EXAMINING PRIMARY PRE-SERVICE TEACHERS' DIFFICULTIES OF MATHEMATICS TEACHING WITH THE MICRO-TEACHING METHOD

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Abstract: The purpose of the study was to examine primary pre-service teachers' difficulties of the teaching of mathematics with micro-teaching method. The participants of the study were 15 third grade pre-service teachers from the department of primary education in the faculty of education. In this grade which includes four sections, there were approximately 150 pre-service teachers. All of them taught mathematics with the micro-teaching method in a period of 40 minutes. To gather data, a semi-structured interview was administered. Later the recorded interviews were transferred to written texts and analysed. The pre-service teachers' responses were qualitatively analysed to

characterize patterns and categorize answers. The main results of the study revealed that before the teaching the pre-service teachers were concerned about classroom management, excitement, lack of materials, unable to use time effectively. A majority of them indicated that, during their teaching, they were most forced into managing classroom and encouraging students' class participation. The artificial nature of micro-teaching negatively influenced pre-service teachers' classroom management and prevented to implement their teaching plans as they wished.

Key words: Mathematics teaching; primary education; pre-service teachers; micro-teaching.

1. Introduction

In training persons the society needs, the importance of the educational institutions is not deniable. Definitely the most basic elements of these institutions are teachers. Therefore, teachers in both pre-service and in-service should be trained in the best way. Yet, negatives in teachers' behaviours are at the top of the causes of students' failure (Oktar & Bulduk, 1999). Being teacher is a process which includes theory and practice, and asks pre-service teachers to improve themselves in many aspects. Conversely, many studies highlight that the most of novel teachers are difficulties in transforming their content knowledge into a form in which students are able to understand (Canbazoğlu, 2008; Simmons et al., 1999; Veal, Tippins & Bell, 1998). These problems in composing theory and practice increase the importance given to teaching practices and micro-teaching applications in teacher training area day after day (Baştürk, 2009).

First, micro-teaching has been used by Dwight Allen to train medicine students at Stanford University in the early 1970s. Then, it started to be adapted into teacher training area to help teachers and pre-service teachers acquire and improve new teaching skills (He & Yan, 2011). The following unique characteristics distinguish micro-teaching from the other pre-service teachers' training methods (Allen & Ryan, 1969):

- Micro-teaching offers pre-service teachers an authentic teaching environment. So, teacher's and student's role are clearly identified.

- Pre-service teachers only focus on a specific teaching skills in each micro-teaching session. It helps them to only concentrate on their teaching by reducing the complexity of normal classroom teaching.

- Pre-service teachers' teaching is video recorded and reviewed in order to increase the supervision of practice. It can significantly expand the traditional knowledge-of-results or feedback dimension.

Asiabaka and Emenalo (2011) do not find right that teacher education institutions send pre-service teachers to practicum schools without providing them to master teaching skills through learning to teach. In fact, with programs whose the theoretical side is more dominant, it is difficult to answer to the question "how best teachers are to be prepared for teaching which led to the emergence of micro-teaching in teacher education" (Ijioma, Obasi & Ifegbo, 2014, p.22). As is known, for some professions such as medicine, law, engineering, there are some specific skills to be required before sending students to stages in real environments. As teaching is also among this type of professions, one of the most important methods ensuring teaching skills is micro-teaching.

Micro-teaching can be considered to be a clinical approach. With this method, pre-service teachers can have the opportunities to experience real teaching situations and thus transfer their theoretical knowledge of teaching and learning into practice. By composing theory and practice, pre-service teachers can acquire new teaching skills and develop those existing before. In addition, by means of feedbacks (given by both classmates and lecturer), it provides pre-service teachers to correct themselves and improve their teaching skills until they become perfect (Ekşi, 2012; Kpanja, 2001; Sarı, Sakal & Deniz, 2005). Some researchers such as Adedapo (2013) and Nzewi (1988) highlight that micro-teaching plays an important role in acquiring three basic components of teacher training as follows: cognitive, psychomotor and affective domain. Discussion environment generated in classroom after micro-teaching is quite useful to all participants (i.e., pre-service teacher who taught, those listening to teaching and lecturer). The first two find opportunities to recognize what needs to be done or not. The last has opportunity to talk about some concrete cases by supporting on its theoretical grounds.

Starting from the literature, it is possible to distinguish micro-teaching process into some stages. This also helps us to consider teaching skills pre-service teachers need to mobilize. For instance, in planning stage, pre-service teacher prepares the lesson plan on the selected topic before. The next stage is teaching. Pre-service teacher performs micro-teaching which was prepared and planned by her/him to real students (in our case, their friends). Meantime, micro-teaching is recorded by lecturer through video camera or portable receivers. Then, pre-service teacher watches and hears the video recording at the end of teaching. It is followed by critique stage in which lecturer and her/his friends review, analyse and discuss pre-service teacher's micro-teaching. By taking account criticisms and suggestions, pre-service teacher revises micro-teaching plan and teach again to same group. In the next stages, the second micro-teaching is recorded, reviewed and compared to the first.

This study aims to reveal primary pre-service teachers' difficulties of the teaching of mathematics with micro-teaching method. The results of the study can serve improving the use of the micro-teaching method in teacher training process. Furthermore, identifying pre-service teachers' difficulties and weaknesses in teaching skills can give some ideas of what knowledge and skills should be focused on, in faculties of education

2. Method

In this study, a descriptive survey method was used. It described and interpreted what was. This type of researches are concerned with "conditions or relationships that exist, opinions that are held, processes that are going on, effects that are evident, or trends that are developing" (Sinha & Dhiman, 2002, p. 21). Many scientific disciplines, especially social science and psychology, use this method to obtain a general overview of the subject.

2.1. The participants

The participants of the study were 15 third grade pre-service teachers from the department of primary education in the faculty of education. In this grade which includes four sections, there were approximately 150 pre-service teachers. In their course entitled "mathematics teaching II", all of them taught mathematics with the micro-teaching method in a period of 40 minutes. They needed to prepare a lesson plan for 5 learning objectives related to the topics selected randomly from the elementary mathematics curriculum (grades 1-4) and lecture it. In the choice of the research group we adopted the maximum variation sampling. Therefore, from the general opinions of the lecturer of mathematics teaching lesson (at the same time the first researcher) on their academic performance, we struggled that the pre-service teachers at different academic levels participated in the study.

By using the micro-teaching form, all participants were evaluated by the first researcher and three pre-service teachers, called as jury, selected randomly through a random drawing software on Web. The jury members were changed every week. There were three assessment stages after every micro-teaching as follows: self-assessment, peer assessment (with the participation of pre-service teachers which currently exist in classroom), jury assessment (three pre-service teachers selected randomly) and expert assessment (the first researcher, at the same time, lecturer of the course).

2.2. Data collection and procedures

To gather data, a semi-structured interview was administered. By supporting on the relevant literature, informal interview with pre-service teachers and their experiences in teacher training area, the researchers developed the interview questions (e.g., Baştürk, 2010; Bilen, 2014; He & Yan, 2011). The content validity was established by a panel of experts consisting of three educators who were teaching in the department of Primary Education. They determined that these questions were able to measure pre-service teachers' difficulties in this subject. Approximately 10 pre-service teachers, out of the research group, reviewed the questions for understanding and in line with the feedbacks from them, minor changes were made in some questions.

Interviews were conducted with the participants in a relaxed atmosphere. They were tape-recorded and lasted about 15-20 minutes. The interview schedule consisted of 16 questions. Within the scope of this paper, we presented the results of the analysis of questions directly related to the research problem. In these questions, pre-service teachers were asked to talk about their anxieties before teaching, difficulties encountered, most annoying things and the anxiety levels during teaching.

2.3. Data analysis

The recorded interviews were transferred to written texts and later analyzed. The pre-service teachers' responses were qualitatively analyzed to characterize patterns and categorize answers. Responses were analyzed by using open coding. Open coding is the part of analysis that pertains specifically to the naming and categorizing of phenomena through the close examination of data (Yıldırım & Şimşek, 1999). To determine the inter-judge reliability, data and categories were examined by the researchers and one expert from the department of Primary Education. Disagreements between the experts were solved by discussing and so a great common agreement was provided on categories and coding (Lincoln & Guba, 1985).

3. Results

In this section, we presented the results of the analysis of four questions in the interview form. These analysis were based on frequency tables and some quotations from the pre-service teachers' answers.

3.1. Pre-service Teachers' Anxieties before Teaching

As seen in Table 1, the pre-service teachers' anxieties before teaching were categorized into six categories. The classroom management was the anxiety most frequently mentioned by pre-service teachers before teaching (6 pre-service teachers). Both materials and unable of excitement control were mentioned by 4 pre-service teachers as an anxiety cause, while 3 pre-service teachers worried about use of time. Two pre-service teachers feared to criticisms of classmates or jury team. For only one, the weakness of the topic to be taught was an anxiety source before teaching. All this is reflected in the following comments:

Table 1. *Pre-service teachers' anxieties before teaching*

Categories	Frequency
Classroom management	6
Materials	4
Unable of controlling excitement	4
Use of time	3
Criticisms of classmates or jury team	2
Weakness in the topic to be taught	1

Before my teaching, I suspected that classmates would make noise and my classroom management would be weak. And however, I tried to do activities. I tried to keep the attention of the class lively (Pre-service Teacher 1).

First, I hesitated that I wouldn't provide my domination of classroom. In order to find solutions to this problem, during my teaching, I always tried to take precautions by using some strategies such as asking to participate in activities students (i.e. pre-service teachers) who were interested in other things, walking in classroom, attracting their attention and admonishing them to stop talking (PT8).

I was very afraid of the weakness of my prepared materials, criticisms of the lecturer and classmates. For example, the class can easily critic everything. Sometimes, they can usually warn of time such as there are five or ten minutes. I was much afraid of it. Indeed, in my teaching, I had some difficulties in the use of time (PT14).

I thought I would be excited. But I did not get excited too much. First, I had a little, but it passed later. By thinking that if I improvised, I could be more comfortable, I taught all my topic by improvising (PT5).

What I am afraid most was not teaching with real students. Students who would listen to me, were not at the level of primary school. Therefore, for me, it was an important problem in exciting their interest and enthusiasm. In my teaching, I tried to excite them with my prepared activities (PT4).

I thought that I would have problems in the use of time. To avoid this, during my teaching, I removed some unnecessary things, namely I didn't present them. I gave priority to knowledge I considered as important. I tried to take precaution in this way. At the same time, I hesitated that my classmates would be bored with my teaching. Thus, in my teaching, I gave place to game-based activities more than materials (PT11).

In the first two comments, the classroom management was mentioned as an anxiety source. As solutions to this problem, the pre-service teachers implemented some classroom management strategies such as providing to participate in classroom activities students who were talking and uninterested, admonishing and walking in classroom. The third comment included an anxiety which was based on the idea of unable to control excitement. From what she said, we understood that during her teaching the pre-service teacher found a solution to this problem by improvising. The fourth comment could also be associated with classroom management problem. The artificial nature of experience concerned the pre-service teacher. Because, classmates were not real students at the level of primary school and drawing their attention in classroom activities was difficult. Regarding the last comment, there were two anxiety sources. One of them is related to time management. Against it, the pre-service teacher tried to make provision by removing from his teaching some parts he considered to be unnecessary. As in the previous comment, one other referred to the artificial nature of experience.

3.2. Pre-service Teachers' Difficulties Encountered during Teaching

In this section, we presented the results of the analysis of the question which asked the pre-service teachers to talk about encountered difficulties during teaching. As well seen in Table 2, the pre-service teachers' anxieties before teaching were associated to those during teaching. So, classroom management (5 pre-service teachers) and encouraging students' class participation (4 pre-service teachers) were the most important difficulties for them in teaching. On the other hand, four pre-service teacher stated that they encountered any problems. Despite their small numbers, some pre-service teachers had difficulties in time management, organization of group studies and overcoming unexpected things. This was supported by the interview comments, as illustrated below:

Table 2. *Pre-service teachers' difficulties encountered during teaching*

Categories	Frequency
Classroom management	5
Encouraging students' class participation	4
Non-problem	4
Time management	1
Encountering unexpected things	1
Organization of group studies	1

As they (she is talking about classmates) were adults, I had not difficulty in classroom management. We had to teach, as if we taught third or fourth grade students at the level of primary school, but classmates eventually knew everything I taught. When I asked a question, they immediately responded by forgetting the role they had to play. Sometimes I warned them to speak by asking permission. On the other hand, I also had difficulty in time management (PT13).

I had some difficulties in activating students (i.e., pre-service teachers) by using constructivist approach. I would like that students were more active in teaching but it was not easy in some time (PT6).

I had problems in the use of time. My teaching did not pass like I planned before. Some extreme cases happened during my teaching. For example, some questions were asked from parts I prepared or not. They affected negatively my use of time and I could not teach some activities as required. Thus, student could not understand them or their understanding lasted long (PT9).

In fact, I had problems in organizing group studies. During group studies, there was a bit of noise from the class. Thus, I had difficulties in organization. Besides, as I developed materials myself, adapting them into teaching was another difficulty for me. Out of these two things, I think that I was not bad (PT11).

In the first comment, we considered that the artificial nature of experience was a difficulty in the pre-service teacher's classroom management. The fact that classmates were unable to behave as primary students, sometimes complicated her classroom management and implementation of her teaching plan. The second comment referred a difficulty related to activate students. The pre-service teacher would like to teach by using constructivist approach but she had difficulties in expanding it all teaching. In the third comment, we remarked that time management causes problems in teaching. Some unexpected questions of classmates negatively influenced the pre-service teacher and prevented him from doing teaching he wanted. The last comment highlighted encountered difficulties in group study organization and adaptation of developed materials into teaching.

3.3. Most Annoying Things during Teaching

In Table 3, we categorized the most annoying things during teaching into four categories. What annoyed the pre-service teachers most was that classmates did not listen to teaching (6 pre-service teachers). Furthermore, lack of response to questions they asked (5 pre-service teachers) was also among most annoying things during teaching. Three pre-service teachers did not encounter any problems while existence and conversations among themselves of jury team annoyed one other. The following extracts are typical of such comments:

Table 3. *Most annoying things during teaching*

Categories	Frequency
Not listening to teaching	6
Not responding to questions posed by pre-service teacher	5
Nothing	3
Existence and conversations among themselves of jury team	1

The fact that students spoke among themselves and some students did not listen to me, affected me negatively and lost my concentration. That was why I feel so bored. Sometimes, I tried to warn them about being quiet (PT1).

In fact, there was not anything which bored me. Only just, when I asked questions, classmates were not willing to respond by considering as simple. Thus, I had difficulties in motivating them to respond my questions. I found the solution to this problem by asking directly questions some of them not all class. In this way, receiving answer became easier (PT11).

What bored me, was the indifference of the class. After some time, their attention was completely dispersed and they started to behave like uninterested. In the part of assessment, I especially selected uninterested students in teaching. In this way, I tried to activate them (PT13).

As usual, the lecturer established a jury team which included four persons (one of them was himself). All of them had a form composed of about 25-30 items. A few times, they talked among themselves. I could hear or understand criticisms from their eyes. Thus, this situation had a negative impact on

me. On the other hand, some students' unwillingness to participate in teaching bored me very much (PT14).

The first comment referred the unwillingness of classmates to listen to teaching. This situation influenced the pre-service teacher negatively and caused the loss of concentration. In the second comment, we encountered once more the problem of the artificial nature of experience. The pre-service teacher tried to overcome classmates' unwillingness to respond questions by pointing some of them directly. As the previous two comments, the third comment also mentioned classmates' indifference. We considered that the pre-service teacher followed the same strategy: Ensuring the participation of uninterested students in classroom activities. In the last comment, we understood that existence and conversations among themselves of jury team and lack of participation in classroom activities annoyed the pre-service teacher.

3.4. Pre-service Teachers' Anxiety Levels during Teaching

In the interview form, there was a questions which asked the pre-service teacher to assign a number from one to ten to their anxiety level during teaching. As well seen in Table 5, the lower anxiety level was 3 (4 pre-service teachers) and while the highest was 8 (2 pre-service teachers).

Table 5. *Pre-service teachers' anxiety levels*

Anxiety level between 1 and 10	Frequency
3	4
4	2
5	4
6	2
7	1
8	2
Total	15

There were five pre-service teachers who had an anxiety level more than 5. Four of the participants were moderately anxious and their anxiety level is 5. The number of pre-service teachers having an anxiety level less than 5 was six. The mean of anxiety level of all participants was 5 (Standard Deviation: 1.73205). As a result, by including pre-service teachers who assigned 5 it can be asserted that micro-teaching is a worrisome process for the most of the pre-service teachers.

4. Conclusion and Discussion

In this study, we examined primary pre-service teachers' difficulties of mathematics teaching with the micro-teaching method. Micro-teaching is an important method which offers many advantages to pre-service teachers such as self-confidence, seeing and fulfilling the weaknesses, learning different methods and techniques (Ananthakrishnan, 1993). It is possible to find many studies in the literature which highlight the importance of micro-teaching (Cruickshank, 1985; Cruickshank & Metcalf, 1993; He & Yan, 2011; Metcalf, 1993; Peker, 2009; Vare, 1994). We believe that the increase of studies which address this subject with many different aspects will positively contribute to micro-teaching applications and help educators to use them in the most efficient and useful manner. In this direction, we conducted this research with 15 pre-service teachers and obtained the following results:

Before teaching, the pre-service teachers were concerned about classroom management, lack of materials, excitement, unable to use time effectively, criticisms of classmates or jury team and weaknesses in the topic to be taught. The fact that classroom management mostly worried the pre-service teachers among them brings to mind the artificial nature of micro-teaching. In the literature, there are some criticisms of micro-teaching. The most well-known one of them is the artificial nature of the experience. In this context, some researchers such as He and Yan (2011), Stanley (1998) and Cripwell and Geddes (1982) underline that pre-service teachers are reluctant to take part in micro-teaching activities by virtue of non-natural classroom environments, material production procedures, and time constrained course schedules.

Regarding the pre-service teachers' difficulties encountered during teaching, the most of them are also related to classroom management and hence the artificial nature of the experience. Classmates are not real students and so unable to behave as primary students. Attracting their attention in lesson is not easy. Sometimes this situation negatively influences pre-service teachers and prevent to implement their teaching plan as they want. Of the similar causes, expected yield of group studies cannot be obtained. Overcoming this drawback, He and Yan (2011) stress that it is important to determinate more effective ways of integrating micro-teaching with the acquisition of pedagogical knowledge, construct an authentic classroom setting, provide more opportunity for teaching practice, more school experience, more practical guidance from school teachers, and enlist more support from the university and department.

Even if it is expressed by a limited number of pre-service teachers, the effective use of teaching time is another important difficulty for them. In the scope of this research, we had the opportunity to watch many micro-teaching. These experiences showed us that the ability of pre-service teachers' time management was very fragile and they had difficulties in distinguishing time into teaching goals according to their importance. Although it will be developed with experience, we believe that it is needed to more focus on the planning of teaching in relevant courses of teacher training programs.

On the other hand, the pre-service teachers' teaching anxiety is not at a level deniable. We think that the possibility of encountering unexpected questions of students and the assessment process to be performed at the end of teaching substantially increase this anxiety. Ameen, Guffey and Jackson (2002) underline that difficulties in answering students' questions are among teaching anxieties. There is an inverse relation between teaching anxiety and confidence. So, pre-service teachers' confidence increases, and their teaching anxiety decreases (Peker, 2009). If we consider that increasing confidence requires to be well-equipped with many knowledge and skills such as content knowledge, pedagogical knowledge and pedagogical content knowledge, the faculties of educations should provide required environments (such as micro-teaching) in which pre-service teachers may acquire and transform them into practice.

As a result, this study allowed us to consider the primary pre-service teachers' difficulties of micro-teaching, but this supported only on what they said. Thus, further research is needed to focus on the nature of their teaching practices both in practicum schools and faculty. We also believe that it is necessary to examine the present teacher training programs in the context of difficulties and weaknesses identified by the previous studies and this study.

Acknowledgement

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