
7. Hafta	Son Görüşme	Görüşme protokolü

3.3 Veri Analizi

Miles ve Huberman (1994), veri analizini, araştırmacıların başlangıçta ilk konuları ya da kategorileri ortaya koydukları ve sonra da bu konularla tutarlı ya da konuların yanlış olduğunu gösteren kanıtlar bulmak üzere verileri inceledikleri süreç olarak tanımlarlar. Bu çalışmada kullanılan kategoriler, hizmet öncesi matematik öğretmeninin ÖSP'nda ÖU süreci yoluyla geliştirilmesi beklenen başlıca alanlardır.

Dolayısıyla araştırmacı olarak verileri bu kategoriler ışığında kodlamaya başladım. Çalışmanın kodlama sürecinde, kodlama birimi, söz öbekleriydi. Açık bir kodlama süreci elde etmek için, Miles ve Huberman'ın (1994) önerdiği adımları izleyerek, verileri dikkatle okudum, kategorilerle ilgili ifadeleri belirledim ve bunlara birer kod verdim. Sonra bu kodları, her bir ifade uygun kod altında düzenlenecek şekilde kaydettim.

Anlatılan kodlama sürecine göre ilk veri kümesini çözümledikten sonra, kategoriler veya birinci sıra konuları ve ikinci sıra konuları (Miles ve Huberman, 1994) ortaya çıkmış oldu. Sonra genelden özele doğru akışı gösteren veri analizi şemaları ve tabloları oluşturdum. Kodlar ve alt kodlar üzerinde yapılan veri analizi sonucunda, Bayan Çalışkan'ın yansıtıcı düşünceleri için bazı başlıklar ve alt başlıklar belirledim. Bayan Çalışkan'ın yansıtıcı düşünce sürecini, "uygulamanın başlangıcı", "dönem içinde uygulama" ve "öğretim sonrası" başlıkları altında inceledim.

3.4 Güvenilirlik

Lincoln ve Guba (1985) güvenilirliği, "Bir sorgulamacı, (kendi de dahil olmak üzere) hedef kitlesini, bir sorgulamanın bulgularının dikkate almaya değer olduğuna nasıl ikna eder? Bu konuda ikna edici olmak için hangi savlar geliştirilebilir, hangi ölçütlere başvurulabilir, hangi sorular sorulabilir?" (s.290) sorusunun yanıtı olarak tanımlamışlardır. Nitel araştırmalarda, çalışmanın geçerliliğini garanti etmek için muhatapların geri bildirimi, üçleme, ayrıntılı tanımlama, meslektaş değerlendirmesi ve dış değerlendirmeler önerilmektedir (Creswell ve Miller, 2000). Bu çalışmada, kaynakların üçlenmesi, yöntemlerin üçlenmesi, alanla uzun süredir ilgileniyor olma, meslektaş değerlendirmesi ve muhatap geri bildirimi teknikleri kullanılmıştır. Farklı veri toplama yöntemlerinin kullanılması da güvenilirliği sağlamaya katkıda bulunmuştur. Veri toplama araçlarının, çalışmanın amacına, kapsamına ve sürecine uygunluğu, nitel olgu çalışmasının doğasını bilen bir başka araştırmacı (meslektaş) tarafından gözden geçirilmiştir. Bu çalışmada meslektaş değerlendirmesinin yanı sıra muhatap geri bildirimi süreci de işletilmiştir. Bayan Çalışkan, hem yerinde ve zamanında (Lincoln ve Guba, 1985) hem de görüşmeler sırasında ve sonrasında geri bildirimde

bulunmuştur. Çalışmanın aktarılabilir ve güvenilir olması için, bu bölümde, veri toplama, veri analizi ve diğer süreçlerin ayrıntılı tanımları verilmiştir.

Merriam (1998), "önyargıları ya da 'öznelliği' ortadan kaldırmaya çalışmak yerine, bunları belirlemek ve verilerin toplanması ve yorumlanmasını nasıl şekillendirdiğini izlemek önemlidir" (s.15) demiştir. Danışmanlık deneyimimin genel olarak süreç üzerinde nasıl bir etkisi olabileceğini belirledim ve buna uygun olarak süreç içinde yansıtıcı düşünce notları tuttum. Ayrıca danışmanlık deneyimim sayesinde iyi bir gözlemci haline geldiğim için, bu gözlemleri ayrıntılarıyla çözümlemeye odaklandım. Bunun yanı sıra, Bayan Çalışkan'ın yansıtıcı düşünme süreciyle ilgili veriler, bir başka meslektaşım tarafından da kodlandı ve çözümlendi.

4. Bulgular

4.1 Uygulamanın başındaki yansıtıcı düşünceler

Uygulamanın başındaki yansıtıcı düşünme süreçlerinde Bayan Çalışkan, *Öğretmenlik Sertifikası Programı (ÖSP) ile ilgili birtakım konuların ve programın gerekliliklerin*in altını çizmiştir. Bu konular, pedagojik içerik bilgisi edinmek, öğretmenlerle buluşmak, onların deneyimlerinden içgörüler edinmek, bilgilerini diğer öğretmen adayları ile paylaşmak, ders danışmanı tarafından verilen görevleri yapmak ve dersin gereklerini yerine getirmek, farklı sınıf düzeylerinde öğrencileri gözlemek, ayrıntılı ders planları hazırlamak ve farklı amaçlar için farklı kaynakları seçip kullanmakla ilgilidir.

ÖSP ve programın gerekleriyle ilgili konulara ek olarak Bayan Çalışkan, *öğretim süreci*yle ilgili, alternatif ders planını devreye sokmak, öğrenciler hakkında bilgi edinmek, zamanı yönetmek, uygun malzemeleri seçmek, aktivite kağıdı kullanmak, teknolojiyi kullanmak gibi konuları vurgulamıştır. Bayan Çalışkan, ÖSP'nın ilk yılında aldığı OD dersindeki öğretim süreciyle ilgili olarak bu konular üzerinde yansıtıcı düşünmüştür.

Bunların ötesinde, Bayan Çalışkan yansıtıcı düşünme sürecinde *kendini başarılı bulduğu ve güçlü hissettiği eylemler*le daha fazla geliştirmesi gerektiğini düşündüğü eylemleri ayırt etmeye çalışmıştır. Bayan Çalışkan, uygulamanın başında

güçlü yönleri olarak pedagojik içerik bilgisi edinmesini, öğretmenlerle buluşmasını, onların deneyimlerinden içgörüler kazanmasını, bilgilerini diğer hizmet öncesi matematik öğretmenleriyle paylaşmasını, ders danışmanının verdiği görevleri yapmasını ve dersin gereklerini yerine getirmesini, farklı sınıf düzeyindeki öğrencileri gözlemesini, ayrıntılı ders planları hazırlamasını ve yaratıcı olmasını göstermiştir. Bunlara ek olarak, uygulamanın başında geliştirmesi gereken konuları, birkaç kaynaktan yararlanma, dersin aşamaları arasında geçiş yapma, alternatif ders planını devreye sokma, öğrenciler hakkında bilgi toplama, zamanı yönetme, farklı amaçlar için malzeme seçme ve teknolojiyi kullanma olarak belirtmiştir.

4.2. Öğretim uygulaması sırasındaki yansıtıcı düşünceler

Bayan Çalışkan'ın ders görüşmeleri öncesindeki yansıtıcı düşünceleri gözden geçirildiğinde, planlama, kararlar ve bunların ardındaki nedenler, genel olarak öğretim ve planlama öncesi dönemde göz önünde bulundurduğu noktalar konusunda yansıtıcı düşündüğü görülmektedir. Bayan Çalışkan'ın öğretim uygulamaları öncesindeki *planlama ve öğretim süreci*yle ilgili yansıtıcı düşünceleri, başlangıç analizi, kaynaklar, grup çalışmalarını planlama ve uygulama, öğrencileri ödüllendirme, yönerge verme, erken bitirenler için alternatif plan ve farklılaştırma, öğrencilere soru sorma ve bunun arkasında yatan neden, çalışma kağıdı kullanma konularındadır.

Bayan Çalışkan, öğretim uygulamalarının öncesinde *öğrencilerin öğrenimi* konusunda, gruplama stratejileri ve esnek gruplama, grup içinde sorumluluk paylaşımı, etkinliklerin ve öğretim yönteminin seçiminde belirleyici etkenler, problem çözme sürecinin planlanması, yeni bir kavramın öğrenilmesi, ön bilgi gerektiren bir kavramın öğretilmesi, manipülatif kullanma ve öğrencilerin öğrenim görevleriyle etkin bir şekilde meşgul olmalarını sağlama konularında yansıtıcı düşünmüştür.

Yukarıda sözü edilen yansıtıcı düşünme alanlarına ek olarak Bayan Çalışkan öğretim uygulamaları öncesinde *değerlendirme ve sınıf dinamiği* konusunda da yansıtıcı düşünmüştür. Değerlendirme konusundaki yansıtıcı düşünceleri, öğrencilerin değerlendirmeye etkin katılımları ve dereceli puanlama anahtarlarının

kullanımıyla ilgili olmuştur. Öğretim uygulamaları öncesindeki sınıf dinamiğine ilişkin yansıtıcı düşünceleri, grup çalışmasını tercih etme, gruplardaki öğrenci sayısını düzenleme, grup çalışmasını yönetme, öğrencilerin göreve odaklanmaları ve sessizlik, sınıfta hareket olanağı sağlama konularına odaklanmaktadır.

Bayan Çalışkan, *geliştirmesi gereken alanlar* açısından da öğretim uygulamaları hakkında yansıtıcı düşünmüştür. Bu alanların en önemlilerinden biri, zaman yönetimi ve dolayısıyla zaman yönetimi sorununa karşı önlem almak olmuştur. Bayan Çalışkan'ın yansıtıcı düşüncelerini etkileyen etkenlerden bazıları, kendi öğretimine ilişkin kaygıları olmuştur. Bu kaygılar arasında önemli konulardan biri, öğrencilerin iyi öğrenmeleri için ortamın sağlanması gibi, ders işlemeyle ilgili konulardır. Ayrıca Bayan Çalışkan, öğrencilere matematiği sevdirmek ve öğrencilerin ders sırasında sorulan sorulara doğru yanıt verebilmeleri üzerinde durmuştur. Öğrencilerin verdikleri yanıtlar ve öğretim sürecinde istemeden ortaya çıkan durumlar, Bayan Çalışkan'ın yansıtıcı düşüncelerini tetikleyen konulardan bazıları olmuştur.

Öğretim uygulamaları sırasında *öğrenci öğrenimi*yle ilgili yansıtıcı düşünceler, dersi öğrenci özelliklerine göre farklılaştırmak ve dersin işleniş stratejisini, öğrencilerin tepkilerine göre değiştirmekle ilgilidir. *Sınıf dinamiği* açısından ise, öğretim uygulamaları sırasındaki yansıtıcı düşünceler, zaman yönetimi konusunda önlem alarak dersi alternatif bir şekilde işleme, öğrencileri motive etme ve ödüllendirme, öğrenciler arasındaki farklılıklarla başa çıkma ve dikkati kolay dağılan öğrencileri destekleme konularına odaklanmaktadır.

Bayan Çalışkan'ın eylem hakkındaki yansıtıcı düşüncelerinin çoğu, ders sonrası görüşme sürecinde kendini göstermiştir. Genel olarak, Bayan Çalışkan, *sınıf içindeki öğretim süreci sırasında gerçekleşen eylemler, bunların olumlu ve geliştirilmesi gereken yönleri* üzerinde yansıtıcı düşünmüş ve sonraki öğretim uygulamalarındaki eylemlerine buna göre karar vermiştir.

Bayan Çalışkan'ın öğretim uygulamaları sonrasında *sınıf yönetimiyle* ilgili yansıtıcı düşünceleri, yönerge verme ve zamanı yönetme üzerine odaklanmıştır. Bunlara ek olarak Bayan Çalışkan, *öğrencilerin bilgisi,* öğrenci isimlerini bilme,

içeriğe hazır olma, grup çalışmasına hazır olma ve beceri farklılıkları hakkında yansıtıcı düşünmüştür. *Öğrenci öğrenimi* konusunda öğretim uygulamaları sonrasındaki yansıtıcı düşünceleri, problem çözme sürecini planlama, zorlayıcı bir öğrenim ortamı yaratma, yöntem konusunda kıvraklık geliştirme fırsatları yaratma, somut malzemeler kullanma, alternatif planı devreye sokma, tahtayı kullanma ve öğrenim düzeyini artırmaya yöneliktir. Öğretim uygulamaları sonrasında *öğretim süreci*yle ilgili yansıtıcı düşünceleri ise, dersin amaçlarına ve hedeflerine ulaşma, kavramları somutlaştırmak için görsel modeller kullanma, grup çalışması sırasında öğretmenin rolünü gözden geçirme, kavramı matematikteki diğer kavramlarla ilişkilendirme üzerine odaklanmıştır.

Öğretim uygulamaları sonrasında *değerlendirme* konusundaki yansıtıcı düşünceler, kontrol listesi kullanma, öğrenimi kontrol etme, değerlendirme araçları ve stratejilerini kullanma, öğrencilerin verdikleri çözümlerin yöntemlerini kontrol etmeyle ilgilidir. Öğretim uygulaması sonrasında *öz değerlendirme*ye ilişkin yansıtıcı düşünceler, acemi öğretmen olma ve ideal öğretmene ulaşmaya odaklanmıştır. Bayan Çalışkan'ın öğretim uygulaması sonrasında yansıtıcı düşünme tarzı, öğretmenliğinin güçlü yönünü belirleme, geliştirmesi gereken alanları belirleme, sonraki uygulamalar için gelişimi belirleme ve kendini bir öğrenen olarak görme şeklinde olmuştur.

4.3 Öğretim uygulamasının sonundaki yansıtıcı düşünceler

Öğretim uygulamasının sonunda Bayan Çalışkan, *planlama, öğretim süreci, değerlendirme, sınıf yönetimi, öğrenciler ve öğrenimleri* gibi çeşitli konularda yansıtıcı düşünmüştür. Bunlar, öğretim uygulamasının bir ya da birkaç bölümünde ele aldığı konulara paraleldir. Uygulamanın sonunda *planlama*yla ilgili yansıtıcı düşünceler, kuramları uygulamaya koyma, dersin hedeflerini yazma, yoğun müfredatla başa çıkma, öğrencilerin sınıf düzeyini ve başarı düzeyini dikkate alma ve öğrencilerin öğrenim gereksinimlerine ve özelliklerine yanıt verme konularında gerçekleşmiştir. Uygulamanın sonunda *öğretim* sürecine ilişkin yansıtıcı düşünceler, teknoloji, konuyu uygulama, içeriği anlama, kendini ders içeriğine yakın hissetme, anlamlı öğrenim için ortamı yaratma ve metaforlar kullanarak konuyu kolaylaştırmaya yoğunlaşmıştır. *Değerlendirme* konusundaki yansıtıcı düşünceler, farklı değerlendirme araçları ve stratejileri kullanma, öğrencileri değerlendirme

sürecine dahil etme, öğrencileri motive etme ve ödüllendirme, ön ve son testler kullanmayla ilgilidir. Uygulamanın sonunda *sınıf yönetimi*ne ilişkin yansıtıcı düşüncelerin odağında, temel anlaşmaları sunma ve iletişim kurarak öğrenme yer almıştır. *Öğrenciler ve öğrenimleri*yle ilgili yansıtıcı düşüncelerin konuları ise dersi öğrenci gereksinimlerine göre değiştirme, öğrencilerin mevcut bilgi ve becerileri hakkında daha fazla bilgi sahibi olma, matematik korkusunu ortadan kaldırma ve olumlu bir öğrenim ortamı yaratma olmuştur.

Öğretim uygulaması sırasında ele alınan konuların dışında Bayan Çalışkan daha ileri düzeyde birtakım konulara da dikkat çekmiştir. Bunlar, *öğretmenlik mesleği, kişisel özellikler* ve *ÖSP'nın gerekleri*yle ilgili yansıtıcı düşüncelerdir. Uygulamanın sonunda *öğretmenlik mesleği*yle ilgili yansıtıcı düşünceler, ilk dersi planlama, sınıfta dersi işlerken kaygılı olma, son dersle ilgili duygular, iyi bir öğretmen olma ve etkili öğretim, ayrıca kendini gerçek bir öğretmen gibi hissetme konularıdır. Uygulama sonunda *ÖSP'nın gerekleri*yle ilgili yansıtıcı düşüncelerin merkezinde ise, derse sürekli katılım, tüm hafta boyunca katılımcı okulda olma ve dersinin gözlenmesi yer almıştır.

Uygulama sonunda *kişisel özellikler*e ilişkin yansıtıcı düşüncelerin konuları arasında, sabırlı olmak, derinlemesine ve genişlemesine öğrenme isteği duymak ve mücadeleci bir ruha sahip olmak vardır. Bayan Çalışkan'ın *güçlü noktaları,* pedagojik içerik bilgisi edinmesi, öğretmenlerle buluşması ve onların deneyimlerinden içgörüler kazanması, bilgilerini diğer hizmet öncesi matematik öğretmenleriyle paylaşması, ders danışmanının verdiği görevleri yapması ve dersin gereklerini yerine getirmesi, farklı sınıf düzeylerinde öğrencileri gözlemesi, ayrıntılı ders planları hazırlaması, yaratıcılığı, grup çalışması planlaması ve yaptırması, planlama için iyi bir başlangıç çalışması yapması, öğrencileri motive etmesi ve onlarda öğrenme isteği uyandırması, öğrencilere gelişmelerini sağlayacak zorlayıcı etkinlikler tasarlaması, konuların ve kavramların kapsamı, sıralaması ve sınırları konusunda bilgili olması ve değerlendirme amacıyla dereceli puanlama anahtarları hazırlaması yer almaktadır. Bayan Çalışkan, uygulama sonrasında *geliştirmesi gereken alanlar* olarak, uygun etkinlikleri seçme, metaforları önceden belirleme, içerik bilgisine çalışma, Türkçe matematik terimleri hakkında bilgi sahibi olma,

gerçekleştirilebilir ve ulaşılabilir hedefler koyma, zamanı yönetme ve öğrencilerin çalışma süreçlerini ve öğrenimlerini değerlendirmeyi belirlemiştir. Tablo 4.1 çalışmadan elde edilen bulgulardaki ana başlıkları sunmaktadır.

Tablo 4.1 Çalışmadan elde edilen bulguların ana başlıkları

	Öğretim uygulaması başında	**Öğretim uygulaması sırasında**			**Öğretim uygulaması sonunda**
Yansıtıcı düşünme içeriği	Öğretmenlik Sertifikası Programı (ÖSP) programın gereklilikleri *Öğretim süreci	**Öğretim uygulamaları öncesinde** *Planlama ve öğretim süreci *Öğrenci öğrenmeleri *Değerlendirme *Sınıf dinamikleri	**Öğretim uygulamaları sırasında** *Öğrenci öğrenmeleri *Sınıf dinamikleri	**Öğretim uygulamaları sonrasında** *Sınıf yönetimi *Öğrencilerle ilgili bilgi *Öğrenci öğrenmeleri *Öğretim süreci *Değerlendirme *Öz-değerlendirme	*Planlama ve öğretim süreci *Değerlendirme *Sınıf yönetimi *Öğrenci öğrenmeleri *Öğretmenlik mesleği *Kişisel özellikler *Öğretmenlik Sertifikası Programı (ÖSP) ve programın gereklilikleri
Yansıtıcı düşünmenin yönelimi	*Geliştirdiği alanları tespit etme *Geliştirilmesi gereken alanları tespit etme	*Geliştirilmesi gereken alanları tespit etme	*Öğrenci öğrenme düzeyini en üst düzeye çıkarma *Sınıf yönetimini sağlama	*Öğretmen olma noktasında güçlü yanları tespit etme *Geliştirilmesi gereken alanları tespit etme *Gelecek öğretim uygulamaları için geliştirilmesi gereken alanları belirleme	*Geliştirdiği alanları tespit etme *Geliştirilmesi gereken alanları tespit etme

5. Sonuçlar, Tartışma ve Çıkarımlar

5.1 Sonuçlar ve tartışma

Araştırmalar, öğretmenlerin uygulama deneyimlerini mesleğe adım atmada son derece önemli ve vazgeçilmez bir unsur olarak gördüklerini göstermektedir (Zeichner ve Gore, 1990). Bayan Çalışkan için, ÖSP'nın ilk yılında aldığı dersler, iyi bir öğretmen olmasına dikkate değer katkılarda bulunmuştur. Bu açıdan çalışmanın bulguları, Zeichner ve Gore'nin (1990) fikirlerini destekler niteliktedir.

Zeichner ve Liston'un (1996) öğretmen adaylarının deneyimlerinin diğer öğretmen adayları için değerli bir öğrenim kaynağı olabileceği yönündeki görüşleri de bu çalışmanın bulguları ile örtüşmektedir. Bayan Çalışkan, diğer öğretmenleri gözleyerek bilgi edinmekle kalmamış, diğer öğretmen adaylarının deneyimlerinden de yararlanmıştır. Lee'nin (2005) belirttiği gibi, hizmet öncesi matematik öğretmenlerinin yansıtıcı düşünceleri, kişisel artalana, alan deneyimi bağlamlarına ve iletişim şekline bağlıdır. Bayan Çalışkan'ın öğretim süreçleri konusundaki yansıtıcı düşünceleri, geleceğin öğretmeni olarak önceki deneyimlerinin sonuçlarıdır.

Çalışmanın sonuçları değerlendirildiğinde, Bayan Çalışkan'ın genellikle öğretim süreçlerinin öncesinde ve sonrasında yansıtıcı düşünme yaptığı görülmüştür. Öğretim etkin bir şekilde devam ederken de yansıtıcı düşünme uygulaması yapmış olmasına karşın, dersi işlerken gerçekleşen yansıtıcı düşünceler, ders öncesi ve sonrasındakilerle karşılaştırıldığında, sayı ve çeşitlilik olarak daha azdır. Kaliteli eğitimin üç kilit özelliği vardır: Anlayış sağlamaya yönelik kavramsal öğretim, içerik içinde bağlantılar kurmak (Shepard vd., 2005) ve öğrenci katılımı yoluyla dikkati yönlendirmek (Marzano vd., 2001). Öğrencilerin çalışmalarını gözleyen ve onların öğrenim süreçleri üzerinde yansıtıcı düşünen Bayan Çalışkan, öğrencilere daha uygun olacak şekilde öğrenim ortamında değişiklikler yaratmasına olanak sağlayan bir anlayıştadır. Bayan Çalışkan'ın bu anlayış doğrultusunda öğrencilerin anlamasını ön plana çıkaran bir kavramsal öğretim yaptığı söylenebilir.

Bayan Çalışkan'ın ders öncesindeki yansıtıcı düşüncelerinin temelinde, önceki derslerde elde ettiği sonuçlar, olumlu noktalar ve geliştirilmesi gereken noktalar yer almaktadır. Bunlara ek olarak, öğretim öncesi yansıtıcı düşünce süreci,

ders görüşmelerinden sonra vurgulanan yansıtıcı düşüncelerin sonuçlarını ve bu yansıtıcı düşünceleri takip eden eylem adımlarını içermektedir. Bu bulgu, Schön'ün (1983) yansıtıcı düşünme sürecini sıkıntı yaratan ya da umut vaat eden bir şeyin başlattığı ve süreci belirleyen etkenlerin, genel anlamda tatmin edici bulunan değişikliklerin yapılması ve duruma yeni bir anlam katan ve araştırılacak soruların doğasını değiştiren yeni özelliklerin keşfedilmesi olduğu yönündeki iddiasıyla uyumludur.

Dewey (1993), doğası itibarıyla döngüsel olan yansıtıcı düşünme sürecini bir tür sorun çözme süreci olarak tanımlamış ve beklenen bu sorunların, öğretmenlerin yansıtıcı düşünceye dayanan eylemlerinin tetikleyicisi olduğunu belirtmiştir. Bayan Çalışkan'ın yansıtıcı düşünme süreci de bu şekilde işlemiştir. Derslerinden birinde bir sorun olduğunda, Bayan Çalışkan bu sorunu yeni dersleri için başlangıç noktası olarak kullanmıştır. Bir başka deyişle, bir "sorun" bir sonraki planlama döneminde onun ilk düşündüğü unsurlardan biri, hatta çıkış noktası olmuştur.

Yansıtıcı düşüncelere dayanarak eylemde bulunmak, yansıtıcı düşünme uygulamasını yalnızca geçmişe bakıp düşünmekten ayırır ve öğretmenlerin gelişimindeki kilit özelliklerden biri olabilir (McDuffie, 2004). Bayan Çalışkan, işleyişi ile ilgili sorunları fark etmekle kalmamış, düzeltmek için bazı eylemlerde bulunmuştur.

Bayan Çalışkan'ın yansıtıcı düşüncelerini etkileyen etkenler zaman zaman öğretimi konusundaki kaygılarıyla ilgilidir. Bayan Çalışkan eylem sırasında yansıtıcı düşünmüş ve öğretim süreci devam ederken önceden tahmin ettiği sorunları anında düzeltmek için çözümler bulmaya çalışmıştır. Bu açıdan yansıtıcı düşünme kavramı Polya'nın (1945) matematik problemi çözme süreci ile benzerlik göstermektedir.

Öğretmenler ve öğretmen adayları, sınıf uygulamaları konusunda yansıtıcı düşünerek, öğretime ve içinde çalıştıkları ortama eğilimlerinin ne olduğunu gözleme şansı elde edeceklerdir (Zwozdiak-Myers, 2009). Bayan Çalışkan'ın uygulama sonrasındaki yansıtıcı düşünme tarzı, öğretmenliğinin güçlü yönünü bulmak, geliştirilmesi gereken alanları belirlemek, sonraki uygulamalar için gelişime karar vermek ve kendini bir öğrenen olarak görmektir. Bussis ve diğerleri (1985) yansıtıcı

düşünmeyi, bireyin içinde gelişme gösterdiği ya da öğrenim ortamından doğan entelektüel düzenlemeler olarak tanımlamışlardır. Bu bağlamda Bayan Çalışkan için, her bir öğretim süreci, öğrencilerin öğrenimi gibi çeşitli konuları içine alan bir öğrenim ortamı ve öğretmenlik mesleğinde kendi gelişimi için bir ortam olmuştur.

Bayan Çalışkan'ın uygulaması öncesindeki, sırasındaki ve sonrasındaki yansıtıcı düşünme süreçlerinin ortak ve farklı yönleri vardır. Çalışkan ders görüşmelerinden önce çoğunlukla beceri gelişimi, matematik öğretiminin doğası, farklı sınıf düzeyleri, farklılaştırma, değerlendirme, öğretim yöntemleri, malzemeler, öğrencilerin özellikleri, yönerge verme, grup çalışmasını yönetme, öğrencilerin ilgi alanları ve mevcut becerileri gibi konulardan söz etmiştir. Öğretim sürecinde Bayan Çalışkan'ın düşünceleri, sınıf yönetimini devam ettirme ve öğrencilerin öğrenim gereksinimlerine daha iyi bir şekilde cevap verme üzerine odaklanmıştır. Bayan Çalışkan öğretim sürecinin sonunda dersleri hakkında yansıtıcı düşünürken ortaya çıkan belli başlı konular, yansıtıcı düşüncelerin ve önceki uygulamaların sonucunda yapılan öz değerlendirme ve görülen gelişmelerdir. Ders sonrası görüşmelerde Bayan Çalışkan, ağırlıklı olarak, öğretimin başarısı, öğrencilerin öğrenim düzeyleri ve dersi planladığı ve amaçladığı şekilde öğretme konularını vurgulamıştır.

Öğretim süreçlerinin öncesi, sürecin kendisi ve sonrası olarak tanımladığım bu üç süreçteki yansıtıcı düşüncelerin ortak noktası, Bayan Çalışkan'ın planlandığı ve amaçlandığı şekilde etkili bir öğretim sunma ve öğrencilerin öğrenimi için uygun ortamı yaratma yönündeki niyeti ve odağıdır. ÖU döneminin başından itibaren Bayan Çalışkan, öğretim sürecindeki gelişimini izlemiş ve kendini güçlü hissettiği alanlar, gelişme gösterdiği alanlar ve daha fazla gelişme göstermesi gereken alanlar konusunda yansıtıcı düşünmüştür. Bir dersin öncesi, dersin kendisi ve sonrası hakkında bilinçli bir şekilde yansıtıcı düşünmek için çaba göstermek, öğrenci öğreniminin kalitesi açısından büyük bir değer taşır (Burrows, 2012).

Öğrenci öğreniminin kalitesini etkileyen yalnızca bir öğretmenin sınıfta ne yaptığı değildir. Araştırmalar, bir öğretmenin sınıfa getirdiği coşku, enerji, öz farkındalık ve açık fikirlilik gibi özelliklerin öğrenciler ve öğrenimleri üzerinde çok büyük bir etkisi olduğunu ortaya koymaktadır (Burrows, 2012). Bayan Çalışkan'ın kişisel özellikleri, öğretmenliğine ve öğrenci öğrenimine katkıda bulunmuştur.

Yansıtıcı düşünme yaklaşımında, oldukça uzun süreli bir gelişim esastır (Dewey, 1933) ve bu, zaman içinde geliştirilebilecek bir alışkanlık olarak düşünülmelidir (Harford ve MacRuairc, 2008). Bu açıdan, Bayan Çalışkan'ın hala gelişime açık olan noktaları, öğretimde deneyim edindiği ölçüde zaman içinde gelişebilir.

5.2 Çıkarımlar

5.2.1 Uygulamaya yönelik çıkarımlar

Yansıtıcı düşünmenin, "öğretmen öğrenimi ve gelişiminin kilit noktası" (Shulman ve Shulman, 2004, s. 264) olduğu göz önüne alındığında, etkili bir öğretim sunmak için, hizmet öncesi ve hizmet içi eğitim öğretmenlerin yansıtıcı düşünme becerilerini geliştirecek şekilde planlanmalıdır (Baki, Güç ve Özmen, 2012). Böylesine yoğun bir programda öğretmen adayları, öğretmenlik mesleğinde ilerlemelerini sağlayacak çeşitli konularda yansıtıcı düşünme şansına sahip olacaklardır.

Yalnızca ÖSP'nın yapısı değil, ÖU programının gerekleri ve katılımcı okulun yapısı da yansıtıcı düşünceyi olanaklı kılmak açısından çok önemlidir. Okul yöneticilerine, öğretmen eğitimcilerine ve hizmet içi öğretmenlere, öğretmen adaylarının yansıtıcı düşünme uygulamasını geliştirmede önemli görevler düşmektedir (Lowery, 2003). Yansıtıcı düşünme ve yansıtıcı düşünme uygulama süreci, hizmet öncesi öğretmenlerin eğitiminde çok önemlidir (Cumyn, 2010) ve gerek ÖU dersi gerekse bu dersin katılımcı okul unsuru büyük önem taşımaktadır.

Dolayısıyla uzman öğretmenler olarak danışmanlar, yansıtıcı düşünen öğretmenlerin gelişimini desteklemede ciddi bir rol üstlenmektedir. Bu çalışma, danışmanların hizmet öncesi öğretmenlerin yansıtıcı düşünmelerini yönlendirmede etkili olduklarını göstermiştir.

Yansıtıcı düşüncenin düzeyini artırmak için, yansıtıcı düşünce uygulamasını gerçekleştirmeyi amaçlayan hizmet öncesi öğretmenler, sürekli olarak yansıtıcı düşünme uygulamalarıyla içli dışlı olmalıdırlar. Buna ek olarak, gerçekçi bir iyileşme sağlamak için, hizmet öncesi öğretmenlerin değerlendirilme kaygısı

duymaksızın kendi ilerlemeleri hakkında yansıtıcı düşünmelerine olanak sağlanmalıdır.

5.2.2 Gelecek araştırmalara yönelik çıkarımlar

Bu çalışma, gözlemler ve görüşmeler gibi araçlarla elde edilen nitel verilerin, bir hizmet öncesi öğretmenin yansıtıcı düşünmesi olgusuna çok boyutlu bir bakış açısı getireceğini doğrulamıştır.

Yukarıda sözü edilen konular ışığında, bu araştırma, hizmet öncesi matematik öğretmeninin zaman içindeki yansıtıcı düşünceleri, bu düşüncelerin içeriği ve yansıtıcı düşünme uygulaması sürecindeki gelişmeler konusunda bir örnek ve anlamlı bir anlayış sunmuştur.

Ancak, yansıtıcı düşünme uygulaması "insanların yansıtıcı düşünme fırsatları, yetenekleri ve eğilimlerinin değişiklik gösterdiği" (Copeland, Birmingham, De La Cruz ve Lewin, 1993, s. 348) bir süreklilik arz ederek gerçekleşir. Dolayısıyla, hizmet öncesi öğretmenlerin uzun bir zaman diliminde ve belki de öğretmenliklerinin ilk yılında gelişimlerini izleyen çalışmalar, yararlı bilgiler ortaya koyacaktır. Bir öğretmen adayının yansıtıcı düşünme uygulaması sürecinde danışmanların rolünü inceleyen bir çalışma da yansıtıcı düşünme sürecini diğer taraftan anlama konusunda yararlı olacaktır.

Appendix I: Thesis Copy Permission Form

TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ■

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : Toker
Adı : Zerrin
Bölümü : İlköğretim

TEZİN ADI (İngilizce) : A Preservice Mathematics Teacher's Reflective Practices on Self Improvement Regarding Teaching and Learning Process in Practice Teaching

TEZİN TÜRÜ : Yüksek Lisans ☐ Doktora ■

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz. ■

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