# The Educational Approaches of Turkish Pre-Service Elementary Mathematics Teachers in Their First Teaching Practices: Traditional or Constructivist?

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*Abstract: This research aimed to identify theeducational approaches that pre-service elementary mathematics teachers adopt for their first teaching practice (TP) and the reasons for their choices. It was carried out with thirteen pre-service teachers (PTs). These PTs were observed during their first TP in a real school setting, and interviews were conducted after the TP. Our observations led us to the conclusion that PTs generally tended to utilize traditional teaching approaches. The interviews revealed that PTs' epistemological beliefs and beliefs about learning and teaching mathematics are largely in line with constructivist theory, and that their tendency for traditional approaches was due to: the influence of past educational experiences, the teaching styles of in-service teachers working at practice schools and their negative opinions about constructivist approaches, the limitations of their university educations, their lack of experience, and choosing the easier option. We conclude with a discussion of the implications of these findings for teacher training in mathematics.*

## Introduction

Enormous scientific and technological developments have rapidly transformed social structures, obliging educational systems to keep up with them. In this changing world, the expectations from schools and the skills that school students should acquire for professional life have also changed (Umay, 2007). Along with developments in other fields of science, significant advances have also been made in educational sciences, and important knowledge pertaining to human learning processes has been accumulated. New approaches have been developed that enable students to learn better, boost the productivity of school education, and thus better respond to social needs. Constructivist theory, which began to be shaped in the early twentieth century by scholars such as W. James, J. Dewey and L.S. Vygotsky and was particularly developed by the perspectives of Jean Piaget (Phillips, 1995; Wadsworth, 1996). It is based on the thesis that learners should acquire knowledge actively, and on the idea that students develop comprehension through experiences they relate to what they already know (Piaget & Inhelder, 1971). This approach asserts that acquired knowledge is constructed like a building in the mind, only its building blocks are relationships with prior learning experiences. Everyone forms these relationships between their own individual experiences, and learning is thus a personal matter. Constructivist theory consequently argues that direct knowledge transfer from one individual to another is impossible, and that knowledge is constructed as a result of personal effort (Brooks & Brooks, 1999; Glasersfeld, 1989; Glasersfeld, 1995; Phillips, 2000).

Following the National Council of Teachers of Mathematics' (NCTM) publication of math education standards reflecting the constructivist approach (1989, 1991), constructivist curricula were developed in many countries, and this theory's influence in the world of education grew (Aldrich & Thomas, 2005; Umay 2007). Nearly fifteen years after the NCTM's call, curricular reform began in Turkey in 2005. The Turkish education system tried to replace the traditional behaviorist teaching approach. This approach is centered around the teacher, and it renders students passive, since it supposes learning to occur by means of the teacher transferring knowledge to passively listening students (Ministry of National Education [MNE], 2009). Since this curricular reform, new text books have been prepared,

technology has been popularized at schools, and regulations based on the new approach have been established for teacher training programs. Regulations have aimed to replace the traditional teacher-focused teaching approach with new constructivist approaches. Thus, the task of the teacher has changed from transmitting knowledge to moderating learning environments and facilitating students' acquisition of knowledge (Gömleksiz, 2005; Yıldırım, Er-Nas & Ayas, 2009).

Teachers play a key role in the successfully implementation of innovations in mathematics education, since they are an important factor in the practical effectiveness of a program (Duru & Korkmaz 2010; Arslan & Özpınar, 2008; Çakıroglu & Çakıroglu, 2003). They also carry the program's targets into the classroom environment and build a bridge between these targets and students. Students learn mathematics through experiences to be furnished by teachers, and teachers play the most important role by arranging the learning environment, selecting activities, and using technology effectively (NCTM, 2000). When teachers shape learning environments; their views and their beliefs about the learning-teaching process and the teaching-learning approaches that they adopt play a role as important as, perhaps more important than, their theoretical knowledge (Aldrich & Thomas, 2005; Struyven, Dochy, & Janssens 2010; Teo, Ching Sing Chai, Hung, & Lee, 2008). Teachers who embrace the constructivist approach organize student-focused activities that support independent learning, group discussions and students' meaning-making, and they put more emphasis on the learning processes (Brooks, 2002). Such teachers see conceptual change as an important instrument, think of students as active constructors of knowledge, and regard this construction of knowledge as an indispensable component of the learning process (Prosser & Trigwell 1999). In the traditional approach, on the other hand, the teacher is the source of knowledge, and students are its passive recipients. This approach puts emphasis on learning through acquiring information, and in this approach, the teacher's main responsibility is teaching students concepts that correspond to specific learning outcomes (Prosser & Trigwell 1999; Howard, McGee, Schwartz, & Purcell, 2000).

Teachers' beliefs affect their perceptions, decisions and teaching styles (Aldrich & Thomas, 2005; Fives & Buehl, 2012), and play a significant role in determining whether they embrace and practice the techniques and activities of new approaches (Donaghue, 2003; Gregoire, 2003). This is also true for math education. Teachers' beliefs regarding math learning and teaching have a strong impact on their instructional decisions in classroom (Calderhead, 1996; Handal, 2003; Pajares, 1992; Polly et al., 2013; Stipek, Givvin, Salmon, & MacGyvers, 2001; Thompson, 1992).Toluk Uçar and Demirsoy (2010) have attempted to determine the extent to which math teachers in Turkey believe in the principles of the new curriculum and put these beliefs into practice. There are many studies in the Turkish literature that assess the TP courses and PTs' opinions about them (Becit, Kurt, & Kabakçı 2009; Boz & Boz, 2006; Çetintaş & Genç, 2005; Dursun & Kuzu 2008). However, fewer studies thoroughly examine elementary mathematics PTs' beliefs and experiences of TP in Turkey (Eraslan, 2009). Since TP enables PTs to practice teaching in real classroom environments and to put theoretical knowledge into practice, exploring PTs' preferences between traditional and constructivist approaches during their TPs and the motives for these preferences is likely to provide clues to help better train PTs and eliminate problems inherent to the field. Thus this research aimed to determine PTs' tendencies in the teaching-learning process by observing the TPs that PTs perform in schools and to determine the reasons for these tendencies.

Despite radical changes in Turkey's education system, numerous problems pertaining to the implementation of curricular reform are encountered in schools, and the actual use of new approaches remains limited (Aykaç, 2007; Karadağ, Deniz, Korkmaz, & Deniz, 2008; Karacaoğlu & Acar, 2010; Aykaç & Ulubey, 2012). Along with a variety of factors, an

important reason for this is the failure to provide in-service teachers (teachers who are responsible for teaching in state schools) with sufficient in-service training, which limits their ability to switch suddenly to a new approach (Karacaoğlu & Acar, 2010). The participants in this study had been theoretically and practically trained to integrate new approaches into their teaching during four years of university education. This study offers new conclusions regarding these problems.

Various studies address the effect of teacher training courses (e.g., in educational psychology or child development) on the approaches that PTs adopt, and most suggest that proper training will help develop constructivist attitudes (Aldrich & Thomas, 2005; Gibbs & Coffey, 2004; Klein, 1998; Krull, Koni, & Oras, 2013; Struyven et al., 2010). In general, these studies use self-reporting instruments to obtain PTs' opinions after their training; however, the issues that they largely overlook are the extent to which PTs are able to integrate the approaches and beliefs acquired by means of these courses into their TPs, and—if they fail to integrate them—the factors that cause this failure. One observational study that investigates how constructivist theory and beliefs are reflected in TPs, whether PTs implement constructivist theory in their classrooms and why they do so, produced useful insights into teacher training (Aldrich & Thomas, 2005).

This study was guided by the following research question:

1. What type of educational approach (traditional vs. constructivist) is used by Turkish pre-service elementary math teachers during their first teaching practices in real classrooms? What factors are responsible for such decisions?

## Method

Investigating a contemporary phenomenon in its real life context (Yin, 2003), this research allows for a case study methodology, enabling the researcher to analyze the "how" and the "why" of tendencies in PTs' teaching approaches in their first TP in a real school setting. In case studies, one or more events, media, programs, social groups or other interrelated systems are thoroughly examined (McMillan, 2000). Case studies may be carried out with the purpose of defining and observing the details that constitute an event, developing potential explanations and evaluations of an event (Gall, Borg, & Gall, 1996). These studies are among the qualitative research methods that enable researchers to thoroughly examine and interpret a group, events or relations within a context, and to make analytical generalizations, rather than realistic estimations, about similar situations (Cohen, Manion & Morrison, 2007). Data was obtained through interviews conducted after teaching practice and through the observation of TPs, yielding detailed information about the research case.

## Participants

The participating PTs were determined by purposeful sampling. This method allows for in-depth study of situations that are thought to have ample data (Patton, 1987). The research was carried out with thirteen pre-service teacher volunteers in their final year of an Elementary Math Teaching Program (EMTP) (EMTP lasts for four years.), who were practicing math teaching in secondary stage (6-8 grade) of elementary schools as part of the TP course. [In the Turkish education system, obligatory education consists of two stages (elementary and secondary). The first four grades (1–4) form the first stage of elementary school, whereas the last four grades (5–8) are called the secondary stage of elementary school. Pre-service mathematics teachers who graduate from EMTP work only in the

secondary stage of elementary schools (5-8 grades) as a specialist in mathematics.] Maximum diversity sampling, a purposeful sampling method, was used to determine the participants. The aim of this sampling is to form a relatively small sample and to maximize the diversity of individuals in this sample relative to the problem addressed (Yıldırım and Şimşek, 2008). Therefore, PTs' genders and academic achievement levels were considered before defining the sample. Of the PTs in this study's sample group, six are males and seven are females, and they are equally distributed among low, medium and high-level academic achievement. Since all of the PTs had completed their elementary education before 2005, they had not previously encountered the practices of the new program based on a constructivist, student-focused approach. During their university education, they had taken the following courses, apart from courses in pure mathematics: Methods of Teaching Mathematics, Introduction to Educational Science, Educational Psychology, Teaching Principles and Methods, Instructional Technologies and Material Design, Sociology of Education, Measurement and Evaluation, History of Turkish Education, Counseling, Classroom Management, and New Approaches in Teaching Processes. As part of these courses, contemporary educational approaches are taught, not only theoretically, but also in practice. Especially in the course "Methods of Teaching Mathematics", in line with the principles that the new math curriculum proposes, teaching practice was done by the PTs in artificial classroom (consisting of other PTs), classroom discussions were held about these practice sessions, and feedback was given by the professor. In their final year, they are sent to state schools for making observations (in School Experience Course) and making teaching practices (in Teaching Practice course). As part of the first-semester School Experience course, PTs observe teachers, students, school administrations, and the school-society relationship, and they prepare portfolios of their work. These portfolios are evaluated by university supervisors in the EMTP and these lecturers give feedbacks to PTs about their observations. In TP course offered in second semester, PTs make their first teaching practices in real classrooms at the end of four years of pre-service education. These practices are evaluated by cooperating teachers (in state schools), university supervisors and their peers. In addition, PTs in Turkey have to take a multiple-choice test that assesses their theoretical knowledge in educational sciences and their math knowledge in order to be able to become teachers. Due to the high number of candidates who apply to become teachers, candidates really want to score well on this test, and after the third year they participate in an intensive preparation process to acquire the theoretical knowledge it requires.

## Data Collection and Analysis

Although a formal ethics approval process is not required in Turkey, where this study was conducted, ethical considerations informed the design and conduct of the study. Before conducting the study, all participants were provided with verbal information about the nature and purpose of the research, and they were made aware that their participation in the study would be voluntary and anonymous and that all data would be used solely for research purposes. Multiple data sources were collected and evaluated to provide data for the research questions. First, the thirteen participants were observed for one hour during which they practiced teaching in a real classroom for the first time as part of the TP course. Before the TP, no directions related to the approaches that they should adopt were given to the PTs. To observe PTs freely choosing their approach with no guidance or feedback, observations were done by the researcher, who was also their TP course professor, in the first TP. At the end of each teaching practice session, the researcher took notes, and the teaching practice done by seven PTs was video-recorded.

Then, follow-up semi-structured interviews were conducted. We asked fourteen questions in the interview. We first asked questions regarding PTs' epistemological beliefs and beliefs about teaching and learning math. Following questions were related to PTs' teaching practice: They were asked why they used a specific approach for teaching practice to determine the factor that came to their minds first. Then, they were asked questions related to various variables that were likely to influence their use of teaching approaches: their educational background (from elementary to university education), the environment in the practice school, and their perceptions regarding the workload caused by implementing new approaches. Furthermore, additional questions were asked to explore participants' responses thoroughly. The interviews were conducted in a suitable timeframe after their first teaching practice before the evaluation session that preceded their second TP. These interviews, conducted in the researcher's office, were recorded with the participants' permission.

The content analysis method of inductive analysis was used to analyze the data. This method is employed to reveal the concepts behind data and relations among these concepts by means of encoding (Miles & Huberman, 1994; Yıldırım & Şimsek 2008). To this end, written data, which consisted of notes taken after observations and notes taken after repeated viewing of videos, were encoded by the researcher and an expert who specializes in qualitative research. For reliability, encodings made by both researchers were compared, and opinions were exchanged on discrepancies. Then, in light of the common codes, themes were identified. Voice recording data obtained in interviews conducted after the observations were also transcribed by the researcher and the same operation was applied to them.

## Findings

This section, will present the themes that emerged from data analysis and findings obtained from observation and interviews.

## Findings from Observation

In this section, findings related to observation of the teaching approaches that PTs adopt for their first teaching practice in the TP course.

### *Equipment and Materials used by PTs in their Teaching Practices*

Table 1 shows the equipment and materials utilized by PTs during TPs, and the number of PTs who used them.

| Material | (n) |
|---|---|
| Whiteboard | 13 |
| PowerPoint Presentation | 6 |
| GeoGebra (Dynamic Math Software) | 3 |
| Concrete Materials (3D Geometric Objects) | 3 |
| Activity Page | 2 |
| Video | 1 |

**Table 1: Equipment and Materials used in TP.**

### The ways materials were used

PTs used the *whiteboard* for writing down the basic definition and properties of the subject, drawing figures to clarify examples, and inviting a selected student to solve a problem in front of the class. They used *PowerPoint presentations* to convey definitions and properties related to the subject visually, to show the problems that students would solve, and to invite students to solve problems. They utilized GeoGebra dynamic math software to show visually specific concepts and relationships that are difficult to explain verbally, and to demonstrate correct solutions. On the other hand, PTs used concrete materials to convey explanations to students, to invite a chosen student practice with the material and to ask questions about concrete materials. They utilized activity pages to have students perform example exercises after the lecture, and finally, they used videos to depict concepts that require spatial skills using visuals. Following observation note displays one of the PTs' way of material use:

*"PT 10 initiated by using a Power-Point presentation about angle types. He presented the descriptions of angle types and gave examples. While using the slides, he used his arms analogically to explain the features of angles. He then conducted a GeoGebra activity and reflected it to the classroom wall using the projector. He measured certain angles moving a virtual protractor in this activity. He also asked the types of emerged angles to whole classroom. He evaluated students' responses and corrected problematic ones. After this activity, he turned back to his Power-Point presentation and asked multiple-choice questions existed in final slides to volunteer students."*

Observation showed that they utilized materials generally as facilitators and mediators while trying to transmit knowledge. None of the pre-service teachers chose to organize learning environments that would enable their students to experience and discover knowledge through interactions with materials. Although they made use of materials prepared for students' construction of meanings for certain concepts, they preferred to offer explanations about these materials, and thus to enable students to make sense of concepts, rather than giving way to allow students to interact directly with those materials.

### The ways PTs integrated students into the learning process

PTs (N = 11 PTs) asked questions to the general classroom and received responses from students, asked questions to students that they chose (N =7), performed activities themselves and then explained them to students, rather than having students perform them (N=2), checked whether an answer given to a question was understood by other students (N=1), invited students to repeat the answer (N=1), picked one of the students and invited the student to write down a question and solve it on the whiteboard and correct any mistakes (N= 4), and performed group activities at the end of the class (N= 1), forming geometric figures by inviting some of the students to the front and offering explanations of these figures (N= 1) .

The PTs fostered an environment where some students were active while others observed, rather than ensuring the active participation of the entire classroom in the learning process. One of the pre-service teachers made sure to include all students in the process by organizing an activity; however, she tried to teach the subject primarily through her own direct lecturing and examples, and used the activity at the end of the class hour only as practice. Another pre-service teacher asked half of the students to stand up and form a

cylindrical figure by giving direct instructions, and provided her own explanations using the figure that students formed.

### *Teaching methods used by pre-service teachers*

The following methods were used to enable students to learn subjects predetermined by the PTs: Expository teaching (N=13 PTs), question and answer (N=13), summarizing the subject and solving sample questions (N= 8) and then having students solve problems on the whiteboard (N= 4) , enabling students to comprehend the operation through long explanations (N=2), relating subjects to everyday life at a limited level (N=5), offering explanations using concrete materials (N=3), asking questions to the entire class and receiving answers from some students (N=11), explaining the reasons for an applied operation using a rote-learning approach (N=2), loudly repeating the correct answer after a wrong answer is given by students (N=1), and explaining the solution of a problem by demonstrating it on the whiteboard when students fail to find it (N=2).

These findings show that the methods and techniques implemented by PTs are more suited to the teacher-focused approach. Some PTs directed their students to do rote-learning, rather than encouraging them to make real sense of the subject, either by making a student repeat the answer given by another one or loudly emphasizing the correct answer when an incorrect answer was given.

### Findings from the Interviews

In this section, we presented the themes emerged by the analysis of the data regarding interviews, using the tables. The numbers (n) represent the number of the themes used in whole sample rather than the participants.

### *PTs opinions that reflect their epistemological beliefs*

The participants were first asked questions related to knowledge and learning in order to get a general sense of their epistemological beliefs. The themes that emerged from the PTs' responses to these questions are shown in Table 2.

As we can see, PTs' opinions regarding knowledge and learning generally bear traces of the constructivist approach:

*I mean, knowledge is something subjective. What you have as knowledge may not be knowledge for someone else. It is like something you feed and grow inside through your own experiences. (PT 8)*

*I think knowledge is binding someone's experiences together with ideas. (PT12)*

| Main Themes | Sub-Themes | n |
|---|---|---|
| Knowledge | Knowledge emerges as a result of my own experiences | 2 |
| | Knowledge develops in the social environment through interactions | 2 |
| | Knowledge is subjective | 1 |
| | Knowledge is the integration of experiences with ideas in mind | 1 |

| | | |
|---|---|---|
| | There should be a need for knowledge in order to be able to acquire it | 2 |
| | Knowledge emerges after solving a problem | 1 |
| | Learning is a process that requires experience | 3 |
| | Learning is the binding of information with mental ties | 3 |
| Learning | Learning is individual, although others also play a role in it | 2 |
| | Learning is the meaningful encoding of knowledge in the mind | 2 |
| | I learn through meaningful explanations | 1 |

**Table 2: Opinions on Knowledge, Learning and How They Occur**

### PTs' opinions on the tenets of Turkish elementary math curriculum

In this section, we scrutinized the PTs' opinions on the tenets of Turkish elementary math curriculum. In addition, as a first question, we asked PTs to express their views regarding the components of efficient math education. The themes derived from these opinions and the distribution of sub-themes across tenets are presented in Table 3.

First, PTs' opinions on the best learning environment for effective math education were obtained. Nearly all the PTs expressed ideas in line with the requirements of the constructivist approach: *Students should take part in the process. Students should be able to make sense of the subject in their minds. Rote-learning should be prevented by concretizing abstract concepts. The classroom environment should be organized to enable students to ask questions. Teaching should be tailored to the needs of individuals. Activities and materials should be used, and students' preparedness should be seen as important.*

| Main Themes | Sub-Themes | n |
|---|---|---|
| The first idea that comes to mind for effective math education | Constructivist | 13 |
| Main Tenets | | |
| Students' physical and mental activeness, learning by experiencing | Constructivist | 10 |
| | Traditional | 2 |
| | I know theoretically | 1 |
| Teacher's role | Guidance, not being the center of attention | 13 |
| Experiential learning | Suitable suggestion | 8 |
| | Not in a math class | 1 |
| View of cooperative learning | Positive | 8 |
| | Negative | 1 |
| The development of communication skills | Suitable suggestion | 10 |

**Table 3**: **Opinions on what is Necessary for Successfully Executing Math Teaching**.

Asked what should be done to enable students to be mentally and physically active and to learn by experiencing in math classes the majority of the PTs presented suggestions based on the constructivist approach: *There should be activities involving students. Lessons should be taught in relation to real life. Students should interact with materials. Students*

*should not remain passive listeners. Students should discover things on their own. Student should be actively engaged in activities.*

In addition, one pre-service teacher stated that he knows what to do in theory, but that he does not know how to do it in practice. Two pre-service teachers offered opinions that were incompatible with the constructivist approach: C*ontrol could be lost if students are too involved in the process. Not everything in math can be learned by experiencing it. Some information should be directly conveyed, and students' physical activity can be ensured by reward and punishment.*

All the PTs stated that the teacher should guide students rather than conveying knowledge. Asked how to perform this role, they proposed methods such as giving hints, presenting methods, directing students to do research, asking them thought-provoking questions and guiding them with questions. However, some PTs did not know exactly how this guiding role should be performed by teachers:

*The teacher should be a guide in all activities. I mean, s(he) should guide students, show them methods, or ask them after performing an activity to do the same. (PT 10)*

Asked what could be done to initiate the teaching-learning process with experiential learning activities, as suggested by the math curriculum; the majority of the PTs suggested ideas that are consistent with the constructivist approach. These PTs stated that situations that students encounter in their everyday lives can be used as a point of departure for experiential learning, and equipment, concrete materials and activities that will enable students to learn by experiencing should be used. One pre-service teacher, on the other hand, stated that it is difficult to provide students with experiential learning opportunities in math classes.

Asked what should be done to improve communication skills, which are also emphasized in the math curriculum; PTs suggested: *Tasks in which students are active, relating skills to everyday life, creating a good atmosphere for discussion, ensuring meaningful learning, using methods like discovery instead of direct knowledge transfer, encouraging students to make presentations at the end of group works, making use of educative games, and writing problems.*


### The PTs' Reasons for Choosing the Approaches that They Used in Their First TP

In the final stage of the interviews, the PTs were briefly reminded of their teaching practice and asked whether the dominant approach in their teaching practice was constructivist or traditional. While most of them stated that it was traditional, a limited number of them reported that they had tried to conduct the class in line with the constructivist approach. However, they had failed to do so completely. In the interviews, PTs defined the teaching environment where teacher-focused approach is dominant, students are generally passive and direct lecturing is generally used as traditional*,* whereas they defined the practices based on the constructivist approach as the *new (or contemporary) approach*. In this stage of the interviews, PTs were asked why they had steered towards the approach that was dominant in their first teaching practice, and then their opinions on the factors that had possibly influenced their preferences were investigated. Our findings are presented in the framework of the themes that emerged from the data.

Table 4 shows PTs' opinions on the influence of their educational lives before and during university on their preference of approaches that they exhibited in their first TP.

| Main Themes | Sub-Themes | n |
|---|---|---|
| Pre-university | Influential in using traditional approaches | 10 |

| | | |
|---|---|---|
| Education | We need to overcome this influence | 1 |
| | So influential that it prevents us from implementing the approaches that we learn at the university | 1 |
| University education | Positive influence on the desire to implement new approaches | 3 |
| | An insufficient effort; practical aspect is weak | 6 |
| | Education courses are not seen as important | 1 |
| | Constructivist in name, traditional in practice | 2 |
| | Content knowledge that we will use in our professional lives is not taught | 1 |

**Table 4: Influence of Educational Experiences**

As Table 4 shows, the majority of the PTs stated that having been educated by traditional methods unwillingly led them to use these approaches in their teaching practices. A significant number of PTs think that the education they receive in universities is not adequate to enable them to overcome this negative influence:

*I can only say that we tend to do what has been done to us, we show what we have been shown, because children do what they see their fathers do. (PT9)*

*We were trained in teacher-focused environments. So everything in a classroom, say, the atmosphere, the arrangement, that blue color, all these things take you into the past, to your background, and then you immediately become someone like your previous teachers. (PT1)*

Six pre-service teachers stated that, although efforts are being made by universities to achieve a transition to the practices set forth by the constructivist approach, these efforts are inadequate:

*There are efforts to replace traditional approaches, but they are not enough. We still do not fully know what we can do as classroom activities. (PT 6)*

On the other hand, three pre-service teachers reported that the university education that they had been receiving significantly contributed to their ability to implement new approaches. However, taking a closer look at the transcripts, we notice that the pedagogical contribution of university education that is emphasized by these PTs is not consistent with the arguments of constructivist approach:

*At the university, we were the ones who were active, especially in the last two or three years. I think this is a good thing. The first year I came to university, I was mute, I could not talk about anything, especially in front of the class. But now I can easily prove something. I can lecture about a topic. I mean, I am now capable of producing something related to mathematics. (PT 2)*

Some PTs stated that the traditional understanding is still prevalent in university courses, that new approaches are still lacking, especially in practice, that education courses are not given sufficient importance, and that they could not fully learn the content knowledge that they will use in their professional lives:

*Well, it appears that we did not capture the practical aspect of the new approaches. What we saw as a model was always a traditional approach. Except for a couple of university professors, all of them conducted their classes using traditional methods. They say that we should do this and that; however, they do not practice this, and no one will embrace something they recommend, but that they do not practice. (PT 8)*

Table 5 shows that the majority of the PTs state that they tended to use traditional approaches, because they wanted to prepare their students for the test that they would take after eighth grade. These PTs stated that using new approaches would not leave enough time for problem solving, would not improve students' multiple-choice test skills, and that parents and school administrations expect teachers to prepare students for these tests. Some relevant comments are presented after table.

| Main Theme | Sub-Themes | n |
| --- | --- | --- |
| | Influences that lead to a preference for traditional approaches | 8 |
| Concerns about Exam Preparation | Implementing new approaches leads to success in exams | 5 |
| | New approaches prepare students for exams, but additional test practice is needed | 2 |
| | This does not affect my preference | 1 |

**Table 5: Opinions on the Examination System Making Traditional**

**Approaches Preferable for Teaching Practice**

*We have an exam-centered system. I do not think parents care much about their kids' active participation in the process. They are concerned more about, say, how many math questions are on the test and how many of them their child can solve. The higher students score on those exams, the better they know math, parents think. This cannot be accomplished if they do not work on solving test questions. In other words, grasping only the logic of math is not enough. (PT 3)*

*The system forces teachers to do this. Okay, you will teach children something there, but it's not going to be enough, because they are required to learn a lot of things and to be able to solve all those different questions on the test. (PT 12)*

PTs who think that the existing examination system leads teachers to use traditional methods said that it is possible to prepare students to exams using new approaches; however, additional study oriented towards the exams may still be needed:

*Well, since we have this examination system, we have to prepare students the traditional way. The system forces you into it, since everyone evaluates their success in terms of their scores. But still, I think that students would not struggle in those exams if you use other approaches successfully. You can give additional lectures or give them assignments, if necessary. (PT 10)*

On the other hand, five pre-service teachers stated that students who are used to rote-learning and traditional approaches would struggle when they encounter a new problem situation, and that practices based on new approaches would lead to exam success since they enable students to learn by discovering and understanding:

*When using new approaches, knowledge can remain in the student's mind for a lifetime as a foundation. In these new approaches, you talk about something as the teacher, and then students construct a lot of other things on that foundation. This way they can succeed on exams, too. (PT 8)*

One of the PTs said that concerns about preparing students for exams would not lead him to use traditional approaches:

*Every single teacher says that there is not enough time, the curriculum is very difficult, there are exams to prepare for, etc. I am not sure if I will be able to do it, but you know every teacher has a dream at the beginning: I want to prepare my students for exams, but at the same time I want them to enhance themselves, not only in math, but also in other*

*fields. I want my students to succeed in other areas, I do not want to just lecture all the time and have them solve problems. That's why this would not affect me. (PT 4)*

The PTs' opinions about inadequate experience with constructivist approaches leading them to either hesitate to use them or gravitate towards traditional methods were also recorded. Following excerpt displays this reasoning line. In addition, Table 6 shows that the majority of the PTs think that their lack of experience makes them gravitate towards using traditional approaches:

*As I said, I was totally inexperienced in the management of a constructivist classroom, because I am not so well trained in this aspect. When a child says something, I do not really know how to react. This is why I did not take that risk, since I would not be able to establish authority. Otherwise, children would be too involved in the process. When this happens, first of all, you may lose your authority. I mean, this is a danger for the teacher. Second, they can ask questions that you cannot answer. (PT 2)*

| Main Theme | Sub-Themes | n |
|---|---|---|
| Inexperience in Implementing Constructivist Approaches | My inexperience leads me to use traditional approaches | 5 |
| | The fear of losing control over the classroom due to my inexperience prevents me from implementing new approaches | 1 |
| | It is not related to inexperience | 2 |

**Table 6: Opinions on the Impact of Inexperience in Tending towards Traditional Approaches**

Some PTs expressed the opinion that inexperience does not cause a tendency towards using traditional approaches:

*I would not feel too inexperienced since I took a course at the university, but there may be other teachers who are not experienced in this. We implemented it here at the university. We did it, not in a real classroom, but in our own classroom. Yet, we learned how to teach subjects through activities. A real classroom can allows for more activities. If I had my own class, I would do everything better, because I would know my students. (PT 13)*

| Main Theme | Sub-Themes | n |
|---|---|---|
| Teaching Environment in the Practice School | The styles of teachers in the practice school lead us to choose traditional approaches | 9 |
| | The physical environment leads us to choose traditional approaches | 1 |
| | Teachers in the practice school have negative opinions of the new approaches | 3 |
| | I would not be affected by the dominant approach in the school | 3 |

**Table 7: The Impact of School Environments on the Tendency to Use Traditional Approaches for Teaching Practice**

The PTs observed classes as part of the School Experience course before the TP term. Therefore, PTs' views of the teaching environments in the schools where they do TP could affect their choice of teaching approaches, and for this reason their opinions on this were solicited. As Table 7 shows, the majority of the PTs believe that they were affected by the

fact that teachers employed in the practice school utilize traditional approaches in their classes. Moreover, some of these PTs stated that they were influenced by the negative opinions of practice school teachers on the utilization of new approaches:

*It influences you a lot, because my teacher was totally a classic. He was like, "I lecture and children listen to me." He did not do anything but lecture. Then, you think that he is the person who knows how to do it, and you are the one who will learn from him. (PT 2)*

*There is now a transition from the traditional to the contemporary, and we are right in the middle. I can honestly say that there is no type of teacher that we can take as a role model. They are all using traditional styles because they have been doing it for like twenty or twenty-five years. (PT 8)*

One PT reported that the physical environment of the school was among the factors that led him to conduct a class in the traditional style:

*Let's say, you will have your students do collaborative learning, but how are you going to do it? Normally, students sit in rows looking at each other's backs. You need to alter the entire arrangement of the classroom, but maybe the other teacher in the next hour will not use the same arrangement. When such problems arise, you cannot help it. You will avoid implementing new approaches (PT 1)*

Three pre-service teachers claimed that the environment in the practice school would not affect them or prevent them from teaching the way they think is most effective. One of the PTs stressed the need for change:

*The school environment does not matter a lot to me. I always go with the direction of change (PT 8).*

The PTs were also asked for their opinions on the idea that traditional approaches are easier and constructivist approaches require more work. As Table 8 shows, nearly half of the participants stated that directly conveying what they know and then solving questions is easier, which is why they might prefer it.

*It is easier to convey what we know verbally, to solve questions on the whiteboard and to correct students who give an incorrect answer. It is preferable because it does not require any extra effort. (PT 6)*

*When you design a material, you can do it at home; when you prepare a program, you can do it also at home. That means you take work home. The other way is easier, because once you study how to lecture a subject then you can repeat it for years. A teacher talks about the same thing for years. (PT 9)*

| Main Theme | Sub-Themes | n |
|---|---|---|
| | Using traditional methods is easier | 6 |
| Taking the easy way out | New approaches are easier if you know how to use them | 2 |
| | I never do something just because it is easier | 2 |

**Table 8: Opinions on the Preferability of Traditional Approaches due to their Easiness**

On the other hand, some PTs argued that implementing constructivist approaches require less work and thus easiness would not be a factor for leaning towards traditional methods.

*I think implementing new approaches is easier, because students do many things themselves while your job is only to guide and supervise. In the traditional style, however, you are at the center and thus you need to make more effort to teach. (PT 1)*

Other PTs stated that the easiness of traditional approaches would not play a role because of ethical responsibilities and the pleasure of exerting effort.

*Plain lecturing and problem solving is easier, of course, but there is also an ethical aspect. That is why I would not prefer to do something just because it is easier. (PT 4)*

*I like to struggle with something. I mean, this is my view right now. I do not know if it will change in the future. I think I will prepare materials and stuff like that at home and conduct classes after that. (PT 13)*

The PTs did not directly identify the limitations of constructivist approaches as the reason for their tendency to use traditional methods in the TPs. However, some PTs noted the limitations presented in Table 9 in various ways during the interviews:

| Main Theme | Sub-Themes | n |
|---|---|---|
| Limitations of constructivist approaches | Takes too much time | 3 |
| | Lack of materials | 1 |
| | Crowded classrooms | 1 |

**Table 9: Limitations that may be encountered when implementing constructivist approaches.**

At the end of the interviews, PTs were asked what most affected their tendency to use traditional approaches. As Table 10 shows, the majority of the PTs repeated reasons mentioned earlier in the interviews, whereas two of them identified these new ones:

*First, we do not have sufficient experience in teaching, because out of four years, only in the last year do we do internships. When I go there, I always want to take responsibility and conduct the lesson. But I see many others who abstain from practicing teaching. I guess, we have not been taught enough about the importance of practice, and that is why we could not improve ourselves as teachers. (PT 4)*

*The most influential factor is that no one is satisfied with what they are doing. Someone who really likes this profession would never prefer traditional approaches, would they? If he wants to help students and if it is clear that traditional approaches are not the most useful ones, then he would not use them. (PT10)*

| Main Theme | Sub-Theme | n |
|---|---|---|
| | Educational experiences | 3 |
| | Taking the easy way | 2 |
| | The examination system | 2 |
| | Not knowing what else to do | 1 |
| Most influential factor | Being inexperienced | 1 |
| | Practice schools' environment | 1 |
| | Teachers' negative opinions | 1 |
| | Lack of emphasis on courses on teaching practices | 1 |
| | Not liking the job | 1 |

**Table 1: Most influential reasons for leaning towards traditional approaches in TPs.**

### Conclusion and Suggestions

The PTs that were observed during their first teaching practice in a real classroom setting generally used traditional teaching approaches. This was evident in the ways they used equipment, the ways they included students in the process and the teaching strategies they employed. Although some PTs made weak efforts to use the constructivist approach, these PTs failed to overcome the influence of traditional approaches and struggled to properly integrate constructivist practices into their lessons. In interviews conducted to determine the reasons for this, the PTs' epistemological beliefs and views regarding mathematics teaching were largely in line with the constructivist approach and the guidelines of the math curriculum. Individuals' epistemological beliefs, defined as their subjective beliefs about what knowledge is and how knowing and learning occurs (Deryakulu, 2004), largely influence their attitudes towards the teaching and learning process (Bozaslan, 2012; Schommer, 1990). There are studies in the literature that show that teachers' beliefs related to math teaching and learning influence their TP (Calderhead, 1996; Pajares, 1992; Thompson, 1992). However, this influence is rather complex and inconsistencies can be observed between teachers' mathematical beliefs and teaching practices (Raymond, 1997; Teo et al., 2008; Thompson, 1984; Toluk Uçar & Demirsoy, 2010). In this research, similarly, although PTs opinions regarding knowledge, learning and effective mathematics education bear traces of the constructivist approach and conform to the requirements of the math curriculum, it was observed that they tended to implement traditional approaches in their TPs. One of the reasons behind this inconsistency may be related to the quality of university education. The prioritization of the theoretical side of the constructivist approach over the practical side may make integrating the teaching approach they believe in into their classroom practices a struggle for PTs. To solve this problem, as suggested by Aldrich and Thomas (2005), in PT training programs the PTs' experiences as learners in constructivist environments should be prioritized as much as the meaning of constructivism. Since these experiences will conflict with their prior knowledge, it is important to enable them to reflect on constructivist knowledge thorough their own experiences.

In line with previous research findings (Ahlstrand & Nilsson 1999; Aldrich and Thomas, 2005; Gibbs and Coffey, 2004; Klein, 1998; Krull, et al., 2013; Struyven et al., 2010), a small portion of PTs considered that the university education was influential in the tendency towards using constructivist approaches to some extent. However, this positive effect on teachers' beliefs may not always translate into classroom use (Rafferty, 1992). Handal (2003) suggested that teachers' inability to transfer their beliefs about mathematics and mathematics teaching into the classroom may stem from factors out of teachers' control. Some of these factors are the current examination system, school administrations, parental pressure, and students' learning habits. In addition, teachers may tend to share the same opinions in an environment where student-focused teaching and new approaches are prevalent. In this study, too, external factors such as the examination system, the environment in the practice school and the prejudices of cooperating teachers about constructivist approaches played roles in the PTs' tendency to prefer traditional approaches in their TPs. In addition, PTs were also affected by internal factors such as their educational backgrounds, taking the easy way, and being inexperienced in constructivist practices.

Although a few PTs mentioned the positive effect of university education on leading them to use the constructivist approach, most of them think that the university's effort to help them surpass the traditional approach was inadequate. Furthermore, some PTs stated that constructivism is only presented theoretically in faculties of education, while in practice traditional approaches are prevalent. These criticisms parallel Baştürk's (2011) findings. PTs also think that they are not well trained in the content knowledge they will use in their

professional lives, and that necessary education about what they will teach in school is not provided by the university. Similarly, Eraslan (2009) found that PTs struggle to link university mathematics courses with the mathematics that they teach in schools. Departing from this point, it could be argued, as Stylianides and Stylianides (2006) suggest, that PTs' undergraduate math education should be related to the concepts they will use in their professional lives. It would be better to teach math to PTs using the methods and techniques they are expected to use in their professional lives (Baştürk, 2011). In addition, PTs are confused by the traditional approaches used in some of their university courses. For this reason, professors in teacher training programs should teach by designing learning environments that involve student-focused approaches and activities. Loughran and Berry (2003) argued that PTs will use these methods when they become teachers, so innovative practices should not be presented in traditional styles. Instead, exemplifying the use of constructivist methods will enhance PTs' experiences.

Raymond (1997) argued that math teachers' teaching styles are affected by their own learning experiences and their former math teachers. The pre-existing pedagogical beliefs can become barriers in attaining the goals of innovative teaching approaches (Fennema & Franke, 1992; Gregoire, 2003 Struyven et al., 2010). Similarly, this study found that nearly all the PTs said that the predominance of traditional approaches in their educational backgrounds had led them to use these approaches in their TP. As Baki (2002) puts it, in their professional lives PTs implement the same practices they experience in their educational lives. Although they encounter theories and practices that contradict their prior beliefs and attitudes about learning and teaching mathematics in their teacher training programs, they still tend to merge their old beliefs with what they learn from the university, rather than completely getting rid of them. In other words, the core teaching/learning approaches that PTs have when they begin their university education grow during their university years, and the traces of their own school days remain undiminished. Given the fact that this study's PTs completed their elementary school education before 2005, when the new curricula were instituted, this influence can be regarded as normal. However, studies show that an important factor that paves the way for an imperfect transfer of theoretical learning into teaching practice is the inadequacy of teacher training programs to cope with PTs' previously held beliefs (Korthagen & Kessels, 1999; Wubbells, 1992). As one of the pre-service teachers stated in the interview, it is not impossible for PTs, who change and grow during their university years, to overcome their previously held negative beliefs with effective training on the implementation of the constructivist approach. If a serious effort is not made, this situation will turn into a vicious cycle, because the future students of PTs who fail to replace traditional approaches entirely will also inherit these negative influences.

In interviews, the PTs reported that they tended to use traditional approaches because of their lack of experience with the practices required by the constructivist approach. Others stated that practical courses are not given sufficient importance at the university. Similar findings were obtained by studies in the literature (Arslan & Özpınar 2008; Büyükgöze Kavas & Bugay, 2009). Thus, it can be argued that PTs unfamiliarity with constructivist teaching practices might have stemmed from the insufficient time allocated by the university to practical courses. Belcheir (1998) reports that new teachers wish they had acquired more experience in classroom environments during their university education. As Toluk Uçar and Demirsoy (2010) suggests for teachers who struggle to implement new approaches, PTs should be familiarized with ample teaching examples in order to learn what a constructivist teaching style is like. In addition, professors who teach theoretical knowledge in teacher education courses should present their practical aspects as well.

It can be inferred from some of the PTs' statements that they are concerned about losing control over the classroom if they use student-focused, activity-based practices.

Various studies have demonstrated that classroom management and management of student behavior are among the issues about which PTs most commonly have concerns (Jones & Vesilind 1995; Poulou, 2007). To alleviate these concerns, PTs should be exposed to key techniques related to behavior management in constructivist, student-centered environments as part of the university's classroom management course. This finding also demonstrates that TP should be considered an important opportunity for PTs to gain experience in classroom management in a student-focused setting.

During TP, PTs follow, benefit from and are influenced by their cooperating teachers (Tang, 2003). As one of the pre-service teachers said, they see in-service teachers as more involved in the profession of teaching than university professors, and thus they are likely to be affected more by their opinions and behaviors. While this fact can provide significant advantages for the training of PTs, this is not the case in Turkey because in-service teachers here are not competent enough in implementing constructivist approaches. Aykaç and Ulubey (2012) found that PTs, who observed lessons as part of the school experience course, had negative opinions about the ways in-service teachers implement new curriculum practices. Aykaç (2007) determined that in-service teachers are largely in favor of traditional methods such as lecturing and question and answer, as opposed to the practices recommended by the elementary education curricula (2005) and teachers' guide books. Eraslan (2009) suggests that cooperating teachers in schools are not meticulous enough in fulfilling their roles and responsibilities. In this study, similarly, some PTs reported that they had been affected by the negative opinions and suggestions of in-service teachers who work at practice schools about constructivist methods as well as by their classroom practices. As Shantz argues (2005), while faculties of education strive to teach PTs contemporary teaching approaches, they may be involved in traditional practices in practice schools. In such situations, PTs may experience serious confusion. If a PT imitates a cooperating teacher rather than implementing the university's teachings, new approaches will not be tried. For all these reasons, it is clear that in-service teachers at practice schools should improve their grasp of contemporary methods and approaches by attending in-service trainings.

Our research found that PTs were affected by the arrangement of the school setting to suit the traditional teaching style. For this reason, PTs should be trained how to implement constructivist approaches in environments shaped by traditional approaches. Although to a lesser degree than in-service teachers, PTs are aware of the limitations of practices based on constructivist approaches. Although they noted these limitations in interviews, they did not say that such limitations led them to lean towards traditional approaches. It might be useful to enable them during their university years to get experiences with how to cope with these limitations. PTs believe that the tests elementary school students have to take to get to high school play a significant role in the dominance of traditional approaches in schools. However, while some of them see the existing examination system as an obstacle to adopting student-focused approaches, a significant portion of them believe that practices shaped around the constructivist approach will also lead to exam success. Therefore, promoting and supporting such positive pre-existing beliefs may be suggested considering that these examinations occupy the Turkish agenda and that the principals and parents produce high pressure on in-service teachers.

Some PTs think that they found it easier to utilize traditional approaches in their first TPs. Struyven, and others (2010) determined that PTs who actively participate in learning environments where student-focused approaches oriented towards conceptual change are used, and who also experience high pressure and workloads in this activated condition, may tend to shift their teaching approach towards more information transmitting strategies. This fact and other difficulties that PTs encounter when putting constructivist approaches into practice demonstrate, once again, the importance of the role TP and TP supervisors play in

PTs' preparation for the profession. As some studies also suggest, quality guidance, support and feedback provided by both supervisors and cooperating teachers, are of great importance for the future teacher's professional growth (Buhagiar, 2013; Walkington, 2005). Reflection, especially after teaching practice may be an effective way of changing PTs' beliefs (Tillema, 2000). Thanks to discussions and thorough reflections after student teaching, outcomes that emerge as a result of the implementation of different approaches can be compared, and thus PTs can select the more useful one for students, even if it requires more work.

Present research shows that PTs' beliefs about teaching and learning math do not thoroughly translate into their first teaching practices. They considered that external factors such as the examination system and the prejudices of cooperating teachers were responsible for this problematic translation. However, we believed that they held immature constructivist beliefs. We considered that predominantly theoretical education about constructivism in teacher training might be responsible for this result. On this point, combining theory with the practice in teacher training may enhance espoused constructivist beliefs. In practical sense, a learning environment including micro-teaching activities supported by constructivist teaching practices may be suggested to integrate theory with practice (Ekşi, 2012; Fernandez, 2005). In such environment, teacher educators may provide sustainable feedbacks and PTs may make reflections on their learning and teaching. Therefore, PTs may produce a stronger belief repertoire supported by constructivist teaching experiences. They may use such repertoire to readily remove external barriers.

In conclusion, the findings of this research indicate that PTs aim to improve themselves and to implement student-focused and activity-based constructivist approaches; however, they struggle to achieve this aim in practice. If optimum conditions are set to enable them to convert these ideas into practice, it will be an important step to ensure our educational system's successful transition from the traditional approach to an approach that meets contemporary requirements.

In the present study, we aimed at thoroughly investigating PTs' preferences of teaching approaches (traditional or constructivist) in their first teaching experiences and the underlying reasons for these preferences. In one another study, the researchers may longitudinally investigate the development of PTs' beliefs and preferences in the course of their teaching practices. In order to create a practical shift in the minds of PTs, another research based on planned interventions taking first experiences of PTs and their beliefs into account would be intriguing. Moreover, a new study of future graduates, who will have been completed their elementary education according to the renewed curricula in 2005, can be compared with this study to gain more accurate insight into the impacts of PTs' elementary school education on their approaches to teaching.

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