

THE EFFECT OF MICROTEACHING ON THE TEACHING SKILLS OF PRE- SERVICE SCIENCE TEACHERS

Selda Bakır

Introduction

The training of the skilled teachers is a matter that concerns every country in the world. If so, what are the skills a teacher needs? Teacher skills can be divided into two groups; personal and professional. Personal characteristics include interest in the profession and being a model person (Kavcar, 2002). In general, professional skills include planning, identifying and using the right methods and techniques, effective communication, keeping the students' attention and being aware of their needs, class management, time management, grading and evaluation (MEB, 2008; Demirel, 2010). The most important factor that distinguishes professional skills from personal characteristics is that the professional skills can be taught (Demirel, 2010).

It has been emphasized, that the sessions under the supervision of professionals provide a feedback about performance that is effective in changing the classroom behavior of pre-service teachers (Rose & Church, 1998). One method that is used to help pre-service teachers to gain teaching skills is called microteaching. Microteaching is an important method, because it provides an opportunity to practice teaching skills in an artificial environment (Benton-Kupper, 2001; Erdem, Erdoğan, Özyalçın Özkay & Yılmaz, 2012), it has the least risk of failure (Erdem et al., 2012), it helps students gain professional experience before employment and it enables them to apply theoretical knowledge (Görgeçen, 2003; Erdem et al., 2012; Gürses, Bayrak, Yalçın, Açıkyıldız & Doğan, 2005; Mergler & Tangen, 2010). Microteaching enables pre-service teachers to gain self-confidence, by reducing the fear of making mistakes to a minimum in the exercises that are performed. It focuses on the teachers' behavior, enabling pre-service teachers to plan and implement new teaching strategies and reflect on their actions (Erdem et al., 2012; Bell, 2007). Farnis



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Abstract. *This study was carried out on 97 participants using a mixed research design, in order to determine the effect of microteaching on the teaching skills of pre-service science teachers and to ascertain the opinions of pre-service teachers about the positive and negative effects of microteaching. Analysis of the data revealed that microteaching has a significant effect on teaching skills, and this effect can be seen under the areas of carrying out an introduction lesson, classroom management, time management and planning, effective communication and concluding the lesson, as well as issues which can be described as being related to self-confidence. In the qualitative section of the study, analysis of the data obtained from written responses and individual interviews with pre-service teachers about the positive and the negative effects of microteaching support the quantitative findings.*

Key words: *microteaching, pre-service science teachers, teaching skills.*

Selda Bakır
Mehmet Akif Ersoy University, Turkey



(1991) who calls this method 'micro-peer teaching' says that it enables students to see themselves in the role of a teacher, both literally and figuratively. When pre-service teachers observe their peers, they think carefully about how they will prepare their own microteaching lessons (Mergler & Tangen, 2010).

Microteaching was first developed at Stanford University in 1960, as a part of an experimental program conducted to train high quality teachers (Demirel, 2010; Chen, Zeng & Yang, 2010). Microteaching is used in the field of health and medicine (Roush, 2008) and in a variety of sectors in pre-service and in-service programs (Demirel, 2010; Görgen, 2003; Higgins & Nicholl, 2003; Allen & Belzer, 1997). It was used for the first time in Turkey during 1990-1991 in a two-hour class at the Technical Training Faculties as part of the YÖK/World Bank Second Industrial Training Project (Uşun & Zorlubaş, 2007).

Microteaching consists of a training cycle that incorporates fewer students, takes less time and consists of the following stages: plan, teach, critique, re-plan, re-teach and re-critique (Peker, 2009). In the literature, the length has been given as 5-10 minutes (Huber & Word, 1969), 10-15 minutes (Klinzing & Floda, 1991; Kpanja, 2001; Görgen, 2003) and 5-20 minutes (Demirel, 2010), while the number of students has been given as 1-5 students (Demirel, 2010), 3-6 students (Huber & Word, 1969), 10-16 students (Klinzing & Floden, 1991) and 20-30 students (Kpanja, 2001). The pre-service teacher is given a specified amount of time by the professor to exhibit his or her professional skills by presenting a topic to his or her peers, who plays the role of students of a specified age group. In addition, an audio or video recording of the session is made. After the first exercise, the recording is viewed and critiqued by the pre-service teacher, the observers and the professor. The pre-service teacher then plans the lesson once more based on the critiques that were made and gives a second presentation, which is also recorded. The second exercise is also observed and critiqued. This process continues until the desired level of skill is obtained (Benton-Kupper, 2001; Erdem et al., 2012; Cruickshank & Metcalf, 1993; Allen & Belzer, 1997).

Reasons to Use Microteaching

Why to use microteaching? First of all, the teaching practicum class that is integrated into the program, so that they can practice the theory they have learned, which is not as productive as desired, both because of the teachers in the schools and because of the large curriculum. On top of all this, the professor can also be very busy, which makes the situation even more difficult. Microteaching is one of the most effective solutions to minimize all of these problems (Çakır, 2000). National and international researches indicate that microteaching is effective in developing positive attitudes toward the profession of teaching and in helping students in gaining certain fundamental skills (Uşun & Zorlubaş, 2007). Secondly, microteaching assists the teacher training process by providing an experimental environment, where the pre-service teachers can gain teaching skills, because it is difficult to provide a natural setting for doing this experiment (Çakır & Aksan, 1992). Therefore, microteaching not only enables students to put theory into practice, it also increases their self-confidence by giving them awareness about the values, attitudes and assumptions of learning (I'anson, Rodriques & Wilson, 2003) and about their academic identities (Kuran, 2009).

The aims of this study were to determine the effect of microteaching, which is discussed in the literature as an accepted and beneficial method for teacher training (Chen, Zeng & Yang, 2010), on the teaching skills of pre-service science teachers, and to ascertain the opinions of pre-service teachers about the positive and negative effects of microteaching. The research questions are:

1. Does microteaching has a significant effect on the teaching skills of pre-service science teachers?
2. Which teaching skills does microteaching affect?
3. What are the views of pre-service science teachers about the positive effects that microteaching has on them?
4. What are the views of pre-service science teachers about the negative effects that microteaching has on them?

Methodology of Research

This study used a triangulation pattern of mixed research designs. The mixed research design is defined as a study which combines qualitative and quantitative research methods (Yıldırım & Şimşek, 2013; Johnson, Onwuegbuzie & Turner, 2007). Triangulation can be evaluated under the topics of data source, method, theory and researcher triangulation (Johnson, Onwuegbuzie & Turner, 2007; Yıldırım & Şimşek, 2013; Patton, 1987; Patton, 2002). This research uses triangulation of quantitative data, written responses and individual interviews. The quantitative section of the



study consists of a single-group pre-test/post-test experimental design, while the qualitative section consists of a case study used to collect detailed information about the exercise process. The intent is to not only verify the results with the data collected, by using different methods, but also to make up for deficiencies in the numerically-based quantitative research with complementary qualitative research that would provide more detailed data. The implication process of this study was put into practice during ten weeks in 2012-2013 academic year, while the whole process of research took nearly two years.

Participants

The accessibility sampling method was used in this study, which was performed over 10 weeks with 97 pre-service teachers (59 women and 38 men) who were taking the class entitled "Special Education Methods-II", in the fourth year of the Science Education department of the Education Faculty of Mehmet Akif Ersoy University.

Data Collection

Qualitative data were collected through a questionnaire developed by the researcher, which is effective in quick collection and analyzing of data taken from a large sample (Yıldırım & Şimşek, 2005), and interviews. The work of Kuran (2009), Benton-Kupper (2001), Peker (2009) and Erdem et al. (2012) was used to prepare the questionnaire. A draft form developed by the researcher was tested with five pre-service teachers who had taken the Special Education Methods-II class, one year prior. Expressions that were not clear were corrected and a second pilot test was carried out. For example, in first pilot test, it was asked what the positive effects of microteaching were. In relation to this question, participants remarked general effects of microteaching. But, I meant that what the positive effects of microteaching on him/her. After the final changes, the final version was prepared. The same two questions were used in the questionnaire and interviews. To collect quantitative data, the study used a Likert scale questionnaire developed by Görgeç (2003) entitled "Survey of Pre-service Teachers' Opinions and Thoughts about Teaching a Lesson". Before starting the microteaching exercises, the "Survey of Pre-service Teachers' Opinions and Thoughts about Teaching a Lesson", which took nearly 30 minutes of participants, was conducted on all pre-service teachers as a pre-test. Immediately after giving the pre-test, the participants were informed about microteaching, that included motivating students, selecting methods and techniques, procuring materials before starting the lesson, asking questions, setting up the teaching environment, tone of voice, gestures, communication in the classroom, eye contact, responding to the needs of students, fluent speech, using education technology, classroom management, summarizing and evaluating by the researcher. Then the students were shown a video of a microteaching exercise. The pre-service teachers were allowed to choose their own lesson topic and were given 10 minutes to exhibit their teaching skills by presenting their lesson to a group of their peers. A panel of five referees was formed in each class. The job of the referees on this panel was to observe the teaching skills of the pre-service teacher who was teaching a lesson to the other pre-service teachers in the classroom, who were playing the role of middle school students. A video of each pre-service teacher's presentation was recorded and observed after the first presentation. Afterward, the pre-service teacher critiqued himself or herself, and then he or she was critiqued by the panel, the other pre-service teachers in the classroom, and finally by the professor. The pre-service teacher was asked to take all of the critiques into account and present the same lesson to the same group the next week, and the same procedure was followed for the second presentation. If the critiques made after the second presentation revealed that the pre-service teacher's performance was insufficient, the procedure was repeated until he or she attained the desired level of proficiency. At the end of ten weeks of microteaching exercises, the questionnaire form that had been administered as a pre-test was given to the pre-service teachers again as a post-test. After that, the questionnaire developed by the researcher was given to 97 pre-service teachers. Finally, individual interviews were carried out with the six pre-service teachers who took part in the exercise. Initially, information about the study was given to the participants and it was asked whether he/she wanted to participate in the study or not. With six participants who were volunteers, two questions were examined through the semi-structured interviews. These questions were as follows:

1. What do you think about the positive effects of microteaching on you?
2. What do you think about the negative effects of microteaching on you?

Sometimes probe questions were used. For example, after the first question it was asked what the teaching skills were, which teaching skills he/she had before microteaching and after microteaching etc. Interviews were taken up from 30 minutes to 45 minutes depending on the participants.



Trustworthiness of the Data

Weakness minimization validity was used for the trustworthiness of this study, which implemented a mixed research design. This type of trustworthiness is said to make up for the weakness of one research approach with the strengths of other approaches (Johnson & Christensen, 2012). Separate precautions were taken for validity and reliability in the quantitative and qualitative sections of the study. Additional precautions taken for the validity and reliability of the qualitative data were: 1) the researcher clearly defined his/her position in the research process, 2) the participants who were the source of data in the study were clearly defined, 3) the methods for collecting and analyzing data were described in detail, 4) the data were presented directly with a descriptive approach without any interpretation, 5) long-term interaction, and 6) confirmation from the participants (LeCompte & Goetz, 1982; Yıldırım & Şimşek, 2005; Johnson & Christensen, 2012; Merriam, 1998). A Croanboach Alfa coefficient was reported as 0.94 for the "Survey of Pre-service Teachers' Opinions and Thoughts about Teaching a Lesson" that was used to collect quantitative data in the study.

Data Analysis

Paired Samples-T-test was used to analyze the quantitative data of this study. Paired Samples-T-test is used for related samples to compare a number of measurements of the same variable within a single group (Pallant, 2001; Gravetter & Wallnau, 2004). A descriptive approach and content analysis were performed for qualitative data. Direct quotes were given in the data analysis stage, in order to accurately reflect the views of the individuals (Yıldırım & Şimşek, 2005) as well as to validate the research. To protect the identity of the participants, code names such as PST-1, PST-2, PST-A, PST-B (pre-service science teacher-1, pre-service science teacher-A, etc.) were used when making direct quotes. Frequency analysis was made with data obtained from questionnaire consisting of two questions. Before launching into data analysis, the researcher had to become familiar with the entire data set to determine the draft categories (such as environment, time etc.) by reviewing all. First, sub-categories (such as limited time, not to regulate time etc.) were assigned to these draft categories. Second, some similar sub-categories were joined together as one category. For example, not to regulate time and limited time categories were joined into the same category. Finally, some draft categories which were determined firstly were reorganized. For instance, category of time was organized as category of limited time. The frequencies specified in the tables (Table 3 and Table 5) of analyzed qualitative data, gathered from written responses to questionnaire indicated the frequency at which each situation was repeated. Because one person was able to state more than one opinion, the frequencies in the table may have been greater than the total number of participants. Thus, the percentages calculated in the tables in the findings section have been calculated, based on the percentage of the total frequencies, and not the number of participants in the study. For the analysis of the data obtained from individual interviews, all the responses of six pre-service teachers were listed in a table with codes and categories. The codes used for each of the pre-service teachers were not placed in the table based on any specific arrangement, but according to the order in which they were stated. The reason for this choice was to show on the table, the first codes that came to the pre-service teacher's mind when microteaching was mentioned.

Results of Research

Table 1 shows the results of the Paired Samples T-test, which was performed to identify the effect of microteaching on the skills of the pre-service science teachers to teach lessons.

Table 1. Paired Samples T-test analysis results for the pre-test and post-test total scores of the "Survey of Pre-service Teachers' Opinions and Thoughts about Teaching a Lesson".

	N	\bar{x}	SD	T	df	p	η^2
Pre-test-post-test	97	-10,422	27,685	-3,708	96	,000*	0,125

* $p < 0.05$



According to Table 1, there is a significant difference between the scores for the pre-test and post-test results ($\bar{X}=102,784$, $SD=19,469$) and the post-test results ($\bar{X}=113,206$, $SD=19,206$; $t(96)=-3,708$, $p=,000$, $\eta^2=0,125$) for the "Survey of Pre-service Teachers' Opinions and Thoughts about Teaching a Lesson". The exercise had a moderate size impact ($\eta^2=0,125 > 0,06$). This shows that microteaching does have a significant effect on the ability of pre-service science teachers to teach lessons.

In order to determine which of the pre-service science teachers' teaching skills were affected by microteaching, Paired Samples T-test was conducted for each item in the questionnaire (Table 2).

Table 2. Paired Samples T-test results of pre-test and post test scores of each item in "Survey of Pre-service Teachers' Opinions and Thoughts about Teaching a Lesson".

Item Number	Items	N	\bar{X}		SD		df	T	Sig (2-tailed)
			Pre-test	Post-test	Pre-test	Post-test			
1	I don't know how to begin the lesson.	97	3,31	3,79	1,211	1,145	96	-2,735	0,007*
2	I am very worried about not knowing the answer to students' questions.	97	2,71	3,10	1,199	1,212	96	-2,239	0,027*
3	I am worried that I will get confused while using the lesson materials.	97	3,61	3,84	1,105	0,909	96	-1,600	0,113
4	I am worried that I will run out of things to say in the middle of the lesson.	97	3,20	3,64	1,133	0,926	96	-2,925	0,004*
5	I am very nervous about teaching a lesson in front of students.	97	2,29	3,02	1,240	1,199	96	-2,397	0,018*
6	I am worried about making a mistake while teaching a lesson.	97	2,74	3,02	1,073	1,190	96	-1,750	0,083
7	I am worried about not knowing how to correct the mistakes I make while teaching a lesson.	97	2,99	3,39	1,141	1,036	96	-2,562	0,012*
8	I am worried because the lesson will be critiqued.	97	3,36	3,60	1,043	1,027	96	-1,559	0,122
9	I am worried about not knowing what to do when students ask questions that are off the topic.	97	3,13	3,45	1,169	1,118	96	-2,003	0,048*
10	I am worried about not speaking fluently during the lesson.	97	3,19	3,67	1,083	0,997	96	-3,029	0,003*
11	I am worried about what to do about a student who constantly causes problems during the lesson.	97	3,20	3,56	1,160	1,060	96	-2,255	0,026*
12	I am worried about not staying in control of the classroom.	97	3,24	3,70	1,058	1,082	96	-2,842	0,005*
13	The idea of teaching lessons is enjoyable to me.	97	2,00	2,16	1,109	1,304	96	-1,056	0,294
14	I do not feel that I am ready for the role of a teacher.	97	3,60	3,72	1,007	1,188	96	-0,865	0,389
15	I am worried that I will not be able to control my tone of voice or the speed at which I talk.	97	3,29	3,67	1,154	0,965	96	-2,597	0,011*
16	I am worried about getting confused while teaching a lesson.	97	3,08	3,60	1,007	1,057	96	-3,551	0,001*
17	I am worried about teaching a lesson in front of students.	97	3,41	3,85	1,068	0,950	96	-2,941	0,004*
18	I am worried about not being able to form proper sentences.	97	3,34	3,71	1,108	1,050	96	-2,899	0,005*
19	The closer it gets to the lesson time, the more I think that there is a lot I need to learn.	97	2,23	2,35	1,159	1,225	96	-0,793	0,430
20	I wish there wasn't any Teaching Practice.	97	4,42	4,36	1,069	1,091	96	0,453	0,652
21	I am worried about starting a group discussion during the lesson because I am afraid I will not be able to maintain control of the lesson and the classroom.	97	3,65	3,73	0,890	0,984	96	-0,711	0,479
22	I am concerned that I will not be able to get down to the students' level.	97	3,45	3,75	1,099	1,000	96	-2,137	0,035*
23	I am worried about not knowing how I will focus the students' attention on the topic and keep them interested.	97	3,35	3,85	1,021	1,034	96	-3,293	0,001*
24	I am worried about forgetting what I was going to say while teaching a lesson.	97	3,00	3,47	1,118	1,081	96	-3,301	0,001*



Item Number	Items	N	\bar{X}		SD		df	T	Sig (2-tailed)
			Pre-test	Post-test	Pre-test	Post-test			
25	When it comes to exercises, I don't know what kind of method to use as an example.	97	3,31	3,91	0,993	0,818	96	-4,309	,000*
26	I don't know what or how to affirm students who make the right kind of contribution to the lesson.	97	3,40	3,93	1,007	0,992	96	-3,759	,000*
27	I am worried about not being able to communicate well with the students.	97	3,65	4,09	1,155	0,902	96	-2,995	0,003*
28	I am hesitant to ask others for help.	97	3,82	3,93	1,258	0,960	96	-0,638	0,525
29	I am worried about not being able to be patient while teaching a lesson.	97	3,49	3,80	1,259	1,077	96	-1,956	0,053
30	I am worried about not being able to control my emotions while teaching a lesson.	97	3,47	3,65	1,182	1,128	96	-1,214	0,228
31	I don't know how I will finish the lesson.	97	3,71	4,05	1,127	0,858	96	-2,409	0,018*

* $p < 0.05$

Table 2 shows that there is a significant difference between the pre-test and post-test scores on items 1 and 23 about the lesson introduction, items 2, 5, 7, 16, 17 and 24 are about the concern of not being able to teach the lesson or answer the questions, items 15, 18, 22, 26 and 27 are about communication skills, such as tone of voice and fluency, items 4, 10 and 25 are about time and planning, items 11 and 12 are about classroom management, and item 31 is about concluding the lesson.

To answer the third research question, pre-service science teachers' opinions about the positive effects that the microteaching exercise had on them were asked with written questionnaire and individual interviews.

Table 3 presents the findings of the descriptive analysis of the pre-service science teachers' opinions obtained from written questionnaire about the positive effects that the microteaching exercise had on them.

Table 3. Results of the descriptive analysis of the pre-service science teachers' opinions obtained from written questionnaire about the positive effects of the microteaching exercise.

Categories	F	%
It increased my self-confidence	59	18.21
It gave me experience	45	13.89
I saw my weak points	43	13.27
I learned how to teach a lesson effectively	43	13.27
It improved my classroom management skills	30	9.26
I learned how to do a lesson introduction	25	7.72
I learned how to communicate effectively	20	6.17
It helped me improve myself	17	5.25
I learned to like teaching	16	4.94
I learned how to conclude the lesson	14	4.32
I learned the skills of planning and time management	12	3.70

Table 3 points out the views of the pre-service science teachers about the microteaching exercise that had a positive effect on self-confidence (18.21%), experience (13.89%), seeing weak points (13.27%), teaching a lesson effectively (13.27%), classroom management (9.26%), doing a lesson introduction (7.72%), effective communication (6.17%), self-improvement (5.25%), learning to enjoy teaching (4.94%), concluding a lesson (4.32%) and planning and time management (3.70%).

The other method of collecting data in this study was individual interviews. Table 4 shows the content analysis



of the views of pre-service teachers about the positive effects that the microteaching exercise had on them.

Table 4. Results of individual interviews with pre-service science teachers about the positive effects that the microteaching exercise had on them.

PST-A	PST-B	PST-C	PST-D	PST-E	PSTF
Gaining experience	Gaining experience	Gaining experience	Self-confidence	Seeing deficiencies	Self-confidence
Lesson introduction	Lesson introduction	Lesson introduction	-being relaxed	-critiques	-overcoming nervousness
-effective introduction	-attracting attention	-effective introduction	Gaining experience	Self-improvement	Effective communication
Concluding the lesson	Concluding the lesson	-attracting attention	-preparing for the lesson	-correcting deficiencies	-gestures and facial expressions
-asking questions	-doing a summary	-establishing connections with the previous lesson	Classroom management	Effective communication	-eye contact
Teaching the lesson effectively	Teaching the lesson effectively	Teaching the lesson effectively	-using space effectively	-tone of voice	-tone of voice
Classroom management	-class participation	-students' questions	Teaching the lesson effectively	-body language	Concluding the lesson
Seeing deficiencies	-getting down to the students' level	Classroom management	-getting down to the students' level	-manner of addressing the children	-providing feedback
Self-improvement	Effective communication	Classroom management	-asking questions	Planning	-doing a summary
-correcting deficiencies	-speaking	Seeing deficiencies	-making students take notes	-preparing for the lesson	Self-improvement
	-gestures and facial expressions	-critiques		-setting goals	-general culture
	Classroom management			Lesson introduction	-correcting deficiencies
	Seeing deficiencies			-establishing connections with the previous lesson	-critiques
				-knowing the students' interests and needs	Teaching the lesson effectively
					-students' questions
					-active learning techniques
					-student participation
					Classroom management
					Seeing deficiencies
					Lesson introduction
					-effective introduction

As it is apparent from Table 4, analysis of the views obtained from individual interviews with six pre-service teachers about the positive effects that the microteaching exercise had on them, identified the following codes: lesson introduction (5 people), concluding the lesson (3 people), teaching the lesson effectively (5 people), classroom management (5 people), seeing deficiencies (5 people), self-improvement (3 people), gaining experience (4 people), self-confidence (2 people), planning (2 people) and effective communication (3 people). Following are direct quotes of the opinions of some of the pre-service teachers about the positive effects that the microteaching exercise had on them:

PST2: "We have taught lessons before in many classes. Even though we have taught these topics before, we always felt worried when we talked about teaching a lesson to students in a school. I can say that I am more confident in this area because of microteaching. I got nervous while teaching for the first time. If we have not had a microteaching lesson, I would have experienced that when I went to a school, I would not have been able to see myself while, teaching and the errors I made would have stayed that way. In other words, I think I gained a lot of my teaching skills through microteaching."

PST4: "Microteaching has had a positive impact on me. I learned how to control my nervousness, albeit not completely. I figured out how to give a lesson introduction. I understood that it is very important to do an evaluation and summary. When I become a teacher, I will do an effective introduction to the lesson and I will definitely do the evaluation and summary section."



PST13: "It helped me gain my first experience. Ever since I started university, we have been teaching lessons in class and making presentations, but this was different, because my classmates who listened to me took the perspective of the level of a primary school student when they asked questions. This is really an advantage for us, because we are going to encounter a lot of students in our professional career. I really enjoyed doing the microteaching exercise. I had the opportunity to see myself and observe my mistakes. I learned how to maintain control of the classroom."

To answer the fourth research question, pre-service teachers' opinions about the positive effects that the microteaching exercise had on them were asked with written questionnaire and individual interviews. Table 5 shows the findings of the descriptive analysis of the pre-service teachers' opinions, which were obtained from written questionnaire, about the negative effects that the microteaching exercise had on them.

Table 5. The pre-service science teachers' opinions, which were obtained from written questionnaire, about the negative effects of the microteaching exercise.

Categories	F	%
There was no negative effect	53	47.32
The student roles were exaggerated	14	12.5
Artificial environment	9	8.03
Limited time	7	6.25
Having the video recorded	6	5.36
Excessive stress during the first exercise	6	5.36
Teaching the same topic a second time was boring	6	5.36
Tension caused by the critiques of peers	5	4.64
It took time and hard work to prepare	3	2.68
It was sometimes boring to watch the videos.	3	2.68

Table 5 exhibits that the views of the pre-service science teachers about the negative effects that the microteaching exercise had on them were that it had no negative effect (47.32%), the student roles were exaggerated (12.5%), the environment was artificial (8.03%), there was limited time (6.25%), having the video recorded (5.36%), excessive stress during the first exercise (5.36%), it was boring to teach the same topic twice (5.36%), the tension caused by critique from their peers (4.64%), it took time and hard work to prepare (2.68%) and it was sometimes boring to watch the videos (2.68%).

Table 6 shows the content analysis of the pre-service science teachers' opinions which were obtained from interviews, about the negative effects that the microteaching exercises had on them.

Table 6. Pre-service teachers' opinions, which were obtained from interviews, about the negative effects that the microteaching exercise had on them.

PST-A	PST-B	PST-C	PST-D	PST-E	PST-F
It did not have any negative effect on me.	It did not have any negative effect on me.	Negative issues caused by the exercise -video recording	It did not have any negative effect on me.	Negative issues caused by the exercise -artificial environment	It did not have any negative effect on me.
Negative issues caused by the exercise -limited time -artificial environment	Negative issues caused by the audience -biased critiques -exaggerated student behavior	Negative issues caused by the audience -negative critiques	Negative issues caused by the audience -biased critiques	Negative issues caused by the audience -exaggerated student behavior	Negative issues caused by the exercise -limited time -video recording
Negative issues caused by the audience -exaggerated student behavior					



As it is seen in Table 6, a review of the opinions of pre-service science teachers about the negative effects that microteaching had on them. The research reveals that four of the six pre-service teachers actually said that the microteaching exercise did not have any negative effect on them. However, after stating these opinions, various issues regarding the negative effects of microteaching were identified. These can be divided into the two groups of negative issues caused by the exercise, which were: limited time (2 people), artificial environment (2 people) and the video recording (2 people), and negative issues caused by the audience, which were: exaggerated student behavior (3 people), biased critiques (2 people) and negative critiques (1 person).

Following are direct quotes of the opinions of some of the pre-service science teachers about the negative effects that the microteaching exercise had on them.

PST16: "I didn't gain much negative things from it. The only thing I thought was negative was the artificial class environment; it was not very natural. I think that is why the classmates who were listening exaggerated their roles."

PST17: "This was the only class that did not have any negative effect."

PST6: "There was a fear of not being able to finish in time. That was the only negative effect."

PST2: "It did not have any negative effect on me. However, at first I did not want to do this kind of exercise because it was a lot of work. I thought it would be a waste of time. It made me dread of it because I don't like teaching lessons in this way. But later I saw that I was able to overcome all of the things that I thought were difficulties."

Discussion

In this section the findings of the first three research questions were interrelated to themselves, they were discussed together while the findings of the fourth question were discussed alone.

Findings Regarding the First Three Research Questions

In this study, the first three research questions were asked to investigate the effect of microteaching on the teaching skills of pre-service science teachers, to determine which teaching skills were affected by microteaching, and to ascertain the opinions of pre-service science teachers about the positive effects of microteaching.

Analysis of the data to answer the first research question of this study led to the conclusion that microteaching has a significant effect on the teaching skills of pre-service teachers. And analysis made to answer the second research question that was carried out to determine which pre-service teacher skills were significantly improved by microteaching, revealed that significant improvement was achieved in the areas of giving a lesson introduction, classroom management, time management and planning, effective communication and ending the lesson, as well as issues such as nervousness, anxiety and fear, which can be described as being related to self-confidence.

Analysis of the data obtained from the written responses in the qualitative section of the study revealed the following positive effects on the students: they gained self-confidence and experience, they learned how to teach a class effectively, communicate effectively, do a lesson introduction, conclude the lesson and do classroom management, planning and time management. They improved themselves, learned to like teaching and saw their deficiencies. Individual interviews conducted with six pre-service teachers revealed that microteaching had positive effects in the following areas: lesson introduction, concluding the lesson, teaching a lesson effectively, classroom management, seeing one's own deficiencies, self-improvement, gaining experience, self-confidence, planning and effective communication. Based on this, the qualitative findings of the study support the quantitative findings. In short, it can be said that the microteaching exercise had a positive effect on the teaching skills of pre-service teachers.

Many researchers have previously reported that a number of teaching skills can be taught with microteaching, that includes: giving a lesson introduction, motivating students, classroom management, asking questions, taking into account the needs of the students, tone of voice, gestures and facial expressions, speaking correctly and fluently, choosing and implementing proper teaching methods and techniques, summarizing and doing evaluations (Akalın, 2005; Fernandez, 2010; Taşdelen Kaçkay & Sanlı, 2009; Benton-Kupper, 2001; Golightly, 2010; Görden, 2003; Anshu & Pratibha, 2009; Cotrell & Doty, 1971; Gürses et al., 2005; Uzun, Keleş & Sağlam, 2013; Peker, 2009; Ceyhun



& Karagölge, 2002; Güney & Semerci, 2009; Kalyoncu & Sazak, 2006; Erdem, et al., 2012; Sevim, 2013; Aydın, 2013; Donnelly & Fitzmaurice, 2011; Kuran, 2009; Mergler & Tangen, 2010; Fernandez & Robinson, 2006; Şahinkaya, 2009; Umuzdaş, 2010; Kuzu, 1996). For example, Kuzu (1996) found that pre-service teachers who went through a microteaching exercise had less difficulty in the areas of preparing or planning for a lesson, doing a lesson introduction, using their tone of voice effectively, speaking Turkish correctly, using gestures and facial expressions, presenting a topic and concluding the lesson, than did those who did not do microteaching.

Benton-Kupper (2001) reported that after doing a microteaching exercise, pre-service teachers had the perspective that integrating microteaching into the teacher training program was very beneficial. Most students found that peer evaluations were beneficial. They were able to learn about different teaching strategies by observing the way their peers taught, and they found the video recordings to be helpful for feedback and reflection. During the microteaching exercise, the students were able to notice strong and weak points about their own teaching skills. Most of the students said that they appreciated microteaching when it came to making plans and teaching the lesson. The students had quite a positive attitude toward microteaching because it increased their self-confidence. Microteaching laboratory exercises provided them with a supportive and safe environment where they could try out ideas and strategies and receive constructive feedback.

Görge (2003) found that by the end of the microteaching exercise, problems had disappeared in the areas of worrying about making mistakes while teaching a lesson, correcting mistakes made during a lesson, worrying about being fluent, using the right tone of voice and rate of speech, worries felt about teaching a lesson to students, keeping the students' attention and interest, subjects that require exercises, the inability to control feelings and concluding the lesson.

In a study by Peker (2009), the authors reported that before the expanded microteaching exercise, pre-service teachers had concerns about not being able to answer the students' questions, communicate, teach or manage the classroom, but after the exercise, they said that most of these fears had gone away and that microteaching had made positive contributions to their teaching performance.

In a study done in Ireland, Donnelly and Fitzmaurice (2011) concluded that even though it caused increased nervousness at the beginning, microteaching actually increased self-awareness and made the participants more self-confident about their own skills and expertise. Microteaching also enabled participants to understand the teacher's role, to be more interactive during the exercises and to reflect on their performance.

In another case, pre-service teachers reported that they gained even more skills and knowledge of the teaching profession during the second microteaching exercise and that microteaching made a significant contribution to their love of the teaching profession. When they were interviewed, the pre-service teachers who participated in this study reported the following positive responses: microteaching enabled them to apply theoretical knowledge, gave them experiences that prepared them for their profession, increased their self-confidence, enabled them to see their strong and weak points, and was an enjoyable and interesting exercise. This feedback shows that microteaching is effective in giving pre-service teachers a positive attitude toward the teaching profession (Kuran, 2009). In a study on microteaching done by Fernandez and Robinson (2006), most pre-service teachers reported that this method is worth the time spent and that it was a beneficial learning experience, and that the most notable benefits of this exercise are practical application of theory, cooperation and reflection.

Findings Regarding the Fourth Question

Another problem that was investigated in the qualitative section of the study was to identify the negative effects that microteaching has on pre-service teachers. A review of the written responses of pre-service teachers about this issue reveals that nearly half of the participants were of the view that microteaching does not have a negative effect. Although the number of negative issues were small, the following issues were raised: student roles were exaggerated, it was an artificial environment, there was limited time, having a video recorded of the session, excessive stress during the first lesson presentation, the fact that it was boring to teach the same topic for the second time, tension caused by peer critiques, it took time and effort to prepare, and it was boring to watch the videos. In the individual interviews carried out with six teachers, it was apparent that the results of the analysis of the pre-service teachers' responses to the same question were very similar to the results obtained from the written response forms. The analysis revealed that although four of the six pre-service teachers said that microteaching did not have a negative effect, the pre-service teachers mentioned two groups of negative issues: limited time,



an artificial environment and the video recording, which were aspects of the exercise, and exaggerated student behavior, biased critiques and negative critiques, which were aspects of the audience.

Studies in the literature (Erdem et al., 2012; Cotrell & Doty, 1971; Kuran, 2009; Çakır, 2010; Peker, 2009; Şahinkaya, 2009) also support these findings. For example, Erdem et al. (2012) reported that with regard to the video recording, critiques and the artificial environment of the microteaching exercise, most of the pre-service teachers said that the video recording and critiques were beneficial, while others said that the video recording and critiques caused them to become nervous and that the microteaching exercise would be more beneficial if it were conducted at the schools where they did their internships.

Cotrell and Doty (1971) performed seven minute exercises with four groups (teaching a lesson to peers with video feedback, to peers without video feedback, to high school students with video feedback and to high school students without video feedback) and found that there was no statistically significant difference between these four groups. But with regard to attitude, they found that the group which taught a lesson to high school students with video feedback (in other words, who worked in a real environment, not an artificial one) had more positive attitudes than the pre-service teachers in the other groups.

In another microteaching exercise, the pre-service teachers reported that in the expanded microteaching exercises, the pre-service teacher sometimes became nervous in front of a camera and that this may have negatively affected their true performance, and that if the audience is not informed and trained about this subject matter, it may not be possible for deficiencies to be overcome (Peker, 2009). At the end of the study done by Şahinkaya (2009), pre-service teachers stated that although they found the microteaching exercise to be a valuable experience, it would be more beneficial if the audience was made up of real students instead of their peers.

Conclusions and Practical Implications

This study used a mixed research design to determine the effect of a microteaching exercise on the teaching skills of pre-service science teachers and to ascertain the opinions of pre-service teachers about the positive and negative effects of microteaching. According to the analysis of quantitative data obtained in the experimental section of the study, it determined that microteaching has a significantly positive effect on the pre-service teachers' skills, in the areas of the lesson introduction, classroom management, time management and planning, effective communication, self-confidence and concluding the lesson. In the qualitative section of the study, written responses were obtained and individual interviews were conducted to ascertain the pre-service teachers' views about microteaching. According to findings obtained with both methods, pre-service teachers reported that microteaching had a positive effect in the areas of increasing self-confidence, gaining experience, teaching a lesson effectively, communicating effectively, how to conclude a lesson, classroom management, planning and time management. Based on this feedback, microteaching exercises should be implemented on a broader scale, since it is so effective in helping pre-service teachers gain teaching skills. Microteaching could be conducted not only in the fourth year of university but in previous years as well.

With regard to the negative effects caused by microteaching, although it is evident that most of the pre-service teachers did not think that there were any negative effects, some of the negative issues that were pointed out are worth discussing. One negative issue that was raised, albeit by very few people, was time. The concept of time is very important for microteaching, because microteaching is an exercise that has a reduced scale with regard to both the number of students and time. In other words, limited time is part and parcel of the microteaching exercise itself. This is because the goal is to have exercises that are reduced in size so that all students will have a chance to take part in it. Another negative issue that was raised was the artificial environment. Microteaching is a method that makes it easier to train teachers in situations where a real classroom environment cannot be offered. In other words, the artificial environment is also part and parcel of the microteaching exercise. However, in addition to the microteaching exercises done in the university, there should be more exercises done in the practicum experience and teaching application lessons, where more time is allotted and a real environment is provided. With regard to the negative issues that were raised concerning student roles and critiques, the professor could warn the participants not to exaggerate the student roles and not to be harsh when critiquing their peers. Finally, to eliminate the problem of a biased audience, the pre-service teachers could be asked to conduct the microteaching exercise with a different class instead of their own.



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Selda Bakır

PhD, Assistant Professor, Department of Elementary Education, Faculty of Education, Istiklal Campus, Mehmet Akif Ersoy University, 15030, Burdur, Turkey.

Fax: +90 248 234 60 09.

Mobile: +90 506 676 42 92.

E-mail: sbakir@mehmetakif.edu.tr seldacu@hotmail.comWebsite: <http://abs.mehmetakif.edu.tr/sbakir>