Improving Pre-Service Mathematics Teachers' Skills about Preparation for the Instruction: The Case of Online Microteaching

Vildan Katmer

Maltepe University, Turkey

Abstract

In this research, which was conducted using the case study design, it was aimed to improve pre-service mathematics teachers' skills about preparation for the instruction with the online microteaching technique. The first three events of Gagne's (1985) nine events of instruction (gaining attention, informing learner of lesson objective, stimulating recall of prior learning) were used as preparation events for the instruction. The participants of the research consist of 11 senior pre-service mathematics teachers. In the research, two online microteaching video recordings of each participant, open-ended peer review forms about microteachings, and a semi-structured interview form were used as data collection tools. First of all, Gagne's first three events were introduced practically online by the researcher. Afterwards, each participant carried out online microteaching on a different mathematics subject using Gagne's first three events, lasting between 5-10 minutes, in line with the achievements determined from the secondary school mathematics curriculum. Each microteaching was reviewed by other participants and the researcher, both during the online microteaching and later from the recordings, and was delivered to the participant with the help of a peer review form. Two weeks later, each participant performed the second microteaching in line with the criticisms received in the peer review forms and during the first online microteaching. Following the completion of the two microteaching process, individual semi-structured interviews were conducted with each participant by the researcher to take their opinion about this process. As a result of the research, it was seen that there were deficiencies in some of the preparation events of the introduction in the first micro teachings, and some events were not observed at all. In the second microteachings, it was observed that the deficiencies in the first microteachings were eliminated. In addition, in individual interviews with the participants, all of the participants stated that applying this process positively affected their acquisition of skills about preparation of the instruction.

Keywords: *Pre-service mathematics teacher, online microteaching, Gagne's events of instruction*

1. Introduction

Teachers are one of the most important components of the education and training process. Since the quality of education is largely directly proportional to the quality of teachers, it is important that teachers who will take part in the education system are well trained both before and during their service in terms of the quality of education. For all these reasons, many practices are used in teacher training to improve the quality of teachers. One of the techniques used to improve the quality of teachers in teacher training is microteaching. Microteaching is a teaching technique first developed by W. Allen and his colleagues at Stanford University in the USA in the 1960s as part of an experimental program to improve the quality of teacher education. Classroom environments contain many variables that are almost impossible to control in order to conduct accurate research. The fact that microteaching facilitates teaching effectiveness and provides the opportunity to manage variables by providing real experience control is one of the important factors that bring this method to the forefront [1].

On the other hand, with the development of digital technologies, online education platforms, interactive course content and live lecture options have made distance education more effective, especially in times of natural disasters such as pandemics and earthquakes. Thanks to these platforms, students can attend classes from their homes or anywhere they are safe [2]. This situation has also brought along the need for teachers to have online instructional competencies. In the development of simulated teaching games for the evaluation of teachers' instructional competencies or in applications that directly examine and evaluate teaching skills, interactive digital environments come to the fore and their use is rapidly becoming widespread. The implementation of online micro-teaching in a virtual environment with multiple learning parameters is a very easy and sustainable approach with web-

based technology. The first examples of the development of this approach are found in Asian countries such as Korea, Japan, China and Indonesia [3, 4, 5, 6, 7, 8, 9]

As in traditional microteaching, the online microteaching process aims to provide various teaching skills. This process is carried out in such a way that the pre-service teacher focuses on one skill at a time, thus enabling the pre-service teacher to reapply the skill through immediate diagnostic assessment [10]. In micro-teaching, it is important to teach only one of these skills at a time. The teaching of the identified skills should continue until that person masters them. After the pre-service teacher has mastered one skill, another skill should be targeted. Therefore, micro-teaching involves "learning one skill at a time" [11, 12].

Allen (1967) [13] defined micro-teaching as a technique to provide pre-service teachers with teaching skills and to develop these skills in environments similar to real classrooms, which are limited in terms of both time and number of students, and identified teaching skills that can be developed through micro-teaching. One of these skills is preparation for the instruction. This skill is one of the 14 critical teaching skills identified as important in the practice initiated by Stanford University in order for teachers to acquire the necessary skills [14]. Especially in mathematics, which is perceived as an abstract course by students, introductory activities are important in terms of involving students in the learning process. The aim of these activities is to draw the student's attention and interest to the lesson at the beginning of the lesson, to motivate, to make the student aware of the objectives of the lesson and to make the environment suitable for starting the lesson.

In Gagne's book "The Conditions of Learning", published in 1965 [15], Gagne identified a nine-step process called the events of instruction. These events were defined as: (1) Gain attention, (2) Inform learners of objectives (3) Stimulate recall of prior knowledge, (4) Present stimulus, (5) Provide learner guidance, (6) Elicit performance, (7) Provide feedback, (8) Assess performance, (9) Enhance retention and transfer. The first three of these events constitute the introductory activities. In first event, called "gain attention", students are presented with attention-grabbing stimuli to ensure students' readiness for learning and participation in activities. In second event, called "inform learners of objectives", the learner is informed about the objective and is informed about what the learners organize their thoughts about what they are going to learn and what they are going to do. In third event called "stimulate recall of prior knowledge", the learners' prior knowledge is organized into conceptual schemas that can facilitate the learning of new content.

From this point of view, in this study, it was aimed to improve preparation for the instruction skills of pre-service mathematics teachers by using online microteaching technique.

2. Method

In this qualitative research, which aims to improve pre-service mathematics teachers' introductory skills by using online micro-teaching technique, a case study design was used, which allows to address a current phenomenon within its environment [16].

2.1 Participants and Instruments

The participants of the study consisted of 11 pre-service mathematics teachers who volunteered to participate in the research and who were attending the last year of a university in Istanbul.
In the research, lesson plans and two online microteaching video recordings of each participant, open-ended peer review forms about microteachings, and a semi-structured interview form were used as data collection tools.
The peer review form consisted of headings about the extent to which the participant realized Gagne's first three events of instruction (good, partially, should be improved). In addition, there are spaces in the form where the participants can also comment on the positive or areas that need to be improved in these events of microteaching. The semi-structured interview form created by the researcher consists of questions about the advantages and limitations of online microteaching and the contributions of this process to them.

2.2 Procedure

Phase I

In the first phase of the research Gagne's first three events were introduced practically online on Blackboard Learn System by the researcher. Afterwards, each participant was assigned a topic from the secondary school mathematics curriculum and asked to introduce that topic using Gagne's first three events. The participants first prepared a lesson plan for their own topic and online micro-teaching sessions on Blackboard, each lasting between 5-10 minutes, were carried out with the participation of other participants as an audience and recorded. The participants re-watched each micro-teaching recording and reported their opinions to the micro-teaching participant with the help of the peer review form. In addition, the participant who conducted the microteaching also evaluated his/her own microteaching with the help of this form.

Phase II

In the second phase of the study, the participants carried out their second micro-teaching on the same topic in line with the criticisms they received in their first micro-teaching with the help of peer review forms. All the procedures in the first phase were applied in the same way in this phase.

Phase III

After the completion of the micro-teaching sessions, individual semi-structured online video interviews were conducted with each participant and their views on this process were obtained. Each interview lasted between 15-25 minutes.

2.3 Data Analysis

The data obtained from the lesson plans prepared by the participants, the micro-teaching video recordings, the peer review forms and the semi-structured individual interviews were analysed using descriptive and content analysis techniques. Participants' micro-teaching videos were analysed by the researcher and the extent to which they realized Gagne's first three events (good, partially, should be improved) was examined. Similarly, in the peer review forms, the participants were asked to rate themselves and other participants on how they realized the first three events in microteaching (good, partially, should be improved) and to explain the reasons.

2.4 Ethics

Volunteerism was taken as a basis in the whole process of this research, which was carried out with the permission of the ethics committee. All video recordings during the research process were recorded with the permission of the participants. At every stage of the development of the data collection tools and the analysis of the data, the opinions of two experts in qualitative research methodology and mathematics education were consulted.

3. Findings

3.1 Findings Related to the First Microteaching

When the findings regarding the participants' first micro-teaching were examined, no participant fully realized the first three events of Gagne. The majority of the participants "partially" realized Gagne's first event, which is "gain attention". It was observed that the events where the participants had the most deficiencies were the second and third events. Especially third event, in which the participants would associate prior knowledge with new knowledge, was performed superficially by the participants and it was seen that the participants had difficulty especially at this event. As a result of the analysis of the videos for the first micro-teaching sessions, the findings obtained by the researcher in line with the expert opinions were mostly in line with the findings obtained from the peer review forms in which the participants evaluated themselves and their peers. In other words, the event rated as "partially" by the researcher was similarly rated as "partially" by the participant herself/himself and her/his peer.

3.2 Findings Related to the Second Microteaching

When the findings regarding the second micro-teaching of the participants were analysed, the majority of the participants improved the event in the second micro-teaching that they realized partially or inadequately (should be improved) in the first micro-teaching. There was no participant who

decreased his/her performance in the second micro-teaching compared to the first micro-teaching. The event of gain attention was performed well by all participants. In the other events, all participants showed positive improvements in their second micro-teaching. Those who did not fully realize Gagne's third event in the first microteaching performed better in the second microteaching. Thus, it was determined that the third event was performed well by the majority of the participants. The researcher's views about the second micro-teachings were mostly in line with the peer review forms in which the participants evaluated themselves and their peers.

3.3 Findings Related to the Participant Views on the Process

When the views of the participants about the micro-teaching process were analysed, all of the participants stated that this process contributed positively to them. All of the participants expressed positive opinions about the process. In particular, the fact that the participants had the chance to watch their own microteaching again and the views of other participants created the opportunity to improve their next microteaching.

"In my first micro-teaching, I thought that the question I asked in the first event was appropriate for this event. However, the reviews received were that the question might create prejudice in students about the subject because it was difficult. In my second microteaching, I prepared it much more carefully and by thinking from different perspectives." (An example of participant view)

In addition, all of the participants stated that they felt more competent in introductory skills after this process.

"*In this process, I learned that it is possible to gain attention of the student not only in the classroom but also while teaching online, and how to do it. Because preparation for the instruction is very important for the student. If they are bored or uninterested at the beginning, it is difficult to recover later...*" (An example of participant view)

Regarding the limitations of online microteaching, they mentioned that there is less interaction and it is more difficult to use materials compared to face-to-face education. *"Although we can benefit from technology, less interaction can be a limitation. Also, we can benefit from more materials in face-to-face classes. However, I believe that if we improve ourselves in online courses, these limitations will disappear."* ..." (An example of participant view)

4. Discussion and Conclusion

In this study, it was aimed to improve the introductory skills of pre-service mathematics teachers by using online microteaching technique. In the study, each participant received two micro-teachings using Gagne's first three events as an introduction to a different mathematics topic. As a result of the study, was observed that all of the participants showed improvements between their first and second online microteaching. It was found that the participants who did not perform these events sufficiently in their first micro-teaching addressed these events better in their second micro-teaching. Especially the fact that the participant had the chance to watch his/her own microteaching again and the comments from other participants played an important role in this development. These results are in parallel with the studies in the literature [4, 9]. Studies have shown that microteaching practices set a precedent for situations that can be encountered in the real classroom environment, allow instant feedback, reduce confusion, and that lecturing to real students in the real classroom environment and lecturing to their peer groups is a very different experience [3, 4, 5, 6, 14, 17, 18].

Moving a technology-supported microteaching practice online was a rich experience for the pre-service teachers. It challenged their pedagogical agility by having to consider all aspects that need to be conveyed online, such as content delivery, student engagement, motivation, etc. [9, 19]. Likewise, in alignment parallel with the improvements of information and communication technologies, online microteaching functions as a versatile technique for more teachers to improve the quality of teaching [6]. In this research, the quality of teaching is revealed through the capacity of the pre-service teachers to support critical and reflective thinking skills.

One-to-one interviews with the pre-service teachers also support the results of the research. All of the participants stated that the micro-teaching technique played an important role in gaining this skill. the participants engaged in reflective practices and managed to think about their own adaptation and teaching practices was also revealed in Kokkinos' research [4].

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