Microteaching and Peer Assessment in Mathematics Teaching Practice

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Abstract

When considering the characteristics that teachers should have, concepts such as critical thinking, active learning, taking responsibility, evaluation, analysis, self-evaluation and reflective thinking are important. In this context, microteaching and peer assessment methods come to the fore. Microteaching is defined as sharing a part of the course with peers and receiving feedback from peers or advisors. Peer assessment, on the other hand, involves providing constructive suggestions among peers, reviewing, and giving feedback in accordance with predetermined criteria. In this study, pre-service teachers' views on microteaching and peer assessment methods are evaluated. The research was designed in accordance with the phenomenological pattern. The participants consisted of eight pre-service mathematics teachers studying in the Department of Elementary Mathematics Teaching at a university in Turkey. Interviews about microteaching and peer assessment were used as data collection tools. A 14-week microteaching and peer assessment implementation process was carried out with the participants. As a result of this process, pre-service mathematics teachers' perceptions about these concepts were obtained. As a result, the pre-service teachers stated that the application provided positive developments in their cognitive, affective, and psychomotor behaviours and that they gained professional experience.

Keywords: Microteaching method, peer assessment, teaching practice, mathematics education.

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Introduction

In education, individuals shape their knowledge cumulatively and internalize the feedback they receive from their environment. Thus, the success of education depends on the level of development of mnemonic processes that enable people to retain, preserve, and reproduce the knowledge acquired during their interaction with the outside world (Drushlyak et al., 2021). At this point, learning models come into play. The aim of learning models used in teaching processes is to develop the personality, desire to learn and the ability of individuals (Kholmatova, 2020). Concepts such as critical thinking, problem solving, and active learning are important in this context. The components that constitute the essence of critical thinking are listed by Faccione (1998) as analyzing, self-regulating, interpreting, inferring, explaining, and evaluating. Critical thinking is a concept that is considered important for learning-teaching activities as well as the problem-solving process. Critical thinking is one of the characteristics that higher education institutions try to develop in students to help them contribute effectively to the global workforce (Liu et al., 2014). Although there is a consensus that critical thinking can be promoted by designing specific teaching strategies (Butler et al., 2017), little is known about how to promote critical thinking in classrooms (Caceres et al., 2020). As one of the most important components of the teaching process, teachers need to shape and develop their teaching skills. Teaching skills are among the basic skills that a teacher should possess. Therefore, pre-service teachers need to continuously train to improve their teaching skills (Dirgantoro, 2019). However, at this point, different abilities and behaviours between individuals may become apparent. As a result, it is important to know and use different methods and techniques when learning and relearning (Etcuban & Pantinople, 2018).

Micro Instruction

Microteaching was first used at Stanford University in the 1960s to improve the quality of student learning in medical education and was later applied to teacher training (Reddy, 2019). Microteaching, also known as teaching demonstration, is a widely adopted teaching task in various teaching methods courses that provides the opportunity to plan and implement lessons by giving sample lessons to peers (Park, 2021). Microteaching is defined as pre-service teachers presenting a scaled-down lesson to small groups or real groups and receiving feedback from their peers and advisors (Bell, 2007; Fernández, 2005). Although there are differences in microteaching practices, keeping the duration of the lesson short, narrowing the scope of the subject, and the participation of fewer students than usual are among the common features of this method (Allen & Ryan, 1969).

Microteaching is one of the latest innovations in teacher training programs used as a professional development tool in pre-service or in-service teacher training programs. Microteaching is included in the course contents of many teacher education programs and

offers a different learning method to prospective teachers and combines both reflective practice and situated learning approaches. Microteaching is defined as a condensed lesson plan used to practice and reflect on action (Ledger et al., 2019; Ledger & Fischetti, 2020). The microteaching technique has been reported to provide cognitive (Bilican, 2022; Hacisalihoğlu Karadeniz, 2014), affective (Göçer, 2016; Tok, 2016), and psychomotor (Saraç & Doğru, 2021) benefits to prospective teachers. In microteaching scenarios, it is possible to talk about a structure based on peer-to-peer collaboration in which participants manage the process together (Fernández & Robinson, 2006; Park, 2021). In this context, peer assessment appears as a natural structure of collaborative learning mentioned in microteaching techniques.

Peer Review

Peer assessment and self-assessment are interrelated concepts. While self-assessment is perceived as individuals making judgments and decisions about their own work in accordance with certain criteria, peer assessment is defined as individuals reaching judgments and decisions about the work of their peers. The difference between self-evaluation and peer evaluation is expressed as the subject of judgments (Adachi et al., 2018a). Self-assessment is one of the basic competencies that university graduates should develop. It has been stated that using peers to support individuals' self-assessment development can have positive results (To & Panadero, 2019). When self-assessment is considered as a strategic process to regulate one's performance, it becomes very important to understand how this process is operationalized (Panadero & Alonso-Tapia, 2013). It is possible to say that self-assessment and peer assessment have positive effects on students in terms of taking more responsibility for their own learning, understanding the subject better, and developing their evaluation and critical reflection skills (Wanner & Palmer, 2018). However, the adoption of self-assessment and peer assessment in higher education has been slower than expected (Adachi et al., 2018a).

Recently, the effects of peer assessment have been widely investigated by researchers. Accordingly, peer assessment has been conceptualized as an arrangement in which students evaluate each other's work in terms of quantity, quality, level, value, and achievement (Fu et al., 2019; Li et al., 2020; Topping, 1998). Peer assessment aims to enable students to participate in scoring their peers' work and to offer constructive learning suggestions to their peers based on rubrics proposed by the teacher and gives them opportunity to make corrections and improvements by playing the role of an evaluator (Hsia et al., 2016; Popta et al., 2017). In addition, it was found that students who received brief cognitive feedback with general comments performed better in addressing specific problems than students who received detailed feedback (Strijbos et al., 2010). Peer assessment is thus defined as the process by which students provide constructive feedback to each other about their progress on an individual task. This process can be simple such as marking multiple-choice answer sheets

according to an answer key, or it can take more complex forms such as dialogues (Adachi et al., 2018b).

The concept of peer assessment has recently become more common in teaching processes. Until the 1990s, assessment processes in universities tended to focus on what students knew. Students were primarily assessed in terms of their understanding of a specific area of knowledge in the subject area they studied (Ibarra-Sáiz et al., 2020). In the 21st century, however, there has been a reconceptualization of assessment as an active process with students, rather than against them (Wanner & Palmer, 2018). At this point, assessors need to review their peers' work according to predetermined criterion and provide feedback (Zheng et al., 2020). However, emotional peer feedback messages may have different effects on student groups at different levels (Cheng et al., 2015). For example, Zhou et al. (2020) stated that students may have trust problems with their peers and themselves while participating in peer assessment, and as a result, there may be dissatisfaction. Negative interpersonal interactions between peer learners, such as the involvement of inexperienced students in the process (Wanner & Palmer, 2018) and distrust of peers, may not benefit students' learning in peer assessment activities (Cheng & Tsai, 2012). At this point, two elements come into play. The first is that the feedback giver is constructive, and the second is that the receiver utilizes the feedback (Rodgers et al., 2012). Given that peer assessment is an intrinsic teaching process (Wen & Tsai, 2008), it is clear that studies in this area are important.

Microteaching, peer assessment, and critical thinking are interrelated concepts. It consists of student teachers preparing and presenting short lessons to a group of students and then reflecting on their teaching experiences. Popovich and Katz (2009) stated that microteaching is a valuable tool to help students develop their communication and critical thinking skills. They also stated that microteaching provides an opportunity for students to analyze themselves and their classmates and develop their ability to provide constructive feedback through peer assessment. Similarly, Arsal (2015) stated that microteaching has positive effects on critical thinking. It was also emphasized that microteaching method should be applied in pedagogical courses to develop critical thinking skills in teacher education programs. Furthermore, Edge (1984) stated that one benefit of microteaching is that it can motivate useful discussions among participants. In microteaching sessions, trainees can experience the techniques from a learner's point of view, which can be a valuable experience. Gürbüzoğlu Yalmancı (2016) stated that microteaching practices that allow peer evaluations should be increased.

Conceptual Framework

Microteaching consists of teacher candidates preparing and delivering brief lessons to a group of students, followed by reflecting on their teaching experiences (Diana, 2013). Peer assessment is defined as the process where similar-level students evaluate the learning outcomes and

products of their peers for quality (Bushell, 2006). Integrating microteaching and peer assessment methods in instructional environments can provide students with the opportunity for self-assessment from two different perspectives. Although it is stated that peer assessment is a part of microteaching (Ralph & Noonan, 2004), it is generally observed that microteaching and peer assessment methods are studied separately. For example, Yurdabakan (2012) investigated the effect of peer assessment training on self-assessment. In the study, it was stated that peer assessment is a good predictor of self-assessment. Moussaoui (2012) stated that peer assessment contributes to the development of critical thinking skills, while Ping (2013) considers microteaching as a powerful tool in the development of teaching methodologies. Bilen, (2015) examined the effect of microteaching technique on pre-service teachers' beliefs about mathematics teaching and their views on classroom teaching. In the study, it was concluded that the pre-service teachers liked the microteaching practices in which they learned about their teaching skills. There are studies in which both concepts are examined together. For example, computer teaching (Kavas & Özdener 2012; Wu & Kao, 2008), English language teaching (Büyükkarcı, 2014; Kurtuldu & Özkan, 2018), biology teacher training (Dewi & Sumarjan 2021), and life science teaching (Zayimoğlu Öztürk et al., 2020). It is seen that studies on peer assessment and microteaching on pre-service mathematics teachers are limited.

Microteaching and peer assessment methods are widely used in teacher education programs to help pre-service teachers develop their teaching skills and self-assessment abilities. These methods have been reported to have positive effects on teaching methodologies and learning outcomes. The potential benefits of integrating microteaching and peer assessment methods in the field of mathematics education have received increasing attention in recent years. Thus, the purpose of this study is to evaluate pre-service teachers' perceptions of microteaching and peer assessment methods, and to provide insights into their practical applications in the field of mathematics education. To achieve this aim, the study aims to answer research questions that investigate pre-service teachers' views towards microteaching and peer assessment methods in mathematics education:

1. What are the views of pre-service mathematics teachers on microteaching method?
2. What are the views of pre-service mathematics teachers on peer assessment?

Methods

The study was qualitative in design to determine the effects of microteaching practices and peer assessment on students and to examine the views of pre-service teachers who experienced these two methods. The research was designed in accordance with the phenomenological pattern, one type of qualitative research design. Phenomenology focuses on phenomena that we are aware of but does not have an in-depth or detailed understanding of (Büyüköztürk et al., 2016). Therefore, when the objectives and sub-objectives of the research are evaluated, it is

clear that the phenomenology design is suitable for the study. The main data collection process in phenomenological studies is through interviews (Yıldırım & Şimşek, 2016). Rubin (1983) divided the interview types into four. In the study, the "open-ended questionnaire interview," which is similar to a structured interview, was preferred. In the open-ended questionnaire interview, a set of questions is directed to the interviewees and the respondents subjectively answer the questions in the way they want (Rubin, 1983, as cited in Yıldırım & Şimşek, 2016).

Data Collection Instruments

In the study, "Interview Form for Microteaching" and "Interview Form for Peer Assessment" were used as data collection tools. While developing the questions, the literature and conceptual framework were used. These forms developed by the researchers consist of seven questions each. Pre-service teachers were encouraged to provide detailed responses during the interviews. In this context, no time limit was made while collecting the data. In addition, forms were implemented by the absentee author who did not attend their classes to ensure the voluntary participation of the participants. The opinions of three expert academics in the field of mathematics education were taken during the development of the forms. The data were analyzed using content analysis technique. The examples of the interview questions included:

- Explain the expressions that come to your mind about peer assessment.
- What kind of cognitive skills did the peer assessment practice you carried out during the teaching practice process give you?
- What kind of gains did the microteaching technique you used provide in terms of your professional development during the teaching practice process?

Participants

The sample consisted of eight pre-service teachers studying in the 4th grade (aged from 22 to 24) of the Department of Elementary Mathematics Teaching at a university in Turkey. Six of these pre-service teachers are female and two are male. Convenient sampling method was preferred in the study because it provides easy accessibility to the students at the university where two of the researchers work. Convenient sampling is expressed as a sampling type preferred to gain from conditions such as time, money, and energy (Büyüköztürk et al., 2016).

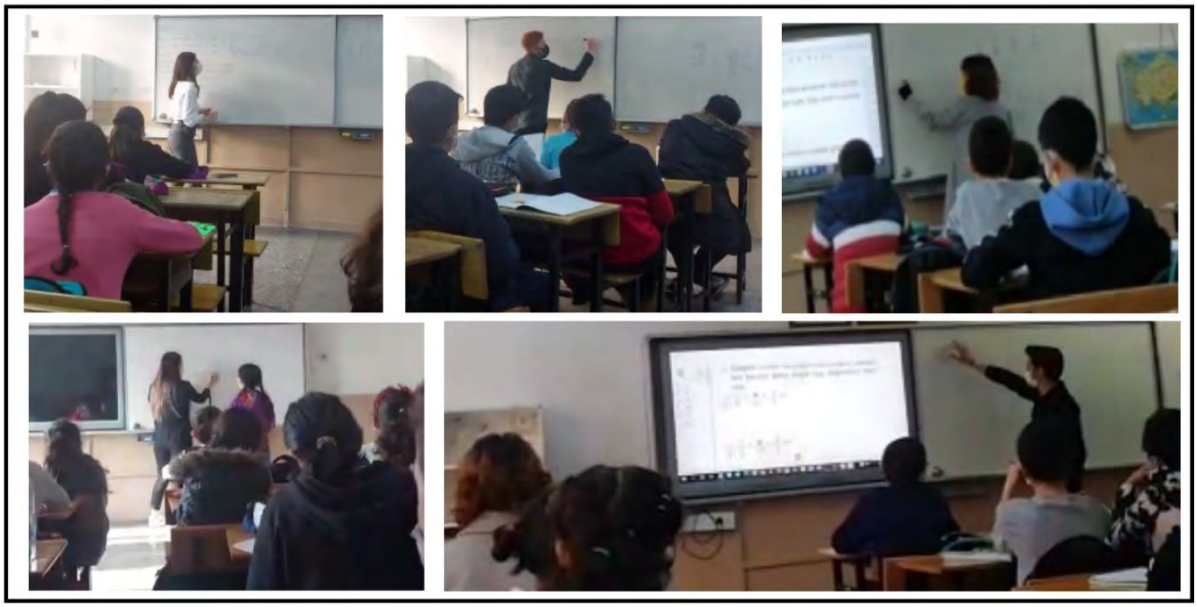
Implementation Process

The implementation process of the study lasted 14 weeks, and in the first 2 weeks, the conceptual content for microteaching and peer assessment was presented to the pre-service teachers. In the next stage, the pre-service teachers came together for 2 hours each week to work on the development of microteaching and peer assessment practices. The pre-service teachers taught 2 hours each week in the schools where they practised. In this process, video lesson recordings were taken twice for each pre-service teacher within the framework of

microteaching technique. The video recording visuals of some pre-service teachers regarding the practices are given in Figure 1.

Figure 1

Video Recording Visuals Related to Microteaching



The pre-service teachers evaluated each other through a peer evaluation form, online group discussions, and post-implementation meetings simultaneously with the microteaching practices. At this point, peer evaluation was carried out under the control of researchers to prevent possible problems. At the end of the practices, the pre-service teachers completed the implementation process by filling in the forms given to them.

Data Analysis

The data was evaluated within the context of the content analysis technique. The data obtained in the content analysis technique must first be conceptualized, reorganized according to the emerging concepts and themes explaining the data must be created (Yıldırım & Şimşek, 2016). Content analysis, which is a technique that allows working indirectly on determining individual behaviour and nature, is expressed as a systematic, repeatable technique in which some words of a text are summarized with smaller content categories by coding based on certain rules. Content analysis is conducted to determine the presence of certain words or concepts in a text or a set of texts (Büyüköztürk et al., 2016). In this direction, in the evaluation of the research data, the interviews were coded, and a code list was first created with themes and categories being created according to these codes. In addition, in order to determine the reliability of the qualitative data of the study, Miles and Huberman's (1994) formula; Percentage of Agreement

P=Agreement/[Agreement + Disagreement] was used. The data were independently evaluated by three academics, and as a result of this evaluation, it was determined that there was 0.88 level of agreement between the coders. The eight students in the study were named as T1 to T8.

Qualitative Validity

In qualitative studies, the concepts of credibility for internal validity, transferability for external validity, consistency for internal reliability, and confirmability for external reliability are used (Yıldırım & Şimşek, 2016). In this context, the measures taken regarding qualitative validity are as follows:

Credibility

In the interviews with the students, no time limit was imposed to ensure that the participants gave more sincere answers. The obtained results were compared, interpreted, and conceptualized. In addition, at the end of the data collection, the collected data was summarized and the participants were asked for their opinion on the accuracy of the summarized data. This way, the participants had the opportunity to add to their views. The researcher's comments were not included in the analysis of the data, the findings were supported with direct quotations, and the data was evaluated with experts throughout the process.

Transferability

The reader needs to make sense of the research results. To ensure this, the data is adequately described. In addition, the data were arranged according to the emerging concepts and themes and were transferred without adding comments.

Verifiability

Raw data was obtained from interviews with participants. In addition, interview transcripts were kept by the researchers, and expert opinions were also considered during the data analysis phase.

Consistency

Independent coding was created in the research, and the reliability of the codes was tested with inter-rater consistency calculations.

Results

Findings related to Microteaching Method

The findings regarding the opinions of pre-service mathematics teachers about the microteaching method they used in their teaching practice are given in Table 1.

Table 1

Findings Related to Microteaching Method

Theme	Category	Code	n
Definition/components	Performance	Presentation/recording	3
		Evaluation	2
	Duration	Short/condensed	3
Appropriateness/applicability	Feedback	Awareness	4
		Professional contribution	2
	Duration	Short/condensed	2
Benefit	Experience	Behaviours	4
		Performance	2
	Self-evaluation	Self-criticism	2
Cognitive gains	Metacognitive skills	Meta cognition/thought	3
		Logic/reasoning	2
	Attention	Focusing	3
Affective gains	Stress/anxiety	Behaviour control	3
		Excitement/tension	3
	Interest	Attitudes	2
Psychomotor acquisitions	Behaviour and movements	Use of the board	3
		Behaviours	3
	Gestures and mimics	Emphasis	2
Professional development	Experience	Classroom management	3
		Behaviours	2
	Self-evaluation	Self-criticism	3

To determine the general knowledge level of pre-service teachers about microteaching, the question "Explain the expressions that come to your mind about microteaching technique" was asked; "performance" (n=5) and "duration" (n=3) categories were obtained for the "definition/components" theme. In the "performance" category, the codes "presentation/recording" (n=3) and "evaluation" (n=2) came to the fore, while in the "duration" category, the code "short/condensed" (n=3) was obtained. Teacher opinions on this subject are as follows:

> "*It is minimized teaching in terms of student and time. It is recorded. There is peer assessment*" (T1).
>
> *"A lecture is given on a certain subject and a presentation is made. The presentation is recorded with recording devices. After the presentation is over, the recording is watched, discussed, and evaluated"* (T2).
>
> *"The prospective teacher is videotaped while lecturing and evaluated together with the person responsible for the prospective teacher at school and his/her peers"* (T3).
>
> *"Videotaping the performance of the performance through a camera. This performance is then watched and evaluated again"* (T4).
>
> *"It is true that microteaching has some advantages. For example, it is very advantageous to watch it again for both self-assessment and peer assessment. The expressions that come to my mind are video recording, reduced time and number of people, and an intensified environment"* (T5).
>
> *"It is an educational technique scaled down in terms of the number of students enrolled and duration"* (T6).
>
> *"Microteaching does not reflect exactly what we have done and what we will do since it is taken by taking a small recording from the lesson"* (T7).
>
> *"It is a short and condensed teaching technique"* (T8).

To determine the appropriateness of microteaching, the participants were asked the question "Do you think that the microteaching technique you used is appropriate in the teaching practice process? Explain." The categories of "feedback" (n=6) and "duration" (n=2) were obtained for the theme of "appropriateness/applicability". In the "feedback" category, the codes "awareness" (n=4) and "professional contribution" (n=2) came to the fore, while in the "duration" category, the code "short/intensive" (n=2) was obtained. Teacher opinions on this subject are as follows:

> *"I think microteaching is very suitable for the teaching practice process. The teaching practice we conducted with the school was very limited in terms of time. For this reason, microteaching was efficient in teaching practice"* (T1).
>
> *"I think that microteaching technique is appropriate in the teaching practice process because it provides pre-service teachers with production experience and feedback"* (T2).

"I think it is appropriate. We were able to see our mistakes" (T3).

"I think it is appropriate because the prospective teacher is lucky to see and evaluate his/her deficiencies after the practice" (T4).

"Microteaching is suitable for self-assessment and peer assessment. It is also suitable in terms of teaching technique" (T5).

"Yes, I think it is suitable. Because the lesson is recorded in microteaching, the student can watch it again and repeat the subject easily. Therefore, learning will be easier. I think that microteaching will be convenient" (T6).

"It is suitable in terms of minimized and short training and recording. However, its applicability to today may not be appropriate" (T7).

"Yes, I think it is appropriate. Short trainings contributed to my professional identity" (T8).

To determine the benefits of microteaching, pre-service teachers were asked the question "Do you think that the microteaching technique you used was useful in the teaching practice process? Explain"; "experience" (n=6) and "self-evaluation" (n=2) categories were obtained for the "benefit" theme. In the "experience" category, the codes "behaviours" (n=4) and "performance" (n=2) came to the fore, while in the "self-evaluation" category, the code "self-criticism" (n=2) was obtained. Teacher opinions on this subject are as follows:

"I think it was useful. It was very useful for us to try it. It was an experience before starting teaching life" (T1).

"If recording devices are used, I think it is useful because it provides the prospective teacher with the opportunity for self-evaluation and learning by doing" (T2).

"I find it useful in terms of seeing the aspects we need to improve. As a result, we have the opportunity to watch ourselves again" (T3).

"I think it is useful because it develops reflective behaviours. It allows us to watch the performance again and again" (T4).

"I think it is useful" (T5).

"Yes, I think so. Since micro-education is recorded, students can watch it again. This will provide easy access to information. Since the duration is shortened, students will listen to the lesson more carefully. Since the number of students is small, the teacher will be able to communicate with the students more easily" (T6).

"Since it is recorded and can be watched again, it is beneficial for teachers and students to improve themselves. It can be especially useful for teachers who are new to the profession to watch themselves again and correct their deficiencies" (T7).

"I think it is useful, it can be advantageous when the technique is applied well. Students

can also watch and self-criticize and evaluate themselves. With this situation, the student can change himself positively" (T8).

To determine the cognitive skills gained by microteaching, the participants were asked the question "What kind of cognitive skills did the microteaching practice you realized during the teaching practice process gain you? Explain." The categories of "metacognitive skills" (n=5) and "attention" (n=3) were obtained for the "cognitive gains" theme. In the "metacognitive skills" category, the codes "meta cognition/thought" (n=3) and "logic/reasoning" (n=2) came to the fore, while in the "attention" category, the code "focusing" (n=3) was obtained. Teacher opinions on this subject are as follows:

"During microteaching, I used my auditory perception skill very actively in order to follow the students and make them more active in the lesson. Both lecturing and doing this at the same time added to my divided attention skill" (T1).

"Focusing on the subject and the class, deciding in which order to solve the questions, reasoning and logical reasoning skills in mental questions" (T2).

"It provided skills such as planning, observation and self-correction" (T3).

"It made me realize and gained meta-cognition skills" (T4).

"Since I was aware that I was being recorded during the microteaching practice, maybe I was a bit stiff and maybe I was not completely comfortable. Although this gave me some discomfort cognitively, I did not have much difficulty mentally" (T5).

"I did not behave naturally because the lesson was videotaped, and I think that I did not fully reflect a subject that you know to the students" (T6).

"Since I had some time anxiety during the microteaching, I did not have the opportunity to convey everything that was going through my mind" (T7).

"I tried to go in accordance with the order of the lesson (first model, then exercise and question). I tried to say the information I wanted to give clearly and clearly" (T8).

To determine the affective skills gained by microteaching, pre-service teachers were asked the question "What kind of affective skills did the microteaching practice you realized during the teaching practice process gain you? Explain." The categories of "stress/anxiety" (n=6) and "interest" (n=2) were obtained for the "affective gains" theme. While the codes "behaviour control" (n=3) and "excitement/tension" (n=3) came to the fore in the "stress/anxiety" category, the code "attitudes" (n=2) was obtained in the "interest" category. Teacher opinions on this subject are as follows:

"Microteaching reminded me of my interest in this profession. It improved my attitude towards teaching profession. It also increased my willingness" (T1).

"It helped me to control the excitement and stress of teaching in the classroom for the

first time and to increase my interest, desire and motivation towards the teaching profession" (T2).

"I gained skills such as organizing myself because I watched the board by myself" (T3).

"It allowed us to manage stress and anxiety in the classroom" (T4).

"Since I have a relaxed and sincere personality, I felt 100% relaxed because I could reflect my emotions or affective skills" (T5).

"I felt a little nervous because I was being videotaped and recorded while I was lecturing. I think I could not show more natural behaviour" (T6).

"Emotions may not be fully reflected on the screen because of the video shooting. However, this shooting also had an excitement, it was a different experience" (T7).

"I took care not to lose my attention in order not to lose control of the class. I gave feedback on the subject to increase the students' interest in the lesson" (T8).

To determine the psychomotor skills gained by microteaching, the participants were asked the question "What kind of skills did the microteaching practice you realized during the teaching practice process give you in terms of psychomotor skills? Explain." Regarding the theme of "psychomotor acquisitions," the categories of "behaviour and movements" (n=6) and "gestures and mimics" (n=2) were obtained. While the codes "use of the board" (n=3) and "behaviours" (n=3) came to the forefront in the "gestures and mimics" category, the code "emphasis" (n=2) was obtained in the "gestures and mimics" category. Teacher opinions on this subject are as follows:

"Before the peer assessment, I checked the gestures I used or made in the classroom first in the classroom and then outside the classroom. It helped me to take care to make physical movements without distracting the students" (T1).

"Preventing students from talking while lecturing helped me to use my voice more emphatically to draw attention or to indicate important points" (T2).

"It contributed in terms of how I should be from the blackboard, my hand movements, the size of my writing" (T3).

"It made us aware of our perceptions, behaviours and attitudes" (T4).

"I was not aware of it before watching and evaluating the video recording. But when I watched it, I realized that I was not very good in terms of posture, posture and movement. From now on, I want to use such skills more accurately and effectively" (T5).

"When I watched the video again, I realized that I was moving too fast and I could not understand where to put my hand" (T6).

"My behaviour and movements seemed a bit exciting when you watched it later. I prefer to stay calmer in my next experiences" (T7).

> *"I decided that I should use my gestures and mimics more effectively. It can increase both interest and attention"* (T8).

To determine the contribution of microteaching to professional development, pre-service teachers were asked the question "What kind of gains did the microteaching practice you realized during the teaching practice process provide you in terms of your professional development? Explain"; "experience" (n=5) and "self-evaluation" (n=3) categories were obtained for the "professional development" theme. While the codes "classroom management" (n=3) and "behaviours" (n=2) came to the fore in the "experience" category, the code "self-criticism" (n=3) was obtained in the "self-evaluation" category. Teacher opinions on this subject are as follows:

> *"I tried microteaching as a result of the teaching practice. Being able to interact with students, even if a little bit, and being able to teach a lesson was very useful for me professionally. I gained an experience"* (T1).

> *"Trying and gaining experience in the teaching profession helped me to self-evaluate by getting feedback and to increase my knowledge and desire for the profession"* (T2).

> *"Since I monitored myself and had an idea about what I did and did not do, it helped me to evaluate myself objectively in terms of profession and to be better"* (T3).

> *"By using technology, it allowed us to watch our practice again and complete our deficiencies"* (T4).

> *"I had no previous experience and I was worried about being able to do the teaching profession, but after watching the recording, I started to think that I was actually adequate and very good in classroom management and pedagogical field. I remind myself that I need to be even better in terms of field knowledge, but in general, I received positive feedback from myself"* (T5).

> *"In terms of my professional development, it helped me to use my voice more effectively and conveniently, to be more upright in the classroom, and to gain skills by explaining more narrowly"* (T6).

> *"It caused me to act more carefully because I knew that we were giving a lecture and that it would be recorded and monitored by our teacher. It caused me to enter my future professional life with more solid foundations"* (T7).

> *"I made criticisms by evaluating myself and I will make improvements about myself by realizing my shortcomings"* (T8).

Findings Related to Peer Evaluation

Secondly, the findings regarding the opinions of pre-service mathematics teachers about the peer assessment they used in teaching practice are presented in Table 2.

Table 2

Findings Related to Peer Assessment

Theme	Category	Code	n
Definition/components	Peer assessment	Task	2
		Observations	2
		Behaviours	2
	Self-assessment	Perspective	2
Appropriateness/applicability	Appropriateness/applicability	Behaviours	3
		Perspective/observations	3
	Not appropriate	Classroom environment/learning process	2
Benefit	Individual	Elimination of errors	4
		Awareness	2
	Peer	Professional contribution	2
Cognitive gains	Critical perspective	Comparison	3
		Level of knowledge	2
	Attention	Focusing	3
Affective gains	Emotions	Empathy	3
		Perspective/observations	2
	Communication	Affective relationship	3
Psychomotor acquisitions	Classroom management	Use of the board	2
		Behaviours	2
	Behaviour and movements	Hand-arm coordination	2
		Eye contact	2
Professional development	Experience	Perspective/observations	4
		Personal development	2
	Self-evaluation	Self-criticism	2

To determine their general knowledge about peer assessment, pre-service teachers were asked the question "Explain the expressions that come to your mind about peer assessment." The categories of "peer assessment" (n=6) and "self-assessment" (n=2) were obtained for the "definition and components" theme. In the category of "peer assessment," "task" (n=2), "observations" (n=2), and "behaviours" (n=2), while the code "perspective" (n=2) was obtained in the "self-evaluation" category. Teacher opinions on this subject are as follows:

> *"It is the evaluation of each other's work by students studying at the same level"* (T1).
>
> *"It is the process of evaluating each other within the framework of certain criteria"* (T2).
>
> *"It is the evaluation of two students at the same grade level with each other from their own point of view"* (T3).
>
> *"Evaluating each other's opinions about the teaching practice performance. As a result of the experiences gained in the same class and in the same teaching environment, peers criticize each other positively and negatively"* (T4).
>
> *"When it comes to peer evaluation, the concepts of tutor and peer come to my mind. Tutor, I think, was the action that was at a higher level and older than the person. A peer is someone of the same age and at the same level"* (T5).
>
> *"Evaluating the concepts such as cognitive, affective, psychomotor domain knowledge and classroom management of the peer lecturing"* (T6).
>
> *"I think it is a useful activity because we will actually evaluate ourselves while doing peer evaluation"* (T7).
>
> *"Determining the deficiencies or good aspects of a peer according to the observations of a peer towards his/her peer or himself/herself"* (T8).

To determine the suitability of peer assessment for teaching practice, the participants were asked the question "Do you think that the peer assessment you have used is suitable for teaching practice? Explain." The categories of "appropriate/applicable" (n=6) and "not appropriate" (n=2) were obtained for the theme of "appropriateness/applicability." In the "appropriate/applicable" category, the codes "behaviours" (n=3) and "perspective/observations" (n=3) came to the fore, while in the "not appropriate" category, the code "classroom environment/learning process" (n=2) was obtained. Teacher opinions on this subject are as follows:

> *"It is quite appropriate for my friends in the same class to evaluate me. It was very correct that they saw me, watched me and commented on what I witnessed"* (T1).
>
> *"I think that peer assessment is appropriate because it enables the pre-service teacher to realize his/her positive or negative characteristics by receiving feedback from other pre-*

service teachers and to provide an opportunity for self-regulation. However, sometimes it may not be appropriate for the learning process" (T2).

"I think it is appropriate because I can observe the actions and behaviours of my peers in the classroom and their good practices or deficiencies" (T3).

"I think it is appropriate because I think that the evaluation of peers rather than the teacher who is responsible for the observation made in the teaching practice can give more objective and more realistic results" (T4).

"Yes, I think it is appropriate for the experience" (T5).

"Yes, I think it would be more reliable and valid if the evaluation is not only done by the teacher but also by the peer" (T6).

"When evaluating our peers, it is suitable for us because it gives us the opportunity to explain their deficiencies to them and to provide feedback about their competencies. However, it may not be appropriate because I may have deficiencies in terms of classroom environment and students" (T7).

"I think it is appropriate when it is done impartially" (T8).

To determine the benefits of peer assessment for teaching practice, pre-service teachers were asked the question "Do you think that the peer assessment you have used is useful for teaching practice? Explain"; "individual" (n=6) and "peer" (n=2) categories were obtained for the "benefit/benefit" theme. In the "individual" category, the codes "elimination of errors" (n=4) and "awareness" (n=2) came to the fore, while in the "peer" category, the code "professional contribution" (n=2) was obtained. Teacher opinions on this subject are as follows:

"My friends with whom I studied during the teaching practice process had the opportunity to observe the whole process. I think it was very useful for them to see my shortcomings and mistakes and evaluate them in terms of guiding me" (T1).

"I think it is useful because it provides a perspective on determining the skills and criteria that form the basis of evaluation and helps the prospective teacher to get feedback from people other than teachers" (T2).

"I think it is very useful. I think it is very useful for individuals with similar mindsets to empathize and evaluate each other" (T3).

"I think it is useful because I find it necessary to evaluate the semester-long practice. In this way, it gives the prospective teacher the opportunity to see the shortcomings, right and wrong" (T4).

"I definitely think that it is important that the peer evaluators make an objective, objective and impartial evaluation. At the same time, the person being evaluated should be open to

criticism and meet the evaluation with maturity. But above all, it enables people to realize the things that they cannot realize themselves through the external environment" (T5).

"Yes, I do. It benefits me and my peers in terms of professional experience" (T6).

"I think it is useful both for myself and for my peers" (T7).

"I think it is useful. In situations that we do not realize in ourselves or that could be better, the peer assessment suggestion can help to close the gap in that subject" (T8).

To determine the cognitive gains of peer assessment, the participants were asked the question "What kind of cognitive skills did the peer assessment practice you realized during the teaching practice process give you? Explain." The categories of "critical perspective" (n=5) and "attention" (n=3) were obtained for the "cognitive gains" theme. In the "critical perspective" category, the codes "comparison" (n=3) and "level of knowledge" (n=2) came to the fore, while in the "attention" category, the code "focusing" (n=3) was obtained. Teacher opinions on this subject are as follows:

"It improved my attention skills because I try to be very careful while doing peer assessment. At the same time, examining everything in detail was useful for focusing skills" (T1).

"Peer assessment helped other pre-service teachers in the group gain critical thinking skills while evaluating" (T2).

"I can say that it improved my attention and focusing skills" (T3).

"It improves attention and reasoning skills. Because it empathizes at the point of managing stress and anxiety during the application and evaluates accordingly" (T4).

"Cognitively, I may have made a comparison between the action and teaching of my peers and my own education and teaching" (T5).

"Researching concepts such as field knowledge and classroom management on our peers helped us to have a better command of this information" (T6).

"When I was evaluating my peer, I constantly evaluated myself or other peers by making comparisons in my mind. I had certain limits. Although these boundaries are not definite, I think I now know more or less the framework within which a teacher should be" (T7).

"While my peer was lecturing, I empathized and thought "how can I teach?" This situation prompted me to look for solutions by finding my shortcomings. It caused me to identify the good and bad sides of my peer and to contribute to him/her" (T8).

To determine the affective gains of peer assessment, pre-service teachers were asked the question "What kind of skills did the peer assessment practice you realized during the teaching

practice process give you in terms of affective skills? Explain." The categories of "emotions" (n=5) and "communication" (n=3) were obtained for the theme of "affective gains". In the "emotions" category, the codes "empathy" (n=3) and "perspective/observations" (n=2) came to the fore, while in the "communication" category, the code "affective relationships" (n=3) was obtained. Teacher opinions on this subject are as follows:

> *"Interacting with my friends during the assessment contributed to my communication skills. I applied responsibility skills during peer assessment"* (T1).
>
> *"It increased the relationship and communication with pre-service teachers"* (T2).
>
> *"Thanks to mutual communication, I reviewed my behaviours such as interest, attitude, demeanor towards students"* (T3).
>
> *"It gives the ability to empathize. Because it empathizes at the point of managing stress and anxiety during the application and evaluates accordingly"* (T4).
>
> *"I listened to my peer's lesson well and tried to observe as much as I could"* (T5).
>
> *"I evaluated the emotions that our peer used effectively from my point of view how we can go to that emotion"* (T6).
>
> *"Since I thought that my peers did not feel comfortable, I tried to focus on them a lot. I evaluated them by putting myself in their shoes. In fact, I think that we evaluate ourselves while doing peer assessment"* (T7).
>
> *"While my peer was lecturing, it enabled us to identify his/her incorrect utterances"* (T8).

To determine the psychomotor gains of peer assessment, the participants were asked the question "What kind of skills did the peer assessment practice you realized during the teaching practice process give you in terms of psychomotor skills? Explain." The categories of "classroom management" (n=4) and "behaviour and movements" (n=4) were obtained for the "psychomotor gains" theme. In the "classroom management" category, the codes "use of blackboard" (n=2) and "behaviours" (n=2) came to the forefront, while in the "manners and gestures" category, the codes "hand-arm coordination" (n=2) and "eye contact" (n=2) were obtained. Teacher opinions on this subject are as follows:

> *"Thanks to the evaluation, I was told the comments made about hand-arm coordination during the teaching process. I will pay attention to control with these comments"* (T1).
>
> *"Since the eye contact of the prospective teachers in the classroom and their moving between the desks in the classroom to ensure classroom dominance revealed positive results, observing them helped them gain these skills"* (T2).
>
> *"I understood that I should pay attention to simple but effective psychomotor behaviours such as how to get off the board and how to use the pencil"* (T3).

"It contributed to teacher-student communication. It allowed us to see classroom attitudes and behaviours from a general framework. It enabled us to use the board and time effectively" (T4).

"I examined my peer's classroom management and behaviour. There were parts that I was impressed" (T5).

"I evaluated how I could or could not apply our peer's behaviour, gestures and eye contact in the classroom" (T6).

"The fact that I was influenced by my peer's lecturing attitude, behaviour and gestures and applied them to myself helped me overcome my own shortcomings" (T7).

"I paid attention to my screen's use of the board and interactive board while lecturing" (T8).

To determine the gains of peer assessment for professional development, pre-service teachers were asked the question "What kind of gains did the peer assessment practice you realized during the teaching practice process provide you in terms of your professional development? Explain." The categories of "experience" (n=6) and "self-evaluation" (n=2) were obtained for the theme of "professional development." In the "experience" category, the codes "perspective/observations" (n=4) and "personal development" (n=2) came to the fore, while in the "self-evaluation" category, the code "self-criticism" (n=2) was obtained. Teacher opinions on this subject are as follows:

"Teaching practice contributed a lot to me in terms of professional development. The most important part of this contribution was evaluation. Because we saw what was right and what was wrong more thanks to these evaluations. It enabled us to correct our mistakes and add something to ourselves" (T1).

"It was beneficial for my professional development because it enabled me to make self-evaluation by getting feedback from other pre-service teachers" (T2).

"It enabled us to watch each other and see our deficiencies and good points and to correct the deficiencies and make our good points better" (T3).

"Professionally, the positive or negative criticisms in classroom management, time management and our communication with students encouraged us to improve ourselves more" (T4).

"The more teacher styles I see, the more efficient and effective my self-evaluation will be" (T5).

"While my peer was lecturing, I put myself in his/her place and tried to feel how he/she used his/her cognitive, affective and psychomotor skills and thus I gained the appropriate actions I can take in the classroom" (T6).

"It helped me to see my own shortcomings. It reminded us that we should enter professional life more experienced. It made us aware of which subjects we should be more careful" (T7).

"I thought about what individual differences change in teaching. I decided which situations can be better and should be used for success" (T8).

Discussion

This study demonstrates that pre-service mathematics teachers have general knowledge about microteaching. They were able to make necessary explanations about the definition and components of microteaching and emphasized performance, short-intensive time, presentation, recording and evaluation. The participants found microteaching suitable for teaching practice in terms of feedback, short-intensive time, awareness, and professional contribution. In addition, the candidates found microteaching useful for teaching practice in terms of experience, behaviours, performance, self-evaluation, and self-criticism. The reason for these results can be considered as the reflections of the microteaching method on the candidates themselves. As a matter of fact, it has been stated that microteaching improves self-reflection on pre-service teachers and encourages professional development (Park, 2021). In addition, pre-service teachers may have expressed their opinions by considering the benefits of microteaching for both professional and content knowledge. This result is consistent with Murtafiah and Lukitasari's (2019) finding that microteaching technique positively improves pre-service mathematics teachers' learning practices, content, and pedagogical knowledge. Microteaching enables teachers to learn the required roles and behaviours of the profession in the preparation period and makes teachers ready for the profession (Çoban, 2015).

The pre-service teachers stated that microteaching had some cognitive contributions stating that they gained metacognitive skills, developed metacognitive thinking skills and that microteaching contributed positively to logical reasoning skills, and improved attention and focusing skills. Pre-service teachers stated that with microteaching they were able to better cope with stress and anxiety, control their behaviour, overcome feelings of excitement and tension, and improve their interest and attitude towards the learning process. The pre-service teachers stated that their psychomotor behaviours such as board use, classroom behaviours, gestures, mimics, and emphasis improved thanks to microteaching. The results obtained can be considered as evidence of the skills that microteaching provides to pre-service teachers. Indeed, microteaching helps teachers to better understand the teaching and learning process (Reddy, 2019). Elias (2018) stated that microteaching method gives pre-service teachers the chance to evaluate their strengths and weaknesses in terms of teaching. In addition, it was determined that pre-service teachers were able to develop skills in planning, questioning, evaluation,

management of student misbehaviour, application of instructional materials, and develop positive attitudes towards the profession during the teaching process with microteaching.

In the study, pre-service teachers' general knowledge about peer assessment was presented and it was seen that pre-service teachers had sufficient knowledge about the definition and components of peer assessment. While evaluating peer assessment and self-assessment situations in general, pre-service teachers considered the task and work conditions. The pre-service teachers found peer assessment in teaching practice to be appropriate. At this point, pre-service teachers emphasized that peer assessment contributed to the development of behaviours and perspective and contributed to personal development in terms of observation. In addition, pre-service teachers found peer assessment useful for teaching practices in general. The pre-service teachers evaluated the benefits of peer assessment in two groups in terms of individual and peer. The pre-service teachers think that peer assessment contributes to them in terms of eliminating mistakes, raising awareness, and levels of professionalism. However, there are also pre-service teachers who do not consider it appropriate in terms of classroom environment and learning environment. The reasons for these results may be the role of the self-assessment component, which is closely related to peer assessment and directly affects the process. Indeed, self-assessment and peer assessment are seen as effective assessment approaches for student learning. Moreover, while these assessment methods are associated with several advantages, they are also associated with a number of challenges (Boud et al., 2015; Carnell 2016). Indeed, despite the potential of peers to support students' self-assessment development, students' concerns about peer assessment activities may prevent their participation in peer feedback (To & Panadero, 2019).

The pre-service teachers stated that peer assessment provided them with some cognitive gains. The pre-service teachers stated that they gained a critical perspective, gained comparison skills, increased their level of knowledge, and improved their attention and focusing skills. As a matter of fact, there are studies in the literature emphasizing the importance of cognitive feedback in peer education (Hattie & Timperley, 2007). Again, pre-service teachers stated that peer assessment provided them with some affective gains. At this point, it has been determined that their emotions, perspectives, and empathy skills have developed through observations, and their affective relationships have progressed along with their communication. They also stated that it improved their psychomotor gains positively. The pre-service teachers stated that they made progress in psychomotor classroom management, controlling their behaviour and movements, hand-eye coordination, and eye contact in using the board. In addition, pre-service teachers stated that peer assessment contributed to their professional development. At this point, pre-service teachers stated that they gained experience and improved their perspectives through observations on self-evaluation and personal development. The reasons for these results can be seen as the qualified feedback that students received during the peer assessment

process. Indeed, the importance of receiving and providing quality feedback is at the center of peer assessment (Boud & Molloy 2013; Nicol et al., 2014). Disclosing feedback in peer assessment increases peer assessors' awareness of the main task issues and their own strengths and weaknesses, thus encouraging reflection-inaction. Peer feedback therefore provides inputs for assessors to reflect on their initial judgments and rethink their application of the criteria (To & Panadero, 2019). However, another reason for the results may be the development of reflective thinking skills, which are closely related to cognitive, affective, and psychomotor skills. For students to benefit from peer learning, it is extremely important that they are equipped with reflective thinking skills to improve themselves (Taylor et al., 2015; To & Panadero, 2019).

Limitations and Future Directions

This study was conducted with eight pre-service mathematics teachers during a 14-week teaching period. The small number of students can be seen as a limitation. For this reason, it was aimed to avoid this limitation by conducting the study in qualitative type. In addition, for the process to proceed efficiently, two 2-hour lessons were held with pre-service mathematics teachers for 14 weeks in order to evaluate their teaching practices. According to the results obtained within the scope of the study, the following suggestions can be made to researchers who want to work in this field in the future:

1. Within the scope of the study, some information about the concepts of microteaching and peer assessment were presented to fourth grade pre-service mathematics teachers and their opinions about these concepts were taken at the end of the practices. In this framework, these two concepts can be emphasized in the first three grades of undergraduate mathematics curricula to increase the awareness of pre-service teachers on this issue.
2. This study shows that microteaching and peer assessment practices improved pre-service mathematics teachers in cognitive, affective, and psychomotor aspects. New scientific studies and projects including experimental processes can be carried out to test this development.
3. Within the scope of the research, pre-service mathematics teachers, in which microteaching and peer assessment practices were carried out, stated that they developed professionally. Similar studies can be conducted with current mathematics teachers through in-service programs or train-the-trainer projects.

Conclusions

This study evaluated prospective mathematics teachers' ratings of microteaching practices and peer assessment methods. Participants found that microteaching and peer assessment were beneficial to classroom practice in terms of feedback, professional contribution, self-

assessment, and self-criticism. In addition, prospective teachers indicated that these practices had some cognitive and affective benefits for them. According to the results of the study, it is important to include these two concepts in undergraduate mathematics education programs to increase prospective teachers' awareness of this issue.

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