



Investigating Pre-Service Mathematics Teachers' Self-Assessment Process

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ABSTRACT

Teaching practice requires a variety of thinking skills, the most important of which is reflective thinking, which is defined as a self-assessment ability that enables an individual to overcome the uncertainties he encounters by questioning his experiences through critical and conscious research. This study aims to examine pre-service mathematics teachers' self-assessment processes related to their classroom practices and professional development. For this purpose, a self-assessment form composed of open-ended questions was prepared, in order to allow pre-service teachers reflect on their teaching practices. The form was filled by eight pre-service teachers immediately after their in-class practice sessions through an eight-week training program. Items included in the self-assessment forms were analyzed under three categories, based on the classification proposed by Schön (1987): i) Reflection-on-action, ii) Reflection-in-action, iii) Reflection-for-action. The analysis revealed that the pre-service teachers often engaged in self-assessments in the reflection-on-action and reflection-in-action categories, but mostly steered clear of the reflection-for-action category.

Keywords: Self-assessment, pre-service teachers, reflection

Matematik Öğretmen Adaylarının Öz Değerlendirme Süreçlerinin İncelenmesi

ÖZ

Öğretmenlik, aralarında yansıtıcı düşünmenin de yer aldığı çeşitli düşünme becerilerini gerektirir. Ayrıca bireylerin kişisel gelişimleri için gerekli olan önemli beceriler arasında da yer alan yansıtıcı düşünme, bireyin deneyimlerini eleştirel ve bilinçli araştırma yoluyla sorgulamak suretiyle karşılaştığı belirsizliklerin üstesinden gelmesini mümkün kılan bir öz değerlendirme yeteneği olarak tanımlanmaktadır. Bu araştırma, matematik öğretmen adaylarının sınıf içi uygulamaları ve mesleki gelişimleri ile ilgili öz değerlendirme süreçlerini incelemeyi amaçlamaktadır. Bu amaçla öğretmen adaylarının öğretmenlik uygulamalarına ilişkin yansıtma yapmaları için açık uçlu sorulardan oluşan bir öz değerlendirme formu hazırlanmıştır. Form, sekiz öğretmen aday tarafından sınıf içi uygulama oturumlarından hemen sonrasında sekiz haftalık bir öğretim programı sürecinde doldurulmuştur. Öz değerlendirme formlarında yer alan maddeler, Schön (1987) tarafından önerilen sınıflandırmaya dayalı olarak üç kategoride incelenmiştir: i) Eylem üzerine yansıtma, ii) Eylemde yansıtma, iii) Eylem için yansıtma. Elde edilen veriler, öğretmen adaylarının genellikle eylem üzerine düşünme ve eylemde yansıtma kategorilerinde öz değerlendirme yaptıklarını, ancak çoğunlukla eylem için yansıtma kategorisinden uzak durduklarını ortaya koymuştur.

Anahtar kelimeler: Öz değerlendirme, öğretmen adayları, yansıtma.

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1 | INTRODUCTION

As in many countries in the world, significant educational reform has occurred in Turkey. An essential and primary element of these changes, in turn, involves the efforts to increase the capabilities and improve the training of teachers. Therefore tailoring the professional training programs offered to prospective teachers to meet these specific requirements is a must (Clarke & Hollingsworth, 2002), since teaching profession, by definition, requires interaction with students who have different learning styles and levels of competence, and engagement in different learning environments. Teachers, in turn, need to continuously review and evaluate all these distinctive experiences, and develop specific strategies for subsequent educational processes. That is why teacher training programs, as well as the requirements for the teachers are expected to meet, often underline the need to introduce a range of thinking skills. Against this background, the crucial skill of reflective thinking is also noted for its function in supporting constructive perspective towards learning. It is also universally recognized as a crucial skill required for personal development of professionals (Colton & Sparks-Langer, 1993). Individuals who have high levels of reflective thinking skills are assumed to be capable of solving the problems they face, and transposing and applying their existing knowledge to different circumstances (Duban & Yelken, 2010). Çam Aktaş (2016) defines reflective thinking as the ability to overcome uncertainties through critical and conscious investigation regarding a case or a problem, to apply experiences to different circumstances, and to enable the individual in setting a distinct course based on all such experiences. The literature is rich in emphasis on the benefits this skill provides to teachers. According to Moon (2008), reflective thinking provides the individual with a perspective that is handy for analyzing and making better use of her experiences, and helps her keep track of progress in gaining experience. Larrivee and Cooper (2006) note that teachers competent in reflective thinking engage in teaching based on in-depth contemplation on the desirable as well as undesirable outcomes of any action. On the other hand, Ünver (2003) states that the activities carried out and methods employed in a learning process which fails to emphasize reflective thinking, cannot go beyond merely providing a static set of knowledge, skills, and experience for the relevant grade. Against this background, one should also note that reflection and self-assessment activities are often carried out together, and reinforce each other. They both are meaningful processes that help learn from experiences (Desjarlais & Smith, 2011). While reflection usually involves critical thinking and journal-keeping; self-assessment is a process which improves one's own performance (Desjarlais & Smith, 2011). Accordingly, many teacher-training organizations state reflective thinking as one of the basic skills that a teacher should have. For instance, the Ministry of National Education in Turkey noted, "self-assessment helps teachers to think about their professional competencies, determine their current situation, set development goals and make necessary adjustments and effect required improvements to achieve such goals" (Ministry of National Education, 2017, p.10).

A large number of studies focused on reflective thinking, both in Turkey (Savran Gencer, 2008; Tok, 2008; Erdoğan, Şengül, 2014; Töman & Odabaşı Çimer, 2017; Eğmir, 2019; Demir, 2020) and in the wider world (Amobi, 2005; Bataineh, Karasnah, Barakat & Bataineh, 2007; Eugene, 2003; Lee, 2005; Marcos, Sanches & Tillema, 2008; Schweiker-Marra, Holmes, Pula & Pula, 2003; Pedro, 2005; Thorpe, 2004). The majority of these studies carried out on parallel and complementary subjects focused specifically on the development of the reflective thinking skills of teachers or pre-service teachers. An analysis of the relevant studies in detail reveals that especially the activities designed to develop self-assessment skills support the development of pre-service teachers. It has been observed that self-assessment has positive effects on pre-service teachers' in-class teaching skills (Başaran, 2019), problem solving skills (Baki, Aydın-Güç & Özmen, 2012), performance in practice-based courses such as teaching practice (Altın, 2020; Savran Gencer 2008), planning, implementation and evaluation of teaching practices (Köksal & Demirel, 2008), and attitudes towards the profession (Tok, 2008). Demir (2020) pointed at a significant correlation between the reflective thinking tendencies of teachers, and their ability to instill in the skills demanded by the 21st century, among the students. The definition of performance criteria at the beginning is crucial since this allows revealing strengths and improvements (Wasserman & Beyerlein, 2007) according to these criteria throughout the process. It is possible to evaluate reflective thinking as a skill that includes self-evaluation which, in turn, affects reflective thinking skills positively (Özdemir, 2018). Thanks to reflective thinking skills, teachers are able to review their educational situations with a critical perspective and strive to find the best way to affect students' learning positively. Thus, teachers can both perform an effective teaching and continue their personal and professional development. The studies so far revealed a number of distinct

advantages offered by efforts to improve reflective thinking skills of teachers, however there is a lack of studies investigating the reflective skills processes in depth. Against this background, the present study stands out as a most valuable contribution to the literature in terms of its focus.

As mentioned above reflective thinking is crucial for teachers. Gaining the reflective thinking skill also contributes to the individual's ability to look at herself/himself critically and to engage in qualified self-assessment (Evin-Gencil & Güzel Candan, 2014). Efforts on this front aim to equip the teachers with an internationally recognized outlook. The quality of education is expected to increase as pre-service teachers learn reflection as a major skill. That is why seeking new means to facilitate the development of thinking processes among pre-service teachers is a must. A number of distinct methods and techniques (learning texts, concept maps, asking questions, self-assessment, mind maps, reflective diary, keeping a development journal, forms consisting of open-ended questions, camera recordings etc.) are used for this purpose (Branch & Oberg, 2004; Karataş & Cengiz, 2016; Demirören, Koşan & Palaoğlu, 2009; Kozan, 2007; Tok, 2008; Ünver, 2003; Duman, 2018; Lee, 2005). Among these, self-assessment is arguably an important technique for individuals seeking to discover their strengths and weaknesses, and is often embraced by its users given its applicability advantages (Leise, 2007). However, in the lack of objective self-assessment in line with its purpose, or when the individual presents an inaccurate picture of himself or herself, the results would likely be invalid and unreliable. When due self-assessment process is carried out in accordance with the purpose stipulated above, on the other hand, it allows pre-service teachers to identify the problems they do or would encounter in their lessons, and offer solutions. The present study is expected to help support pre-service teachers involved in realizing the benefits of the self-assessment technique, and thus embracing a rather positive attitude towards its use in the future. Moreover, the participants of the study are expected to develop awareness about the importance of self-reflection. Arguably, a systematic approach to such practices supporting personal as well as professional development will have positive effects on pre-service teachers' performance at work. On the other hand, the existing studies in the literature usually focus on pre-service primary school teachers, science teachers or English teachers (Savran Gencer, 2008; Tok; 2008; Erdoğan, Şengül, 2014; Töman & Odabaşı Çimer, 2017; Eğmir, 2019; Demir, 2020). In this context, the need for studies to provide insights into the examination and development of self-assessment skills of pre-service mathematics teachers who will be responsible for teaching a field dominated by numbers and symbols rather than verbal expressions is apparent.

PURPOSE OF THE STUDY

As the teacher training institutions in Turkey, the faculties of education, aim to provide the pre-service teachers with the experience of working at an actual school by offering a number of practice opportunities not only during the activities integrated into theoretical courses but also with a number of courses focusing on practice (e.g. Teaching Practice, School Experience). Doing so provided the pre-service teachers with an opportunity to learn about their weaknesses and strengths, based on a rather realistic experience with the profession they will soon be taking. Moreover, the benefits of the internship process and the experience gained in the context of teaching practice courses at schools are closely correlated with the pre-service teachers' reflective thinking skills. In line with these considerations, the aim of this study is to examine the self-assessment processes of pre-service mathematics teachers. For this purpose, the study investigated the following research questions:

1. Which types of reflection the pre-service teachers engage in during self-assessment activities?
2. How frequently the pre-service teachers engage in reflections as part of self-assessment activities?

2 | METHOD

This study is based on descriptive special case pattern, a qualitative research method deemed to be compatible with the subject matter involved. Descriptive special case studies involve in-depth description and review of a given system (Merriam, 1998). In the present study, every pre-service teacher included in a group attending the teaching practice course have been deemed a special case, based on the 'the case as a specific, complex functioning thing' definition provided by Stake (1995). For, in the present study, the reflections provided by individual pre-service teachers within the framework of the self-assessment activities have been analyzed. Moreover, the changes they underwent through the process were also investigated. On the other hand, as case studies are about generalizations based on existing theories, so as to develop the initial theory, rather than seeking generalizations

to test fresh hypotheses (Yin, 1984), they were deemed the research model most compatible with the present study's objectives.

SAMPLE

The study was carried out with a group comprised of 8 senior-year pre-service teachers (3 females, 5 males) enrolled in a Primary School Mathematics Teacher Education Department at a faculty of education in university in Turkey, during the academic year 2018-2019. The participants enrolled in this study carried out within the framework of the teaching practice course had previously attended the "Teaching Practice 1" course, which was based mostly on observations inside a classroom setting, and prepared regular course observation reports. Furthermore, the participants also took and successfully passed in the "Measurement and Evaluation in Education" course, which covered self-assessment as an important part of its syllabus.

The study group had weekly interviews lasting at least 90 minutes with the relevant course instructor within the framework of Teaching Practice course, throughout the eight-week period. The interviews focused on the following issues:

- Comments by the relevant pre-service teacher regarding the course (the successful and unsuccessful elements of the course, the problems and issues faced),
- Self-assessment of the relevant pre-service teacher regarding the course (the successful and unsuccessful elements of the course, the problems and issues faced),
- Group's and the instructor's advice regarding the development of the relevant pre-service teacher.

DATA COLLECTION AND ANALYSIS

A "Self-Assessment Form" developed by Sağlam Arslan et al. (2017) was used as the data collection tool. This form intends to lead pre-service teachers to thinking about their own experience as well as the teaching practice they had, upon carrying out the teaching activities they designed for each week. They were asked to fill out the forms on a weekly basis, during the day to follow each class they taught, and duly submit them to the researchers.

In the process, the participants were asked to freely express their opinions, and were told that participation in the study is completely voluntary. The leading questions directed to the participants in the self-assessment forms (taken from Schön's classification, 1987) are presented below:

- What kind of activities did I implement in this class? Which parts of the class were the ones I excelled at? Which parts of the class were the ones I had most difficulty with? (Reflection-on-action)
- Which unexpected developments did I come across during the class? (Reflection-in-action)
- What did I learn about the teaching profession, at the end of this class? What kind of changes would I introduce if I was given the chance to repeat the class? (Reflection-for-action)

Collected data were subjected to content analysis. In the light of the approaches recommended by Patton (2002) and Yıldırım and Şimşek (2016), the forms submitted by pre-service teachers were read over and over, to come up with a thorough breakdown of the data provided. Thereafter, the data points were categorized based on the similarities and differences involved, and were assigned codes, which were then subjected to a second round of categorization to identify themes, which were then analyzed by other researchers as well, to produce the final version of the theme set based on an analysis of consistency of the answers provided, with the themes. The grouping and categorization of the themes were based on Schön's (1987) work, leading to a three-way categorization based on the timing of the reflection action: reflection-in-action, reflection-on-action, and reflection-for-action. Reflection-in-action refers to the individual's ability to find a solution for any unexpected circumstances she may come across during an action. Reflection-on-action refers to looking back once the action is completed, and rethinking about it. Reflection-for-action on the other hand, refers to the application of such reflection to provide guidance for subsequent actions, and to restructure the actions thereafter (Schön, 1987). The data were first analyzed by the researchers independently. Then, the accuracy of the classifications was confirmed by comparing the data obtained. Finally, the percentage of agreement between the researchers was calculated using Miles and Huberman (1994)'s intercoder reliability formula, and it was determined that the rate of agreement

between the researchers was 0.96. The pre-service teachers are coded as “PT” on the tables and statements. The following analysis is provided as an example based on such categorization:

“During the course, my mentor told me that she forgot about the activity to model multiplication with rational numbers alongside the outcome stipulated for that class, and asked me to present it to the class. At that point, I was facing some extraordinary circumstances. And I opted to present it the way I learned in the university course on teaching numbers (PT2).” This statement by the pre-service teacher is included in the reflection-in-action category, and noted as an example of the theme “Proposed solutions and shortcomings identified in the class”.

RESEARCH ETHICS

There must be a research ethics sub-section dedicated in your article under Method section. Please explain your ethical procedures in your study.

3 | FINDINGS

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The data obtained from the reflections provided by the pre-service teachers on the self-assessment forms were classified under three major categories –reflection-on-action, reflection-in-action, and reflection-for-action. The themes and codes presented for each category are presented below, along with self-reflections on part of the pre-service teachers.

Reflection-on-action

This category covers the views the pre-service teachers voiced with respect to the teaching activities they carried out during the eight-week teaching practice, after the completion of the teaching process. This category comprises six distinct themes (the practices the pre-service teachers had implemented during the classes, the purposes of such practices, the successful aspects of the class, lessons learned, problems experienced during the class, and feelings) covering 31 codes (see Table 1).

The ‘practices implemented during the classes’ theme covers the codes stating the subject matter of the class, investigating existing knowledge about the topic, evaluation activities, leading the students to group-work, raising the students’ awareness about the topic (by drawing their interest), using concrete materials, and creating associations with daily life. Among these, the most commonly observed code is investigating the students’ existing knowledge about the topic. PT8’s statement “At the beginning of the class, I first reminded the students about the topics covered in the previous class, and asked them a question about factorization using common factor parentheses. Then, I told them we would now proceed with factorization of perfect square identities.” is a good example of this code.

Under the theme ‘the purposes of practices’, in turn, the pre-service teachers noted the purposes served through the practices they implemented. Among these, the most commonly mentioned purposes were facilitating active involvement of the students, achieving effective learning, reinforcing learning, and making the class interesting. PT5 had the following to say in terms of explaining the purposes of the activities she carried out during the class: “During the class, I began with some examples, with the purpose of checking the readiness and existing knowledge levels of the students. First of all, I presented some cases to remind them about the concepts of equal probability, impossibility, and absolute probability, in the context of probability involving rational numbers. Then, I allowed the students work actively on the problem-solving activity. I was amazed by the inquisitive attitudes and excitement about discovery on part of the students. That really made me happy.” PT7 had the following to note on the fourth self-assessment form, about the purposes of the activities involved in the class: “I began the class with a question to draw their interest, about a matter related closely with their daily lives. After receiving the students’ feedback, I provided explanation about the question I asked, in the form of a model I drew on the board. I asked the students to come up with models of the fractions, and to find which fraction is bigger. I then had the students play a little game, to see if they truly grasped the lesson or not.”

Table 1. Pre-service teachers' reflections on their practices

Reflection on Action										
Themes	Codes	PT1	PT2	PT3	PT4	PT5	PT6	PT7	PT8	f*
Practices implemented during the classes	Determining the topic of the lesson	-	-	-	-	-	-	-	1	1
	Checking prior knowledge,	-	1	1	-	6	7	-	1	16
	Conducting evaluation activities,	-	-	-	-	-	-	-	1	1
	Conducting cohort activities	1	2	1	-	1	1	-	-	6
	Stimulate students' interest/awareness	-	-	-	-	2	1	-	-	3
	Using concrete materials	2	-	-	-	-	-	-	-	2
	Relating to daily life	-	1	-	-	1	6	-	-	8
The purposes of practices	Facilitating active learning,	-	-	-	-	1	1	-	-	2
	Making the class interesting	2	-	-	-	2	-	-	-	2
	Achieving effective learning,	-	-	-	-	-	2	-	-	2
	Reinforcing learning	1	-	-	-	-	-	-	-	1
Inferences	Effectiveness of the methods/materials implemented	1	-	-	-	1	-	-	-	2
	Identifying issues to be considered during teaching	-	1	-	-	-	-	1	-	2
Successful parts in the course	Ensuring students' active learning	1	-	-	-	2	-	-	-	3
	Provide prompt feedback/rectification	-	-	-	-	1	1	-	-	2
	Teaching with games	-	-	-	-	-	1	1	-	2
	Effective communication with learners	-	1	1	-	1	-	-	1	4
	Deliver the lesson effectively	1	4	2	-	-	-	-	-	7
	Ensuring classroom management	2	-	2	-	1	-	-	-	5
	Conducting cohort activities	-	-	-	-	-	1	-	-	1
	Time management	-	-	-	-	-	1	-	-	1
	Compatibility of the teaching approach with the learning objective	-	1	-	-	-	-	-	-	1
	Difficulties faced in class	Learners-teacher communication	-	1	-	1	-	-	-	-
Difficulties in explaining some aspects of the subject		1	-	-	-	1	2	1	-	5
Failing in certain aspects of the subject		1	2	-	1	-	-	-	1	5
Failing in time management		2	-	-	-	-	-	-	1	3
Reviewing previous knowledge		-	1	1	-	-	-	-	-	2
Generation of alternatives solutions		-	-	1	-	-	-	-	-	1
Using materials compatible with the learning outcome		1	-	-	-	-	-	-	-	1
Emotions felt during the class	Teacher candidate' satisfaction	-	-	-	-	4	-	-	-	4
	Students' satisfaction	-	-	-	-	2	-	-	-	2

f*:Frequency

The point most frequently emphasized by the pre-service teachers under the 'lessons learned' (Table 1) theme is about the realization through experience, of the effectiveness levels of various teaching approaches they tried during the teaching processes, based on the knowledge and insights gained through the teaching practice course as well as their practical experience in the classes. Pre-service teacher PT5 stated "choosing daily-life examples for use in the class certainly helped boost the students' level of interest" as an example of reflection on action, arguing that a class taught with reference to daily life cases would be more interesting to students. The pre-service teachers also mentioned the importance of certain crucial points they observed with respect to the planning or teaching of the classes. In her first self-assessment form, PT7 stated "I am not very good at noticing my strengths and weaknesses in terms of teaching classes. The feedback provided by my mentor in the internship made me realize that I was not particularly successful in the class. Sure, that does not mean I cannot improve myself. I will work on my weaknesses during the week, and try to perform better next week." This statement serves as an example of how one can, through the practices, notice the issues requiring improvement for more effective teaching.

Regarding the 'successful parts in the course' (Table 1), most pre-service teachers described how the method/activities they implemented affected learning on part of the students: "I began with an unusual story. It helped with drawing interest of the students as well as of my mentor. Then, I proceeded to present multiple examples of reduction and expansion applied by the students. This approach helped minimize the number of errors made by the students. And I had the students solve a lot of problems during the class. They were pretty happy to come up with solutions (PT5)". PT7 had the following to describe her success in teaching concepts through games, on her self-assessment forms: "When I told the kids 'now we will play a little game with you', they were really elated, and that really increased my motivation. The game was not only a group activity, but also a means to really settle what they learned. To boot, they had a lot of fun. At the end of the class, when I asked them what they learned on that day, one of the students answered 'we learned that games could be a part of mathematics classes.' That answer excited me and made me very happy. At that age, the children are really into games, and they also love being on the move at all times. I think that contributed to my success on this topic." On their self-assessment forms, the pre-service teachers usually stated that the students were actively involved and highly motivated throughout the classes they taught, and that the classes saw some effective learning on the part of the students.

The pre-service teachers also referred to the 'difficulties faced in class'. The most frequently mentioned problems were about the lack of time for activities they developed, the incompatibilities between the current proficiency levels of the students and the activities developed, and the teachers' inability to keep control of the class at times. PT3 expressed the difficulties she experienced during the class, with the following statement on her fifth self-assessment form: "As the problems were rather simple given the current level of proficiency of the class, the students solved them right away, and left me scratching my head for new ones." PT4, in turn, mentioned the following problem she had with class management in her second week of teaching the course: "After giving the game to the students, I really had trouble making my voice heard. They concentrated on the game right away, and didn't hear some of the warnings I provided, and thus made some mistakes."

REFLECTION-IN-ACTION

The reflection-in-action category covers the statements provided by the pre-service teachers, about the solutions they came up with during the class (in action) for the unexpected cases they faced during the teaching practice. The problems identified and the solutions proposed during the class itself were categorized under a single theme in this category. This theme is comprised of eight distinct codes (see Table 2). Two pre-service teachers mentioned the proposed solutions they came up with in order to make the topic or activities more comprehensible for the students. After the first week's class, PT4 engaged in the following reflection-in-action statement: "I noticed that some students had difficulty with some examples. Honestly, I didn't expect that. So, I was more careful in subsequent classes, to make sure that the examples were better matches to students' current levels of proficiency." Another pre-service teacher (PT7) also described the unexpected turn of events she witnessed in the first week of the class, as a case of reflection-in-action: "I did not expect the students to be puzzled about what to do with the worksheet. And that was mostly due to my shortcomings regarding the worksheet. I now know that I should make the worksheet clearer and easier to comprehend." In addition to the statements provided here as examples, some pre-service teachers expressed how they identified certain misconceptions among the students through reflective thinking, had problems regarding effective use of time, failed to initiate engagement of the students, saw students

misunderstanding the directions provided, or had difficulty handling student behavior in terms of maintaining discipline in the classroom. They were able to come up with solutions for some of these cases but were unsuccessful with others.

Table 2. Pre-service teachers' reflections during their practices

Reflection in action		PT1	PT2	PT3	PT4	PT5	PT6	PT7	PT8	f*
Themes	Codes									
Problems revealed in class and solutions developed right there	Take care of a deeper understanding	-	1	-	1	-	-	-	-	2
	Providing explanation for unanticipated situations	-	1	-	-	-	-	1	-	2
	Struggle with improper student behaviors	-	-	1	-	-	-	1	-	2
	Prepare and apply proper worksheets	-	-	-	-	-	-	1	-	1
	Time management	-	-	-	1	-	-	-	-	1
	Giving accurate instructions	-	-	-	-	-	-	-	1	1
	Activating learners	1	1	-	-	-	1	-	-	3
	Noticing misconceptions	-	-	-	-	-	1	-	-	1

f*:Frequency

REFLECTION-FOR-ACTION

This category covers the plans the pre-service teachers come up with for their future teaching practices, through a review of the teaching practices they just had. The reflection-for-action category is comprised of two distinct themes ('action plans for the future', and 'pre-service teacher's awareness levels'), covering 22 distinct codes (see Table 3). The vast majority of pre-service teachers mentioned the valuable experience they gained in terms of preparing materials and activities in accordance with the students' proficiency levels, and further enriching the activities developed. On her fourth self-assessment form, PT8 stated that "I will be preparing simpler questions compared to the ones I originally came up with, as the students were not yet at a level of proficiency to solve the problems I presented" and added she would be more careful about this matter in the future. On the theme 'awareness levels', on the other hand, the most common point raised by pre-service teachers was that the classes they taught contributed to their awareness about the positive aspects and concrete requirements of teaching as a profession. For instance, in the form she submitted at the end of week five, PT5 wrote "the teacher is an actor, and plays the part in accordance with the audience. My students love me so much, and I am very happy about this matter. They always want me to offer them some activities or materials. Making them feel valuable is a small but most crucial detail. Teaching is all about love and affection. One cannot put a prize on touching the heart of a child." On her second self-assessment form, PT6 underlined individual differences, stating "given the fact that each student has a distinct style of learning, developing a wide range of activities and games when teaching the class would make the whole process more effective."

Table 3. Pre-service teachers' reflections for their practices

Reflection for action										
Themes	Codes	PT1	PT2	PT3	PT4	PT5	PT6	PT7	PT8	f*
Action plans for the future	Preparing the lesson	1	-	-	-	-	-	1	-	2
	Providing more guidance when needed	-	-	-	-	-	-	-	1	1
	Favoring student centered practices	2	-	-	-	-	2	-	-	4
	Taking precautions for time management	-	-	-	1	-	-	-	1	2
	Enriching the activities developed	1	1	2	1	-	-	2	-	7
	Using suitable materials	-	-	3	1	-	-	-	4	8
	Supporting teaching with games	-	1	-	1	-	2	1	-	5
	Using smart board	-	1	3	-	-	1	-	-	5
	Using in-class assessment	-	-	-	-	1	-	1	1	3
	Worrying about teacher-students communications	-	-	-	-	1	-	-	1	2
Pre-service teachers' awareness level	Setting the time according to the activities' characteristics	1	-	-	1	-	-	-	1	3
	Motivation	2	-	-	-	-	-	-	3	5
	Professional requirements	1	-	3	1	6	2	1	1	15
	Preferring activities involving students	-	2	-	1	-	-	1	-	4
	Using various types of questions	-	-	-	1	-	-	-	-	1
	Coming up with a concrete formulation of the subject	-	-	-	1	1	1	-	-	3
	Difficulties in classroom management	1	1	2	-	-	-	-	1	5
	Importance of teacher-students communication	-	1	1	-	1	2	2	-	7
	Taking individual differences into account	-	3	-	-	-	1	-	-	4
	Effectiveness of learning with games	-	-	-	-	1	-	1	1	3
	Importance of previous knowledge	-	1	-	-	-	-	1	-	2
	Importance of professional development	-	-	-	-	-	-	1	-	1

f*:Frequency

4 | DISCUSSION & CONCLUSION

The study is based on the analysis of the self-assessment forms filled out by the participants at the end of the class through a period of eight weeks of practice, with a view to gathering data on their reflection skills. The analyses revealed that the frequency of reflective thinking on part of the pre-service teachers varied in relation to their personal and professional characteristics. The differences are deemed to be directly related with their efforts put into the teaching practice course (for the course plan, material preparation, model development etc.), and with their attitudes towards the teaching profession. It is beyond dispute that a high level of motivation is a must for the teachers to be able to perform activities to support life-long development, beyond the obligatory elements of any course. A holistic analysis of the self-assessment forms led to the observation that the participants expressed reflection-on-action statements more frequently compared to statements on reflection in-action and reflection-for-action. This finding can be explained by the lack of any unexpected circumstances the participants coming across during the classes, or the lack of sufficient motivation on their part, for making plans for the future. The fact that the participants rather more frequently made statements under this category can also be explained by the

association of reflection-on-action with rather simpler skills. For instance, reflection-in-action requires the individual to analyze the unexpected circumstances occurring during the class, whereas reflection-for-action requires the development of new proposals based on process analysis applied with respect to the courses. In other words, reflection-on-action was frequently used by the participants, as the only requirement for it was the ability to express what happened during the class, without the need for any significant analysis. On the other hand, the most common reflection-in-action expressions the participants used were found to be usually related to the issues, shortcomings, and problems they had experienced. This finding supports the conclusions reached in previous studies (Akın & Güven, 2014; Güneş & Baki, 2011), which argued that the teachers were usually inclined to notice / express the problems faced. Erginel (2006), in turn, observed that pre-service teachers usually focused on teaching methods, student motivation, and class management in the context of reflective thinking regarding the practice process.

The statements provided in pre-service teachers' self-assessment forms reveal that they realized not only the positive effects of teaching methods they apply in their classes, in terms of achieving effective learning, but also the importance of ensuring a match between the complexity of the activities and the proficiency levels of the students, with specific reference to individual differences. Reflections helped raise awareness among pre-service teachers with respect to what is needed to overcome existing shortcomings, allowed them to notice their existing strengths, and motivated them for working harder to achieve what needs to be done. This conclusion is in line with the results reached by Fırat-Durdukoca and Demir (2012). In a study on developing reflective thinking, Schweiker-Mara, Holmes and Pula (2003) found that the activities described were most effective in helping pre-service teachers in terms of decision-making and problem-solving in classroom settings. The findings reached here also lead one to the conclusion that the participants really make an effort to improve their professional skills, through reflection on and for action.

The present study also paved the way for effective peer-evaluation for pre-service teachers, in conjunction with self-assessment. Other studies also underline the positive effects such an approach would have on reflective thinking skills. Özbek and Köse (2019) noted that interviews to follow the teaching practice ranked high among the 10 factors which helped reflective thinking skills. In other words, the recommendations provided to pre-service teachers by their peers helped the former to grasp details they did not notice during the practice itself, and to work on improvements for subsequent classes.

Based on the results reached, one can argue that providing pre-service teachers with the opportunity to get experience in actual class environments at schools, in the context of developing one's reflective thinking skills, would be most helpful. Doing so enables pre-service teachers to realize actual problems and needs, and gives them the opportunity to organize their education accordingly. In the same vein, Abrams and Middleton (2004) and Weshah (2007) observed that, through reflection, teachers were able to assess the quality of their performance, and identify specific skills they need for professional development.

According to the findings noted above, the pre-service teachers mostly made similar points in their reflective thinking activities, and had shortcomings on the reflection-in-action and reflection-for-action fronts. Based on this observation, one can argue that the participants can certainly do better in terms of problem solving and investigation skills. For, reflection refers to the process of carving out a meaning through the use of problem solving and investigation skills to reveal approaches regarding connections established between different experiences and ideas (Rodgers, 2002). On the other hand, the shortcomings regarding reflective thinking, as noted in this study in a group of pre-service teachers, are understood to be prevalent among teachers as well (Alp & Şahin-Taşkın, 2012; Kır, 2014).

Based on the conclusions reached here, one can recommend courses and activities focusing on the development of self-assessment and reflection in teacher training, as it is found that regardless of their existing self-assessment abilities, the pre-service teachers' reflection skills have some room for improvement regarding certain categories. The faculties of education, as the schools training teachers, play a major part in the development of reflective thinking skills among teachers (Harford & MacRuairc, 2008). In the light of the findings reached here, one can argue that the pre-service teachers' level of development on that front leaves much to be desired. The total lack of core courses on reflective thinking at faculties of education in Turkey, coupled with the rather limited numbers of elective courses on this topic, are probably the root causes of these shortcomings. On the other hand, providing

adequate training to pre-service teachers before they take teaching positions would help ameliorate this picture, and allow them to achieve personal development based on the results of self-assessment on their professional competence levels. The pre-service teachers' activities through the process were not subjected to a holistic analysis here. More comprehensive studies based on a wider range of data collection tools, with a larger group of participants, would certainly help understand and analyze-in-depth the shortcomings noted here. Moreover, studies on the effects of teaching activities focusing on self-assessment on pre-service teachers' creative thinking, problem solving, and analysis skills would also lead to valuable contributions to the literature in this field.

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While preparing this article, the authors certify that research and publication ethics were followed, as well as copyright restrictions for the intellectual and artistic works used.

RESEARCHERS' CONTRIBUTION RATE

Three authors contributed equally to the article writing. All authors read and approved the final version manuscript.

CONFLICT OF INTEREST

The authors of this article declare that there is no personal conflict of interest within the scope of the study.

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