

## The Effects of Micro-Reflective Teaching Practices on the Professional Skill Development of Pre-Service Physics Teachers

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### ABSTRACT

The aim of this study is to find out the effects of micro-reflective teaching practices on the professional skill development of pre-service physics teachers. It was planned as an experimental study with one group pretest-posttest and supported by the case study method. The data were collected by using professional skill scale, observation form and reflective diaries. The sample of the study composed of 13 (6 female, 7 male) pre-service teachers were studying in a Physics Teaching Program in an education faculty in north-eastern Turkey. Each pre-service teacher implemented 5 micro-reflective teaching practice within the scope of the research. These practices were recorded by the camera. At the end of each practice pre-service teachers watched themselves and wrote their reflective diaries. The data obtained from the scales and the observation form were analyzed by using the Wilcoxon Signed Rank Test, and the data acquired from the reflective diaries were examined based on interpretive analysis. The findings based on the data obtained from the professional skill scale, observation forms and the reflective diaries indicate that micro-reflective teaching practices help improve pre-service physics teachers' basic professional skills; subject matter mastery, planning, communication, classroom management, and evaluation.

**Keywords:** Micro-Reflective Teaching, Pre-Service Physics Teacher, Professional Skill Development, Teacher Education, Reflective Diaries.

### INTRODUCTION

In today's rapidly-changing age of information, the qualifications expected of teachers are changing as well. This requires teachers to constantly update their knowledge and gain the qualifications necessitated by the current age (Gökalp, 2004). Today, teachers intended teaching methods and techniques effectively in particular (Kavas, 2009). In order for pre-service teachers to determine effective teaching behaviors and to analyze their own teaching behaviors to make them effective, it is essential that they are provided the teaching experiences whereby they can demonstrate their professional skills in teacher training programs (Savran-Gencer, 2008). However, in the process of teacher training, most of the information is presented to the pre-service teachers in a theoretical way, and observation and practice work they carry out in schools is insufficient for them to transfer their theoretical knowledge into practice (Karaman, 2014; Kuran, 2009). Therefore, the pre-service teacher education process aims to raise pre-service teachers' professional competence to the highest level possible through feedback, and to give them the necessary professional experience before they can apply it to the real classroom environment (Batman, 2017).

The research conducted on effective teacher experiences, teaching methods applied, and teacher professional development (Amobi, 2005; Bower, Cavanagh, Moloney, & Dao, 2011; Çakır, 2010; Jay & Johnson 2002; Kpanja, 2001; Scheeler, Ruhl, & McAfee, 2004; Spurgeon & Bowen, 2002) strongly emphasizes that it is necessary to provide high-quality feedback on teaching practices. Techniques on how to provide feedback on the teaching process are classified as observations, checklists and video recordings by expert instructors or peer groups (Atay, 2003; Westhuizen & Smith, 2000; Zeichner & Wray, 2001). Especially with the advanced technology, the use of video recordings in teacher training has become very popular (Batman, 2017).

Micro teaching practices, which are small lesson practices that provide teaching experiences, develop students' analysis skills when supported with video recordings (McAleese & Unwin, 1997; Kavas, 2009). Micro-teaching practices help students understand innovative education by collaborating with peers and reducing their anxiety levels by getting feedback from their teacher (Alıncak, 2016; Fernandez, 2005; Kuran, 2009; Şen, 2009). Since they offer the opportunity to observe to what extent prospective teachers are able to implement their professional knowledge and skills, micro teaching practices are crucial factors worth examining in terms of how pre-service

teachers view the process of micro-teaching, and the level of success they have in making up for their shortcomings by considering the feedback and corrections given to them (Kuran, 2009). Moreover, most teachers who have just begun their professional career fail to apply their skills they gained during their undergraduate education to their professional environment, which is partly caused by lack of practice and an overemphasis placed on the theoretical courses in schools of education (Batman, 2017; Dedeoğlu, Durali, & Tanrıverdi-Kış, 2004; Taneri & Ok, 2014). This necessitates a greater inclusion in teacher training programs, which will help education faculties achieve their teacher training objectives and enable pre-service teachers to develop their professional skills as best as possible (Batman, 2017; Sancar & Deryakulu, 2020).

Performance measures such as self and peer assessment, which reflect the professional skill development of pre-service teachers, provide an alternative to the limitations of traditional assessment methods. The micro teaching method used in performance evaluation is implemented in an environment similar to simplified and real class environment in order to provide immediate feedback to the pre-service teachers about their teaching. This method, which is based on the experience of pre-service teachers, emphasizes video-recording of teacher practices, ensuring an analysis of what is missing by viewing video records and scoring pre-service teacher practices to improve their success (Kuran, 2009; Küçüköğlü, Köse, Taşgın, Yılmaz, & Karademir, 2012; Sherin, 2000). Thus, it is clear that micro teaching practices offer professional experiences for pre-service teachers. Experience is considered as a significant part of reflective thinking as well. However, only experience by itself is not sufficient for professional development and individuals can only improve when they reflect on their experiences (Dervent, 2012; Posner, 2005). On the other hand, it is stated that reflective thinking skills should be gained to teachers before the service, that is, during their education in education faculties (Eğmir, 2019).

Reflection is defined as a process or activity in which any experience is recalled, reflected, and widely evaluated for a purpose. The reflection process involves conscious recall and review of experience for planning, implementation, evaluation and decision making as a response to past experiences. In addition, this process consists of sections such as itself of events, being remembered the events, and reacting by reviewing (Richards, 1991; cited in Batman, 2017).

Güney (2008) has defined “micro-reflective teaching method” by synthesizing micro teaching and reflective teaching and as a modern, innovative, questioning teaching method. In the micro-reflective teaching method, which is a similar method to micro teaching, there is a controlled teaching environment. The concepts, skills and behaviors to be taught to students are determined in advance and presented in the classroom environment supported by various informatics tools. These tools have feedback, such as computers, CDs, and cameras. Pre-service teachers are recorded on the camera while they are teaching the lesson and then they are provided to reflect by watching these recordings (Güney & Semerci, 2009).

Research indicates that the most meaningful and effective teacher education programs combine theory and practice by using reflective instruction (Adler & Goodman, 1986; Kuran, 2009; Lanier & Little, 1986; Tarman, 2012; Yıldız, 2013; Yılmaz, 2013). Clearly, there is an urgent need for a study on micro-reflective teaching to help pre-service teachers to better prepare for teaching with self-confidence. To date, micro-reflective teaching research has been very limited in Turkey (Güney, 2008; Güney & Semerci, 2009; Akkuzu & Akcay, 2011) and these researchs’ samples consisted of only pre-service Turkish and Chemistry teachers. It seems necessary to find out the effect of microteaching on pre-service physics teachers’ professional skill development. In addition, the number of studies focusing on micro teaching and reflective thinking together and aiming to examine the professional skills development of Turkish pre-service physics teachers is quite low. Therefore, this study seeks an answer to the question “What are the effects of micro-reflective teaching practices on the professional skill development of pre-service physics teachers?”

## **METHOD**

In this section, the research design used in this study, the sample, the data collection tools, and the data analysis are presented.

### **Research Design**

The present study, which employs qualitative and quantitative methods for the data collection and data analysis procedures, was planned as a simple experimental study with single group pre-test/post-test. Robson (1998) emphasizes that scales do not elicit adequate information about teacher practices; and therefore, applying the case study method may yield a deeper analysis by strengthening the simple experimental method. Due to the limitations inherent in the simple experimental design, the case study method was also applied.

Quantitative and qualitative research methods are based on two different paradigms. These paradigms present us with two different windows with strengths and weaknesses. For this reason, using these two methods as a complement to each other helps to understand social events and phenomena (Yıldırım & Şimşek, 2005). In this research, qualitative data are used to support, confirm, explain and reinterpret quantitative results.

### Research Group

The sample group of the study consisted of 13 pre-service teachers (6 female, 7 male) studying in their 4th (senior) year of Physics Teaching Program of the Department of Maths and Science Education at Education Faculty at an university in the north-eastern Turkey. The experiment was conducted during the Spring semester of 2013-2014, and Fall and Spring semesters of 2014-2015, was carried out during the delivery of the “Special Teaching Methods-II”, “School Experience”, and “Teaching Practice” courses.

### Data Collection

The data collection tools used in this study, the implementation process, and the analysis of the data obtained are explained in detail below.

#### Data collection tools

- Professional Skills Scale was used to measure the teaching skills of the pre-service teachers. This scale was filled by pre-service teachers before the first and after the fifth practices.

*Professional Skill Scale (PSS):* It was developed by Kılıç (2006) based on the teaching skills assessment scale determined by YÖK (The Council of Higher Education in Turkey) / World Bank National Education Development Project and consists of a total of 39 items under six dimensions: Subject matter mastery (4), planning (4), teaching process (12), communication (8), classroom management (7), and assessment (4). The scale has the following grading: zero (0) is given for the behavior that is not exhibited at all, and the following scores are given from the worst to the best behaviors exhibited: 1 (low), 2 (middle), 3 (good), and 4 (very good). The reliability analysis for the scale revealed its reliability to be .75.

- Video records, an observation form and reflective diaries were used to reveal the self and peer assessments of the pre-service teachers.

*Reflective Diary Form Based on Video Records:* Pre-service teachers’ 15-25 minute micro-reflective teaching practices were recorded by the researcher in each practice session, and at the end of each practice session, a copy was given to the pre-service teachers. Thus, the pre-service teachers were able to watch their own teaching practices and write their reflective diaries which based on self-assessment. Structured diaries were used in the study. The questions on the reflective diary form were developed by drawing from the related research (Çakır, 2010; Oner & Adadan, 2011). The questions developed by the researcher for the purpose of self-assessment to be done after the each practice by the pre-service teachers were examined by two academics who are experts in their field and finalized (19 questions) according to the data obtained in the piloting phase.

*Observation Form:* In the evaluation of pre-service teachers by peers and experts, the Micro Teaching Evaluation Form was used in the Faculty-School Cooperation Guide (YÖK, 1998). This form consists of 17 items; 9 of which are in the Lesson section and 8 of which are in the Presentation section. The items which are in the Lesson section are rated with "Yes", "Partially" and "No" categories, from positive to negative, and those in the Presentation section are rated with "Good", "Satisfactory" and "Attention required" categories. To increase reliability, the observation forms used in peer assessment were also used by the researcher.

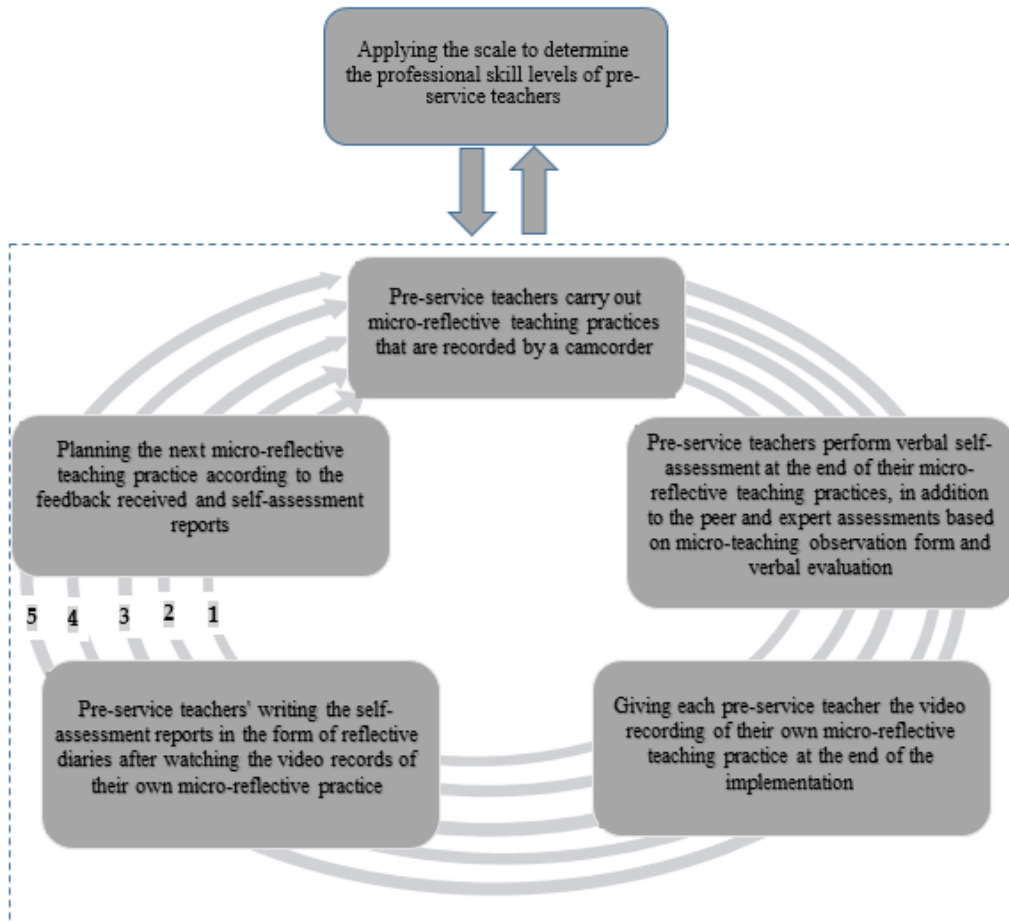
### Research procedure

During the first two weeks of the 2013-2014 academic year Spring semester, in the Special Teaching Methods-II Practicum course, the pre-service teachers were informed by the researcher about micro teaching, reflective thinking and planning of the practices they will carry out during the semester (theories, models, methods and techniques to be used, units, learning outcome selection and duration). At the end of this two-week period, units were assigned to the pre-service teachers.

The units of the 2013 high school physics curriculum implemented in the 9th, 10th, 11th and 12th grade (Material and its Properties, Force and Motion, Energy, Heat, and Temperature, Pressure and Lifting Force, Electricity and Magnetism, Waves, Optics, Simple Harmonic Motion, Regular Circular Motion, Wave Mechanics, Modern Physics, Introduction to Atomic Physics, and Radioactivity) were distributed to the pre-service teachers. This unit distribution process was repeated by the researcher at the beginning of the second semester (in the Fall term of 2014-2015 academic year), and in the last semester (in the Spring term of 2014-2015 academic year). However, in this last semester, the pre-service teachers were free to choose one of the units they had previously taught. The

pre-service teachers performed five micro-reflective practices: two in each of the first two semesters and one in the last semester. Pre-service teachers were provided to complete their recent practices before the first practices they would do in practice schools.

The implementation phases shown in Figure 1 were conducted during three semesters in the Special Teaching-II (pilot practice) and the School Experience and Teaching Practices courses. It was thought that the longer implementation time than the studies in the literature and a higher number of practices in the study would contribute to its reliability. The pre-service teachers were asked to write a diary after each practice in order to enable them to reflect on their experience. To find out the individual developments quantitatively, at the end of the three-term implementation process, the scale applied in the first implementation period was applied again.



**Figure 1:** The Cyclical Structure Taken into Consideration During the Implementation of the Study (Batman, 2017)

### The Role of the Researcher

At the beginning of the implementation, preliminary information, and distributing of the units processes expressed in “Research procedure” subheading carried out by the first researcher. Also, the applying process had managed and at the time of the teaching practices the camera recording, and expert assessments based on observation form had done by her. Add to this, she transferred the video recording on computer after each course and copied for the pre-service teachers. Then, each lesson (micro-reflective teaching) plan had evaluated by the researcher. Lastly, she analysed the reflective diaries and the other data collected from the pre-service teachers.

### Data Analysis

Since the Professional Skill Scale (PSS) completed by the pre-service teachers in approximately 15-25 minutes has six sub-dimensions, the data were analyzed by taking into consideration the total scores from each sub-dimension and the mean scores of each sub-dimension. The "Yes", "Partially" and "No" categories in the Course section of the Micro-Teaching Observation Form used in the evaluation of peers and experts during the micro-reflective teaching practices were scored with “2, 1 and 0,” and the "Good", "Satisfactory" and "Attention required" categories in the Presentation section were scored with “2, 1 and 0,” respectively. Then, the first and last practice

of each pre-service teacher were scored by calculating the mean of the total scores given by the peers and the researcher for the Course and Presentation sections.

Since the analyses using the above-mentioned scores revealed that  $N(13) \leq 30$ , Wilcoxon Signed Ranks Test for Associated Measurements, a nonparametric test that allows comparing the mean scores in the related measurements, was used. The results obtained from the analysis of the SPSS 16.0 package program are presented in tables. The significance level was received as 0.05 in all the statistical analyses conducted. In order to calculate the interrater reliability rates of the observations made in peer and expert assessment, an evaluation of each pre-service teacher was selected randomly and compared with the expert assessment. These reliability percentages, which are calculated to determine the consistency between the data evaluated by different observers (Çepni, 2007), were found to be between 70.59% and 94.11% (0.71 to 0.94), indicating a high level of interrater reliability.

Reflective diaries, which were kept separately by the participants for each practice, were closely examined by assigning first-level codes and revealing the major themes, based on interpretive analysis. To show the codes, themes, and data clearly, tables based on the category-based data display were created. To ensure the reliability in the analysis of the reflective diaries, the diaries selected randomly were also coded by an expert who was familiar with the practices and had qualifications similar to those of the researcher. By taking the common and non-common codes into consideration, the coefficient of consistence was found to be 0.88, showing a high degree of reliability among the researchers.

## RESULTS and DISCUSSION

In this section, the findings obtained by analyzing the quantitative and qualitative data collected through reflective diaries based on video recordings, PSS, and Micro Teaching Observation Form are presented, followed by a discussion of these findings and comparisons with the related studies in the literature.

### Findings and Discussion about the Professional Skill Scale (PSS)

The results of Wilcoxon Signed Rank Test, indicating whether there is a significant difference between "Subject matter mastery", "Planning", "Teaching Process", "Classroom management", "Communication", and "Evaluation" skills of pre-service teachers before and after the micro-reflective teaching practices, are showed in Table 1.

**Table 1:** The Results of the Wilcoxon Signed Rank Test of Subject Matter Mastery, Planning, Teaching Process, Classroom Management, Communication, and Evaluation Sub-Dimension Scores Before and After Micro-Reflective Teaching

Sub-Dimensions	Posttest-Pretest	N	Mean Ranks	Sum of Ranks	z	p
Subject Matter Mastery	Negative Rank	0	0.00	0.00	2.98*	.003
	Positive Rank	11	6.00	66.00		
	Equal	2	-	-		
Planning	Negative Rank	0	0.00	0.00	2.81*	.005
	Positive Rank	10	5.50	55.00		
	Equal	3	-	-		
Teaching Process	Negative Rank	2	2.50	5.00	2.83*	.005
	Positive Rank	11	7.82	86.00		
	Equal	0	-	-		
Classroom Management	Negative Rank	1	2.50	2.50	3.01*	.003
	Positive Rank	12	7.38	88.50		
	Equal	0	-	-		
Communication	Negative Rank	1	2.00	2.0	3.04*	.002
	Positive Rank	12	7.42	89.00		
	Equal	0	-	-		
Evaluation	Negative Rank	1	2.00	2.0	2.43*	.015
	Positive Rank	8	5.38	43.00		
	Equal	4	-	-		

\*Based on negative ranks

As can be seen in Table 1, there is a significant difference between the pre- and post-test scores of the pre-service teachers regarding the "Subject matter mastery" ( $z = 2.98, p < .05$ ), "Planning" ( $z = 2.81, p < .05$ ), "Teaching process" ( $z = 2.83, p < .05$ ), "Classroom management" ( $z = 3.01, p < .05$ ), "Communication skills" ( $z = 3.04, p < .05$ ), and "Evaluation" ( $z = 2.43, p < .05$ ) sub-dimensions of the PSS. It is seen that this difference is in favor of positive ranks namely the posttest score for all sub-dimensions (Table 1).

Table 2 shows that the mean of pre-test and post-test sub-dimension total scores of the pre-service teachers in the research group. It is clear that the mean scores increased in the post-test (Table 2).

**Table 2:** Means of the Total Scores for the Sub-Dimensions

Sub-dimensions	Mean of Pre-test Total Scores	Mean of Post-test Total Scores
Subject Matter Mastery	10,85	13,08
Planning	11,54	13,77
Teaching Process	33	40,39
Class Management	19,92	25
Communication	24,38	28,77
Evaluation	10,92	13,23

There is a significant difference between pre- and post-test scores of the participants for the all sub-dimensions of the PSS (Table 1, Table 2). These differences are in favor of the positive ranks (ie. final test scores), which indicates that micro-reflective teaching practices help pre-service teachers to improve their professional skills. These findings support the participants’ ideas on how they would achieve the lesson plan objectives, their explanations on their ability to implement the activities at the level they plan, their statements about the changes they will make if they repeat the practice, and their explanations on the improvements regarding their planning and teaching process skills included in the reflective diaries, and the findings obtained by comparing the peer and expert feedback. In addition, the study conducted by Kuran (2009) to determine the effects of micro teaching on the acquisition of teaching skills and knowledge supports the conclusion that micro-teaching has a great contribution to gaining knowledge and skills related to the profession. In line with these findings, based on his study on the use of micro-teaching in teacher training, Kılıç (2010) confirms that implementation of the micro-teaching model improves the planning, teaching process, communication, classroom management, and evaluation competencies of pre-service teachers.

**Findings and Discussion about the Micro Teaching Observation Form**

The findings obtained from observation forms filled out by the pre-service teachers and the researcher during the micro-reflective teaching practices are given below.

**Findings obtained from peer assessment**

The results of the Wilcoxon Signed Rank Test comparing the pre-service teachers' implementation scores of the ‘course’ and ‘presentation’ criterias in the micro-reflective first and last practices are presented in Table 3.

**Table 3:** Results of the Wilcoxon Signed Ranks Test Analysis of the First and Last ‘Course’ and ‘Presentation’ Scores

Sub-Dimensions	Last practice- First practice	N	Mean Ranks	Sum of Ranks	z	p
Course	Negative Rank	0	.00	.00	3.18*	.001
	Positive Rank	13	7.00	91.00		
	Equal	0	-	-		
Presentation	Negative Rank	2	7.00	14.00	2.20*	.028
	Positive Rank	11	7.00	77.00		
	Equal	0	-	-		

\*Based on negative ranks

As shown in Table 3, there is a significant difference between the scores of the pre-service teachers on the micro teaching observation form’s ‘course’ criteria implementation in the first and last practice ( $z = 3.18, p < .05$ ). Similarly, it is clear that there is a significant difference between the ‘presentation’ skill implementation scores on the micro teaching observation form for the first and last practices ( $z = 2.20, p < .05$ ). However, it is seen that these differences are in favor of positive ranks for both sub-dimensions (Table 3).

**Findings obtained from expert assessment**

The analysis results of the Wilcoxon Signed Rank Test comparing the pre-service teachers' implementation scores for the ‘course’ and ‘presentation’ criterias in the micro-reflective first and last practices are showed in Table 4.

**Table 4:** Results of the Wilcoxon Signed Ranks Test Analysis of the First and Last 'Course' and 'Presentation' Scores

Sub-Dimention	Last practice-First practice	N	Mean Ranks	Sum of Ranks	z	p
Course	Negative Rank	0	.00	.00	3.19*	.001
	Positive Rank	13	7.00	91.00		
	Equal	0	-	-		
Presentation	Negative Rank	0	.00	.00	3.19*	.001
	Positive Rank	13	7.00	91.00		
	Equal	0	-	-		

\*Based on negative ranks

As shown in Table 4, there is a significant difference between the scores of the pre-service teachers for the micro teaching observation form's 'course' criteria implementation in the first and last practices ( $z=3.19, p<.05$ ). Add to this, there is a significant difference between the scores received by the pre-service teachers for the micro teaching observation form's 'presentation' skill implementation in the first and last practices ( $z=3.19, p<.05$ ). It is seen that these differences are in favor of positive ranks for both sub-dimensions (Table 4).

According to the results of the analysis comparing the scores given by the peers based on the micro teaching observation form (Table 3), there is a significant difference between the pre-service teachers' scores on the 'course' and 'presentation' dimensions for the first practice and the last practice; and considering the mean ranks and sum of the difference scores, these differences favor positive ranks, that is, the last practices. The results of the analysis of the data obtained from the expert assessment also coincide with these findings (Table 3, Table 4). In addition, these findings support the findings obtained from the PSS. Considering the findings obtained, it can be said that the practices performed are helpful in improving the teaching process and presentation skills of the pre-service teachers. Furthermore, these findings support the explanations in the reflective diaries made by the pre-service teachers related to the attainment of the lesson plan objectives, application of the activities at the level they plan, and the changes they will make if they repeat the practices. These findings are also consistent with the results of the study reported by Kuran (2009). Add to this, according to the results of the research reported by Ceyhun and Karagölge (2002), repeated micro teaching practices similar to micro-reflective practices increase the success of pre-service teachers in practice and enable them to develop their professional skills.

### Findings and Discussion Regarding Reflective Diaries Based on Video Recordings

The pre-service teachers were first asked to specify the status of achieving their lesson plan objectives they developed for the micro-reflective teaching practice. In the first implementation, nine pre-service teachers (PsT) thought that they had achieved their goals in the lesson plans, three pre-service teachers reported that they failed to attain their objectives, and one pre-service teacher reported partial success at achieving the objectives (Table 5).

**Table 5:** Pre-Service Teachers' Opinions on Achieving their Lesson Plan Objectives in Micro-Reflective Teaching Practices

IRGP*	1st Practice	2nd Practice	3rd Practice	4th Practice	5th Practice
Yes	PsT2, PsT3, PsT4, PsT7, PsT8, PsT9, PsT10, PsT11, PsT12	PsT1, PsT2, PsT3, PsT4, PsT6, PsT7, PsT8, PsT9, PsT10, PsT11	PsT1, PsT2, PsT3, PsT4, PsT6, PsT7, PsT8, PsT9, PsT10, PsT11, PsT13	PsT1, PsT2, PsT3, PsT4, PsT5, PsT6, PsT7, PsT8, PsT9, PsT10, PsT11, PsT12, PsT13	PsT2, PsT3, PsT4, PsT5, PsT6, PsT7, PsT8, PsT9, PsT11, PsT12, PsT13
Partly	<ul style="list-style-type: none"> <li>• Failure to implement the activity due to a technical fault (PsT1)</li> </ul>	<ul style="list-style-type: none"> <li>• Time management (PsT12)</li> <li>• Lack of technological equipment (PsT12)</li> </ul>	<ul style="list-style-type: none"> <li>• Time management (PsT12)</li> </ul>		<ul style="list-style-type: none"> <li>• Time management (PsT1, PsT10)</li> </ul>
No	<ul style="list-style-type: none"> <li>• Making an activity (PsT5)</li> <li>• Excitement (PsT5)</li> <li>• Compliance with the plan (PsT6)</li> </ul>	<ul style="list-style-type: none"> <li>• Being stuck in a question (PsT5)</li> </ul>	<ul style="list-style-type: none"> <li>• Implementing as planned (PsT5)</li> </ul>		

- Being effective (PsT13)

\*The idea of reaching the goal of the lesson plan

In the second practice, PsT5 stated that the lesson plan did not reach its goal:

*“My plan didn't reach exactly reach its goal. Because I was unable to put a question out of my mind during the lesson and this case affected the lesson; I forgot to receive student comments after watching the video”.*

PsT12 stated that he could reach the aim partially due to the inadequacy of the technological equipment in the classroom and not managing the time effectively. This statement of PsT12 shows that during the planning of the lesson, he did not take into account the technological equipment in the classroom; to be more specific, the fact that students did not have computers. However, in view of the fact that the pre-service teacher did not encounter such a problem in his later practices, it can be said that he learned the lesson from his experience. PsT5's confusion about a question, which was negatively reflected in the flow of her micro-reflective teaching practice was due to her inexperience, and he later overcame this problem by gaining experience through practice. Similarly, in microteaching practices carried out with pre-service science teachers, it was determined that the candidates could not follow their plans due to excitement, and the reason for this situation was shown to be the lack of experience of the candidates (Babacan & Şaşmaz-Ören, 2018). At the fourth practice, all the pre-service teachers expressed that the lesson plans they developed for the micro-reflective teaching practice had reached their goals. In the last practice, two pre-service teachers reported that the lesson plans partially achieved their purposes due to poor time management, while the other 11 pre-service teachers stated that their plans had reached their goals. Table 5 shows that these two pre-service teachers had successfully managed their time in the previous practices. This might have resulted from the fact that during the fifth (the last) practice the pre-service teachers were bored and did not pay as much attention to the lesson planning as in the previous practices and made plans without considering the time. In this context, it is pointed out that a good balance between the similarities and differences with their previous experiences should be ensured in order to offer new learning opportunities to pre-service teachers (Karlström & Hamza, 2018).

In the first micro-reflective teaching practice, more than half of the pre-service teachers stated that they were not able to implement, or were able to only partially implement the activities at the level they planned (Table 6). PsT9 reported that with the sudden change in the plan he developed on the subject of “Capacitors”, he applied the activity at the end of the course instead of throughout the course period, which caused the students to get bored. When PsT9's explanation for this is considered, it can be seen that he was not duly aware that the lesson plan is one of the main factors determining success and that teaching by following the plan is crucial. Considering that the pre-service teacher did not repeat this error after the third practice, it can be said that he acquired the skill to teach the lesson in accordance with the plan. Regarding the first practice, PsT12 expressed the problem of limited time as follows:

*“...I think some of the things I have to teach remain incomplete due to the limited time. In addition to the questions I asked in order to draw attention before the beginning of the lesson, I had made a video, but I couldn't show the video because of the limited time”.*

**Table 6:** Descriptions by Pre-Service Teachers of their Success at Applying the Teaching Activities in Their Plans

Implementation Status of Activities	1st Practice	2nd Practice	3rd Practice	4th Practice	5th Practice
Yes	PsT2, PsT3, PsT7, PsT8, PsT10, PsT11	PsT1, PsT2, PsT4, PsT7, PsT8, PsT11, PsT12	PsT1, PsT2, PsT4, PsT7, PsT8, PsT11, PsT13	PsT3, PsT4, PsT5, PsT6, PsT7, PsT11, PsT12	PsT2, PsT3, PsT4, PsT5, PsT6, PsT7, PsT8, PsT11, PsT12, PsT13
Partly	<ul style="list-style-type: none"> <li>• Technical failure (PsT1)</li> <li>• Reflection in action (PsT4)</li> <li>• Change in plan flow (PsT9)</li> </ul>	<ul style="list-style-type: none"> <li>• PsT9</li> <li>• Technical failure (PsT3)</li> <li>• The selection of method-technique (PsT10)</li> </ul>	<ul style="list-style-type: none"> <li>• Failure in experiment (PsT3)</li> <li>• Question and answer technique (PsT10)</li> <li>• Exclusion from the plan (PsT12)</li> </ul>	<ul style="list-style-type: none"> <li>• On account of material (PsT1, PsT2)</li> <li>• Time management (PsT8, PsT10)</li> <li>• Orienting the course (PsT9)</li> </ul>	<ul style="list-style-type: none"> <li>• Attendance to the course (PsT1, PsT10)</li> <li>• Failure to step out of the plan (PsT9)</li> </ul>



		<ul style="list-style-type: none"> <li>• Time management (PsT12)</li> <li>• Change in the plan flow (PsT9)</li> </ul>	<ul style="list-style-type: none"> <li>• Excitement (PsT13)</li> <li>• Sacking on using board (PsT13)</li> </ul>
No	<ul style="list-style-type: none"> <li>• PsT5, PsT13</li> <li>• Drawing attention (PsT6)</li> <li>• Time management (PsT12)</li> </ul>	<ul style="list-style-type: none"> <li>• Mastery in the subject matter (PsT5)</li> <li>• Implementing the opposite of the plan (PsT6)</li> </ul>	<ul style="list-style-type: none"> <li>• Technical fault (PsT5)</li> <li>• Lack of material (PsT6)</li> </ul>

This shows that he failed to choose the activity appropriate to the time. However, considering that two other pre-service teachers experienced similar problems with using time in the following micro-reflective teaching practice, but this problem is not reported for the last practice, it can be said that the pre-service teachers' time management skills have improved. Similarly, based on his study on technology-supported micro-teaching practices, Babacan (2016) concludes that pre-service teachers' effective time management skill improves thanks to such practices. As it can be seen in Table 6, regarding the last two practices, all the pre-service teachers were able to implement the activities at the level they planned; the number of those who could partially implement them decreased, and especially in the last practice the number of those who were able to implement the activities at the level they wanted increased. Thus, it can be said that the micro-reflective teaching practices contribute to the skill development of pre-service teachers in terms of implementing the activities in the way they planned.

For the first micro-reflective teaching practice, regarding the changes the pre-service teachers wish to make if they repeat the practice; technique, planning, engaging learners in the introduction phase of the lesson, and communication were highlighted. In the first practice, the PsT5 wanted to make changes to overcome nervousness, but in the second practice he wanted conceal this nervousness. As such, it can be stated that thanks to his experience with the micro-reflective teaching practice, he became aware that even if he may not fully get rid of nervousness, he can still get his nervousness under control. Fernandez and Robinson (2006) also support this conclusion by stating that micro education gives pre-service teachers the opportunity to apply what they learned in the courses at the university, and helps them gain confidence, with relieving their anxiety when they begin their professional career in the real school (Alıncak, 2016).

Regarding the fourth practice, it was found that if they are allowed to do the practice again the pre-service teachers plan to make changes mostly about planning, equipment using, communication skills, and ensuring students' active involvement. Four pre-service teachers also expressed that they did not see any need to make any changes in their practices. Regarding the last practice, five pre-service teachers stated that they found their practices very successful and they did not think it would be necessary to make any changes if they repeated the teaching practice. PsT7 explained this with the following statement:

*"I would repeat almost the same presentation. Because it was a very successful presentation".*

Thus, it can be defend that the micro-reflective teaching practices increasingly reached the desired level. Erokten and Durkan (2009) also support this sentiment by stating that as a result of repeated microteaching practices, pre-service science teachers were more comfortable in their lectures, were able to solve the problems they encountered while teaching, and their classroom management and communication skills improved.

Regarding the first practice, five pre-service teachers gived reaction positively and three pre-service teachers responded negatively to the question of whether the micro-reflective teaching practices had gone as planned, according to peer and expert feedback. For the fourth practice, 10 pre-service teachers responded positively while there were no negative responses. For the last practice, while there were no negative responses, 11 pre-service teachers responded favorably (Table 7). Based on the increase in the number of positive responses for the last two teaching practices, it can be said that the feedback received by the pre-service teachers during the micro-reflective teaching practices has become more and more positive as time went by. This case shows that the pre-service teachers made remarkable progress towards meeting their expectations in their micro-reflective teaching practices. However, given the fact that not all these pre-service teachers responded positively to the question, it can be said that there are still shortcomings that need to be remedied.

**Table 7:** The Opinions of the Pre-Service Teachers on the Extent the Micro-Reflective Teaching Practices Went as Planned According to Peer and Expert Assessments

Realization Status of Practice as Planned	1st Practice	2nd Practice	3rd Practice	4th Practice	5th Practice
Yes	PsT2, PsT4, PsT6, PsT11, PsT12	PsT1, PsT2, PsT4, PsT6, PsT9, PsT10, PsT11, PsT12	PsT1, PsT2, PsT3, PsT4, PsT9, PsT10, PsT11, PsT12	PsT1, PsT2, PsT3, PsT4, PsT6, PsT7, PsT9, PsT10, PsT11, PsT12	PsT2, PsT3, PsT4, PsT5, PsT6, PsT7, PsT8, PsT9, PsT11, PsT12, PsT13
Partly	<ul style="list-style-type: none"> <li>• PsT9</li> <li>• Time management (PsT10)</li> <li>• Forgetting (PsT7)</li> <li>• Processing fast (PsT7)</li> </ul>	<ul style="list-style-type: none"> <li>• PsT8</li> <li>• Excitement (PsT5, PsT7)</li> <li>• Communication skills (PsT5)</li> <li>• Mastery in the subject matter (PsT5)</li> </ul>	<ul style="list-style-type: none"> <li>• Minor defects (PsT7)</li> <li>• Pauses (PsT8)</li> <li>• Using board (PsT13)</li> <li>• Formulation (PsT13)</li> </ul>	<ul style="list-style-type: none"> <li>• Planning (PsT5)</li> <li>• Communication (PsT5)</li> <li>• Time management (PsT8)</li> <li>• Summary (PsT13)</li> </ul>	<ul style="list-style-type: none"> <li>• Time management (PsT1, PsT10)</li> </ul>
No	<ul style="list-style-type: none"> <li>• Technical failures (PsT1)</li> <li>• Excitement (PsT1, PsT3)</li> <li>• Fast (processing) finishing (PsT5)</li> <li>• Couldn't having the acquisitions enough (PsT5)</li> </ul>	<ul style="list-style-type: none"> <li>• Time management (PsT3)</li> </ul>	<ul style="list-style-type: none"> <li>• Planning (PsT5)</li> <li>• Answering questions (PsT6)</li> </ul>		

In order to help candidates think about the feedback they received for their micro-reflective teaching practices, they were asked to compare the feedback they received for each practice. Regarding the first practice of the PsT1, while receiving negative criticisms about keeping his stress under control, ensuring mastery of the subject, and adjusting his tone of voice and facial expressions to ensure better communication in the earlier practices; in more recent practices, PsT1 received positive feedback about communication (tone of voice and gesture-mimic use), classroom management, mastery of the subject, use of the board, note-taking, excitement-enthusiasm, besides some criticism of his time management. Based on the feedback received by this pre-service teacher, class management, mastery of the subject, use of the board, giving students note-taking opportunities, and communication come to the fore as the skills he has developed. These findings are consistent with the results obtained by Sevim (2013).

It was found that PsT3 received rather negative criticism in his first two practices. However, it is noteworthy that for his fourth practice, he received a criticism in terms of communication because he did not walk around in the classroom, and in the last three practices, he did not receive any negative comments, while the points of criticism directed at him during the first practice have become positive. Thus, it can be said that he showed improvement in calming his nerves, mastery of the subject, use of the board, classroom management and communication skills. The PsT10 stated that he received negative feedback because he did not use the time well and did not give students adequate time to take notes. His comment on the second practice is as follows:

*"I taught the course in the given time. But I still have shortcomings about note-taking by the students. I also delivered the course with too little enthusiasm. I agree with my friends, I could have been a little more enthusiastic in the class".*

Considering this explanation and the comments on the subsequent practices are examined, it is clear that he could not address his weakness about giving adequate opportunities to students for taking notes, but he was able to turn the criticisms about his time management into positive statements. That the negative statement about the lack of excitement and enthusiasm which was given in the 2nd and 3rd practices, was not given in the ensuing practice, but made again for the last practice suggests that this pre-service teacher failed to show a steady development in this regard. In addition, the fact that in response to the negative criticism on his tone of voice in the last two practices, he reported his plan to be careful about adjusting the tone of voice indicates that he is open to criticism and willing to evaluate the feedback constructively.

It is noteworthy that the PsT11 reflected on the negative criticism he received in his first practice for board use, and that he immediately improved on this in his 2nd practice. Likewise, he was able to convert the criticism on failing to make the lesson fun into a positive statement in the 4th practice and did not receive any negative feedback on this. Based on these findings, it can be said that he takes the feedback in the micro-reflective teaching practices into consideration and is trying to improve himself accordingly. When the findings regarding the comparison of the feedback provided by peers and experts are collectively examined, it is clear that in the period from the first practice to the last practice the negative feedback mostly decreased while the positive feedback increased. These findings support the findings obtained from the micro teaching observation form.

A closer analysis of the findings on the good aspects of the lessons as reported by the participants reveal that PsT6 reported that the lesson plans in the first two practices were good because they expressed the ideas clearly, whereas the third practice was good in terms of relating the subject at hand to the previous subjects, in other words, due to its review step. Therefore, it seems that as the practices progressed, he prepared the lesson plans more appropriately to the stages of constructivist theory and improved his planning skills in the implementation process. A study conducted by Babacan (2016) with pre-service science teachers found that one of the skills that contributed the most to the pedagogical content knowledge of the pre-service teachers during technology-assisted micro teaching practices is ‘the skill of constructing a lesson plan according to the constructivist approach’.

According to the findings on the good aspects of the lessons stated by the pre-service teachers, drawing attention of the students to the lesson, engaging students in the lesson, planning, activity and material development-selection-use, language and expression, and communication skills were found to be at the satisfactory level. Also, it is observed that there is a remarkable development from the 3rd practice onwards in the skill of material development-selection-use. Within the scope of the micro-reflective teaching practices, these pre-service teachers were made aware of the good aspects of the lessons by ensuring reflection on their actions, and they endeavored to maintain these aspects, and also made significant progress on their material development-selection-use skills. These findings are supported by the findings obtained by Karaman (2014) and Kılıç (2010).

When the pre-service teachers were questioned to indicate their strengths as a teacher in the process of micro-reflective teaching, PsT4 stated his communication, language and expression, time management, and mastery of the subject as his strengths in the whole practice. He added benefiting from equipment and materials for the 2nd and 3rd practices; and for the 3rd, 4th, and 5th micro-reflective teaching practices, he also added selection of examples and use of the board as his strengths. Thus, it can be said that the PsT4 maintained his strengths gained in the first practice, and progressively improved in his example selection, material and board use skills from the 2nd practice to the last. Regarding his strengths, PsT8 pointed at positive character traits and communication skills, adding that he was able to control his nervousness and had mastery of the subject in his 3rd practice. PsT8’s adding self-confidence to positive character traits, and the statements made by PsT6 about the development of teaching process skills in his last practice (now with his improved subject area knowledge, he was able to teach the course more confidently) shows that the pre-service teachers completed their practices by gaining professional self-confidence. These findings are supported by other studies conducted on micro teaching by Alıncak (2016), Babacan (2016), Benton-Kupper (2001), and Şen (2009).

When they are asked to express their thoughts about whether the micro-reflective teaching practices are successful or not, in the first practice, nine pre-service teachers were positive, one pre-service teacher was partially positive, and three pre-service teachers responded negatively. PsT7 and PsT11 stated that the positive feedback they received from the peers led them to think so, while Pst9 stated that he gained lasting experiences thanks to peer evaluation:

*“...It is lasting and effective for people to learn from their mistakes and the ideas of their friends and being criticized by their peers”.*

This finding is confirmed by Şahin (2010), who asserts that reflective teaching creates a social learning environment and thus rendering the learned knowledge more permanent. However, PsT1, PsT2, and PsT13 stated that the practices contributed to gaining experience and to develop professionally. These findings are supported by the research results obtained by Kuran (2009). In the third practice, PsT9 implied that; learning through experiencing, discerning the mistakes by reflection and peer evaluation has been effective in the professional development of him and he gained experience. In Bower et al. (2011), similar to PsT9, they found that there was a significant improvement in self-assessment scores of pre-service teachers in the practice-reflection-feedback cycle. Akıllı (2007) supports this finding by concluding that peer evaluation contributes to improving the quality

of teacher performance. Similarly, PsT13 emphasized that through micro-reflective teaching practices he gained experience and improved communication skills. As stated by PsT11:

*“...I think it makes us aware of the being a teacher.”*

the micro-reflective teaching practices ensured gaining the professional awareness.

Regarding his last practice, despite being more successful than he was in his previous presentation, PsT5 believes that he has shortcomings, which shows that he was able to apply reflective thinking successfully and embraced professional development. Diana (2014) emphasizes this point by stating that the ownership is one of the important elements of professional development, and that many teacher educators should contribute to the professional development of both themselves and novice teachers.

Considering all of the above mentioned findings, it can be said that micro-reflective teaching practices conducted over three semesters help pre-service teachers gain professional self-confidence, experience, and awareness, and to develop professionally. Şen (2009) supports these findings, and emphasizes the fact that pre-service teachers' self-confidence increases as they gain experience through micro teaching implementation. In a similar way, Alıncak (2016) also states that micro-teaching practices are an important factor in developing self-confidence by decreasing stress-related processes such as nervousness and anxiety that pre-service teachers will experience in the classroom environment. Furthermore, the findings bring out that the number of the pre-service teachers who do not think that the micro-reflective teaching practice is successful decreases from the first practice to the last practice; and no pre-service teachers think this way in the last two practices. Based on these findings, it can be expressed that micro-reflective teaching practices help pre-service teachers to gain experience towards developing professional skills, and as they gain experience, they benefit from the practices better.

Regarding the findings about the unexpected events or situations encountered by preservice teachers during their micro-reflective teaching practices, that PsT6 solved an extra question because there was some extra class time in his second practice indicates that he followed the advice frequently given in the post-practice evaluations that a teacher always should be prepared with alternative questions and activities; and that he acted with this awareness by reflecting in action. This shows that PsT6 reflected on and tried to implement the suggestions made by his peers and by the experts. These findings are consistent with the results of the study by Tan, Tan, and Wettasinghe (2011), reflecting the opinions of pre-service teachers on how to transfer the good ideas they have learned during the practices to future teaching practices. Furthermore, the fact that although the battery of the laptop he was using died, the pre-service teacher continued teaching without interruption implies that he was able to overcome unexpected problems by reflecting in action from the 2nd practice onwards. In his study about reflective practices, Dervent (2012) emphasizes that reflections on experiences contribute to pre-service teachers' preparation for future professional life.

When the opinions of the pre-service teachers about their level of development in their planning and teaching process as skills are examined, regarding the 3rd practice, the emphasis placed by PsT13 on taking into consideration the positive and negative situations in peer practice when preparing his plans can be taken as a clear indication of the positive effect of the peer observations in micro-reflective practices. This finding is supported by the results obtained by Benton-Kupper (2001) on micro teaching implementations. Akıllı (2007) also supports this finding and emphasizes that the input from peer observation plays a key role in improving the quality of teacher performance. Likewise, Alıncak (2016) draws attention to the fact that in micro-teaching practices, pre-service teachers try to avoid repeating their peers' mistakes made before their own presentation, and in this way, they are able to deliver better presentations.

An analysis of the pre-service teachers' need for peer help in their practice reveals that two of them (PsT3 and PsT11) needed peer assistance in creating activities and experiments in three of the practices. This could have been due to these pre-service teachers' lack of experience, which indicates that especially in the early years of teachers, there is an urgent need for co-teaching practices as in Finland (Diana, 2014), especially in teaching science (ie. physics, chemistry, biology) courses which involve a lot of experimentation activities.

## CONCLUSION

Based on the findings obtained from the Professional Skill Scale and the Micro-teaching Observation Form, it was resulted that the micro-reflective teaching practices are effective in developing pre-service teachers' basic professional skills expressed as teaching process, subject mastery, planning, classroom management, communication, and evaluation skills. However, by considering the findings obtained from the reflective diaries of the pre-service teachers, it was further concluded that whereas micro-reflective teaching practices contribute

significantly to the development of pre-service teachers' planning, teaching process, communication skills, these practices contribute to their mastery in the subject matter and classroom management skills to a lesser extent compared to other skills, and even less to the development of their evaluation skills. These results may have stemmed from the fact that the evaluation processes implemented during and after the practices were carried out on the basis of the observation form, and that the items in the observation form are especially related to planning, teaching process and communication skills.

According to the findings obtained from the reflective diaries, especially in the last two practices, no pre-service teacher remained who could not implement the activities at the level they planned, and the number of those who could partially implement decreased, while the number of those who taught at the desired level grewed in the last practice. Therefore, it can be stated that the practices contributed to the development of the pre-service teachers' ability to apply the course by the plan and carry out the activities at the level they plan. Having as many (five) practices as possible, providing immediate feedback in the expert, peer and self assessment processes at the end of each practice, and strictly following the criteria considered in the assessment procedures may have helped attaining this positive result.

Considering the findings of the comparison of the feedback received by the pre-service teachers from their peers and experts, the negative feedback decreased and positive feedback has increased, and the negative feedback given in the earlier practices has become positive. The feedback given during this process helped eliminate the shortcomings of the pre-service teachers and supported the development of their professional skills (especially planning, communication, classroom management, and teaching process). Add to this, when the findings regarding the good aspects of the lessons in the reflective diaries were examined, it was found that, in general, attracting attention, encouraging student participation, planning, activity and material development-selection-use, language and expression, and communication skills were reported to be at a favorable level. In terms of material development-selection-use, a remarkable development was observed from the third practice on. Therefore, it was concluded that the pre-service teachers made efforts to maintain their good level, which they were aware through reflection, and that there was a significant improvement in the teaching process skills especially concerning the material development-selection-use.

As for the opinions of the pre-service teachers on the success of the practices, they reported that the micro-reflective teaching practices conducted during the three semesters were helpful in terms of gaining professional self-confidence and awareness, developing professionally, and accepting the necessity of professional development; and also, as they gained more experience, they were better able to benefit from the practices. Additionally, the pre-service teachers reflected the positive and negative aspects in their peers' practices in their own teaching, which indicates that pre-service teachers not only improve on the basis of their own micro-reflective practices, but also indirectly benefit from others' practices.

A closer look at the reflective diaries show that some pre-service teachers were able to turn the problems they experienced during the practices into positive factors by managing them successfully. Therefore, it can be said that the micro-reflective teaching practices revealed out within the scope of the research achieved the purpose of making the pre-service teachers see and correct their mistakes and deficiencies on criteria such as managing the stress-enthusiasm, using the board, and time management. In other words, these practices enabled professional skill development especially in the teaching process, by encouraging reflection on actions.

Clearly, the pre-service teachers participating in this study were able to reflect the experiences they gained in the practices to their professional skills. However, they experienced some problems, which was normal as well. Although the pre-service teachers made much progress in developing their professional skills during the study, there are many other experiences, knowledge, and skills that they need to acquire.

It should also be borne in mind that the formal inclusion of such micro-reflective teaching practices in the teacher education process, especially as part of the "Special Teaching Methods I-II" and "Teaching Practice-I" courses, can have positive effects. By finding out the extent prospective teachers can reflect their professional skills in the courses they teach in practice schools within the scope of the Teaching Practice course, the contribution of such micro-reflective practices to pre-service teachers' professional skills development can be determined more conclusively. In addition, by conducting in-depth studies with narrower focus, for each of the subject matter mastery, planning, communication, classroom management, evaluation and teaching process skills of pre-service teachers, micro-reflective teaching practices can be evaluated for the level of improvement.

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