



TEACHING ACTIVITIES IMPLEMENTED BY PRE-SERVICE PRIMARY TEACHERS WHILE TEACHING MATHEMATICS

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Abstract: The aim of this study is to determine the teaching activities of pre-service teachers in the course of mathematics teaching methods. All of the pre-service teachers have selected an attainment content from the primary (1-4) mathematics education curriculum at the beginning of the semester in the scope of mathematics teaching methods course. Data collection tools include prepared lesson plans and presentation notes by the students, as well as field notes of the researchers in addition to an observation form. According to the results obtained with descriptive statistics and content analysis, while the pre-service teachers were successfully performed in timing and taking into account of curriculum requirements, they were not adequately performed in problem posing and problem solving and also using alternative and appropriate evaluation methods.

Key words: Primary Teacher Education, Mathematics Education, Micro-teaching, Preservice teacher

1. Introduction

Depending on the ever-changing and renewed social life, new developments are taking place in education and training environments according to the needs of the society. The key variable of achieving success in these reform movements certainly is the teachers (Battista, 1994). The teachers strive to create environments to maximize learning of the student, day to day attending classes (Nussbaum, 1992). Although in schools many factors contribute to the academic success of students, consensus among educators exists that the most important factor is teacher quality (Caughlan and Jiang, 2014; Harris and McCaffrey, 2010). Fuller (1969) emphasizes that rather than dividing students into those able and those unable, they should be divided as those whom teachers were able to teach and those whom they were unable. It emphasizes that students should be divided into what they can and cannot teach, rather than what they can and cannot do. Teachers are effective in the success of students through the quality of all their classroom interactions, including the teaching practices that they give to students (Kilpatrick, Swafford, and Findell, 2001). In other words, the quality of the teacher in classroom is about how he/she behaves in a class and how his/her practices end up in the learning success of the students (Berliner, 2004; Caughlan and Jiang, 2014). Generally, it is a known reality that teacher behaviour is critical for all courses. In a specific sense, teacher behaviour in mathematics education is multidirectional, and it is known that in order for the student to be successful the teachers should have various skills. The teachers need to have, along with mathematical knowledge, the skills to transform this knowledge into effective teaching practices in order to promote student learning, and to be able to organize classroom environments (Ottmar, Rimm-Kaufman, Larsen, and Berry, 2015). The institution in which the teachers should attain these skills, certainly is the undergraduate programs they attend. However, the studies that were made emphasize that courses in undergraduate programs were unable to sufficiently prepare teacher candidates, and that teacher training should be organized around a basic set of applications to improve knowledge, skill and professional identity by performing the practice and learning in the process (Caughlan and Jiang, 2014; Magiera, van den Kieboom, and Moyer, 2013; Moyer, 2001; Zeichner, 1993).

Received April 2019.

Cite as: Doğan, M. & Taşpınar Şener, Z. (2020) Teaching Activities Implemented by Pre-Service Primary Teachers While Teaching Mathematics. *Acta Didactica Napocensia*, 13(2), 50-64, <https://doi.org/10.24193/adn.13.2.4>

2.1. Teaching Practise in the classroom

Considering the studies conducted with experienced teachers, it is seen that the descriptions of observable teacher behaviours in classrooms appear to be significantly consistent (Berliner, 2004; Fuller, 1969; van der Lans, van de Grift, and van Veen, 2017). In this context, van der Lans et al. (2017) reported that teacher behaviour can be observed under the main headings of teaching quality, creating a safe learning environment, efficient classroom management, effective teaching, teaching the learning strategies and differentiating in the class. Olkun and Uçar (2014) stated that the attitudes and behaviours of the teachers in the classroom reveal their perspectives for learning. Jakob, Frenzel and Stephens (2017) reported that teachers' ability to present their learning content by constructing positive emotions and giving effective feedback to students increased their success in mathematics. Evertson (1994) has evaluated the effective behaviours of classroom activities under the headings of making a good start to the course, arranging the appropriate materials, determining the rules and operations, planning and realizing the teaching and communication skills for teaching purposes. For example, if motivation is provided in the first minutes of the lesson, classroom management will be easier and students' interest in the lesson will increase. In this sense, teachers are expected to make a good start. Another issue is the structure of equipments, activities and problem types that are used for achieving attainments in the classroom. It is known that the structure of the activities used in the classroom environment has an important place in the formation of the students' conceptual structures and the emergence of different thoughts (Ferguson, 2009; Lee and Özgün Koca, 2016). The fact that the activities used are the way in which students can interact and discuss, makes them understand that mathematical ideas are useful (Ainley, 2006).

The institution that teachers need to acquire these behaviours is undoubtedly the undergraduate programs they study. In the faculties of education, pre-service teachers are educated in their fields with the aim of educating teachers who have the contemporary knowledge and skills that are required at the present time. Within the scope of this training, prospective teachers receive professional training along with field content knowledge (Council of Higher Education [CoHE], 1998). Grossman, Hammerness, and McDonald (2009) have stated, throughout history, courses in the curriculum of teacher training accumulated into two categories as fundamental education courses ensuring establishment of discipline for teaching, along with rather application-oriented courses, which contain courses on teaching of specifically certain subjects, on class management, and evaluative courses. However, it is known that the theoretical subjects learned in undergraduate education are not sufficiently reflected in practice. In addition to all of these, the period in which teacher behaviour has its most critical impact on students is certainly the primary school period. The quality of the education in the first few years has a substantial influence on future success of students and their attitude toward school, courses, and themselves (Senemoğlu, 1994). In this 'primary' education, mathematics has a unique importance, for the children in these years could be supported out of school by others or by their family on contemporary subjects that constitute the content of the lessons, and on subjects such as debate and natural discovery or reading books, while in general in mathematics, what was discussed in the lecture is all there is (Wan de Walle, Karp and Williams, 2013). In this sense, for primary teachers, special attention should be given to courses of mathematical teaching. Upon the examination of undergraduate programs, primary school teachers learn in the courses on Teaching of Mathematics-1-2, the purpose of mathematics education, its fundamental principles, and its history, along with teaching methods and strategies for attainments in the curriculum of the course on primary mathematics. The ones to implement this professional knowledge presented to teacher candidates are no other than themselves. One of the most frequent methods used to give in these context teacher candidates before they start their careers, the skills and experience of teaching is the method of microteaching (Allen, 1967; Benton-Kupper, 2001). According to this method, which was developed in Stanford University as a teacher training technique (Allen, 1967), prospective teachers attain experience by giving a micro lecture in artificial classroom environments (Benton-Kupper, 2001; Kpanja, 2001). There are several recent studies and publications on teaching practice and on students' teachers (e.g. Liu, 2011; Ruys, Kerr and Aelterman, 2012; Saylor and Johnson, 2014; Ünlü, 2018). Also, there are studies about what students bring to their field studies, their views about pedagogy and about mathematic students teachers' transition from student to professional life (e. g. Koster, Brekelmans and Korthagen, 2005; Ottmar et.al., 2015; Kuzle and Biehler, 2015; Niemi, Nevgi ve Aksit, 2016; Tang, Wong and Cheng,

2016; Mohamed, Valcke and deWever, 2017 etc.). However, it seems that there is still little research on students' teaching experience during teacher training programmes which may affect their teaching competency. Such a study would be important for institutions and teacher trainers in order to understand the pedagogical know-how that students already possess during teacher training programmes, as well as students' needs in this domain. This research, in this sense, aims to identify the teaching behaviour of primary teacher candidates in the application of micro teaching sessions for the course on teaching of mathematics and to observe potential effects and results of it. Therefore, the research question is "What are the trainee teachers' teaching behaviours while teaching mathematics in the process of a micro-teaching activity?"

2. Method

In this study, mixed method research was used. Mixed-method research represents research in a single study or in a series of studies investigating the underlying phenomena, including the collection, analysis and interpretation of quantitative and qualitative data (Leech and Onwuegbuzie, 2009). In the study, the reason for using the mixed method is to apply the results of qualitative method in detailing and clarifying the numerical data obtained by the quantitative method. Among the mixed method approaches, a complementary - approach method was adopted.

In the complementary mixed method approach, it is essential that quantitative and qualitative methods be used simultaneously and independently from each other in order to understand a situation or phenomenon in detail (Mark and Shotland, 1987). The aim of using different methods is not to ensure the consistency of the findings, but to make the situation rich and detailed by measuring from different perspectives (Greene, Caracelli, and Graham, 1989; Mark and Shotland, 1987). Therefore, in this study, it is aimed to determine with the numerical data obtained from the observation form, the extent to which the participants perform the teaching activity, and the field notes are used to identify details of the activities.

2. 1. Participants

This study was carried out with 45 primary school teacher candidates determined by criterion sampling method. Purposeful sampling may be defined as strategic and purposeful choice of certain kind of conditions, depending on the purpose and the source of the study (Patton, 2014). In the criterion sampling, some characteristics of the participants are predetermined when determining the sample. These characteristics can be age, gender, place of residence, class, occupation, marital status (Mack, Woodson, MacQueen, Guest and Namey, 2005). The following criteria were used to determine the sample in this study: The student teachers have chosen as a sample if, they

1. attend to the current (mathematics teaching methods 2) course in 2016-2017 spring term,
2. successfully completed the classroom management and mathematics teaching methods 1 course.

Considering the above criteria, participants in this course have received theoretical training in class management approaches, contemporary classroom management approaches, positive teacher behaviours, teaching methods, planning of teaching environment in the classroom, time and behaviour management, student-teacher relationship etc. In addition, in the mathematics teaching methods 1 course, they have received theoretical training on the aim and basic principles of mathematics teaching, learning and teaching strategies in mathematics education, the relationship between different learning theories with mathematics teaching and mathematics teaching for learning areas in the primary school mathematics curriculum. It is assumed that the pre-service teachers who have passed the two courses have enough pre-training to carry out the teaching activities in a micro teaching activity.

A total of 45 (39 female and 6 male) pre-service teachers who have successfully completed the classroom management and mathematics teaching methods 1 course were included in the study. At the beginning of the course, the research process was explained to the participants and their approval was obtained. Since the majority of the student teachers are female in the department, only a few number of male student teachers included in the sample.

2.2. Data Collection Tools and Data Analysis

Observation was chosen as the research method that was most suited to addressing the research question. Observation is generally considered to be one of the deepest and richest ways of collecting pedagogical information. It yields more valid or authentic data than would otherwise be the case with mediate or inferential methods, thus providing a reality check (Cohen et al. 2007). Observational data are sensitive to contexts and demonstrate strong ecological validity (Moyles 2002). The type of observation chosen for this study was semi-structured direct (live) observation (Cooper and Schindler 2001). In order to observe the student teachers' presentations for the teaching of the intended attainments, a special observation form has been developed. The observation form consists of a list of possible observable actions that a teacher may exhibit in the classroom from the beginning to the end of an instruction.

2.2.1. Developing the observation form. A systematic observation form was used to obtain the quantitative data of this study. This observation form was created by the first author of the study based on the theoretical subjects, teaching activities, in-class practices, micro-teaching practices and experiences of the mathematics teaching methods 1 and 2 courses. Especially, after considering the dimensions of observable teacher behaviours in the classroom, it was finalized with a pilot study. In this process, first of all, a total of possible 27 items of observation form was formed. In the next year's mathematics teaching methods 1 and 2 courses, the observation form was used by the researchers during the micro teaching sessions on two separate mathematics teaching methods courses. With this experience, it has been decided to make some changes on the form. For example, some of the items included in the pilot version of the observation form were combined together since they can be used interchangeably. As an example, while the problem solving, problem solving steps and problem posing were three different items in the first version of the observation form, after the piloting, it was decided that the students' behaviour towards these three items could be examined under one category. Thus they have combined and made a single item. Similarly, while the emphasis on the textbook and the examples and activities in the book were two separate items in the pilot version, it was decided that they would be reduced to one item. On the other hand, the source of activities item were divided into 3 different items such as sample-activities in the textbooks, sample-activities from alternative sources and alternative problem solving and posing. Thus, it was tried to determine possible source of activities and problems undoubtedly. The performance levels of the activities in each item were obtained by scoring the observation form from 3 to 0 (3: very good, 2: acceptable, 1: not sufficient and 0: none). The categorical list of fundamental behaviours in the observation form and description of each criterion is included in Table 1 below.

Table 1. *Scoring rubric for the observation form*

Domain	Rubric Criterion	Description of the criterion
1. Introduction	Introduction, Greeting and pre-acquisitions	Does the ST make an effective introduction to the lesson?
	Attainments/Skills/field of learning	Does the ST make an appropriate presentation taking into account the acquisitions and skills that are intended in the curriculum?
2. Instruction (including Organization and classroom management)	Technology/Tools and materials	Does the ST use any technology or material?
	Explain of symbols and concepts/ emphasis on important points	Does the ST explain the symbols and concepts effectively?
	emphasis on the textbook / examples and activities in the book	Does the ST emphasis example and activities in the lesson book?
	Alternatives activities and examples	Does the ST use the activities and examples from alternative source?
	Problem solving and steps/problem posing	Does the ST use the problem solving steps or problem posing activities?
3. Assessment and Evaluation	Attention to time and process steps	Does the ST make an adequate presentation in sufficient time?

	Giving feedback/assigning homework/association and evaluation	Does the ST conduct appropriate activities to evaluate students?
	Attention to participation	Does the ST have attention the students' participation in the class?

2.2.2. Field notes. In order to reveal the results of the quantitative data, in other words, what the participants are doing under the activities in each item, in addition to the observation form in the classroom environment, field notes were taken by the research assistant. The research assistant field notes consist of the written comments which the student teachers exhibited during the practice. These notes may answer questions such as how the presenting participant handles the subject, which features it stands for, what it uses, what activity, example or problems are and what it emphasizes. In other words, the activity in the observation form item was tried to be demonstrated by how the participant performed with the field notes.

As an example, a field note for one of the student teacher is given as follows:

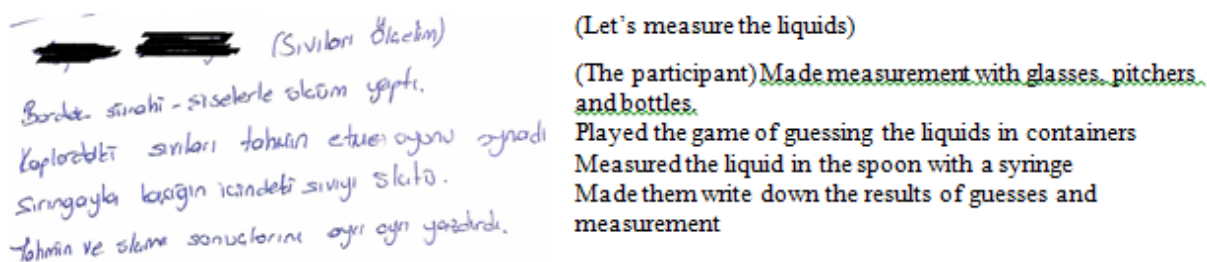


Figure 1. A section of field notes for a student teacher

As seen in Figure 1, for the purpose of analyzing the behaviours more deeply in a qualitative sense, brief notes have been taken about prepared lesson plans, performed activities, and the used materials.

In the analysis of the data, the total scores for each item in the observation form were determined. For the 10 categories of the observation form, the maximum score for each behaviour has been defined as $(45 \times 3 = 135)$. Accordingly, for any behaviour to be at 'fair' level, a score of $(45 \times 2 = 90)$ was taken, while for the level of 'poor', a score of $45 \times 1 = 45$ was taken respectively. Qualitative data were subjected to further descriptive analysis. For this purpose, a framework for descriptive analysis was formed based on the items in the observation form. Data were then processed according to the thematic framework. Thus, qualitative data were obtained in the form of an explanation of each item in the observation form.

2.3. Research Process

The research process of this study covers the last 11 weeks of the mathematics teaching methods 2 course in a Primary Teaching Undergraduate Program. Mathematics teaching methods course is a two-semester compulsory field education course in the 3rd year of the Elementary Teacher Education Undergraduate Program. The researchers in this study have been conducting the related course for a long time in accordance with the program requirements. Before the research process, in the first part of the mathematics teaching course, the necessary theoretical and practical subjects are lectured such as learning-teaching theories and their reflections on mathematics education, structural features of mathematics and their impact on learning, conceptual and operational understanding of mathematics, the subjects related to the teaching of mathematics according to the learning areas (numbers and operations-geometry-measurement-data processing) in the elementary school mathematics curriculum etc. In addition, prepared activities by the researchers carried out in these courses taking into account of recent researches. At the beginning of the mathematics teaching 2 courses, student teachers were informed about micro-teaching sessions and each teacher candidate was asked to choose an attainment from grades 1-4 of primary school according to their preferences. It was noted that each of the selected attainment had to be different from each other. After that the presentation time and order of each

participant were decided together according to the order of subjects from 1st to 4th grade. In the first four weeks of the course, the students were given theoretical information about the basic principles and objectives of the Mathematics Education Program. From the fifth week onwards, the research process started and teacher candidates conducted the micro teaching presentations for about a half-hour (20-25 minutes presentation, 5-10 minutes discussion). During their presentations, it was asked from prospective teachers to think their friends in audience not to consider as their peers, but rather the students of a class, and make their presentations accordingly. Similarly, it was asked, that the audience act as primary school students and treat (ask various questions, request points not understood to be re-discussed) their friends making the presentation as their teachers. Thus, it was intended that prospective teachers behave as much as possible as they would in an actual primary classroom environment. At the end of the presentations, discussions were made with the whole class in 5-10 minutes. Researchers have shared their findings with the presenters and classmates and got their opinions and suggestions about the situations and deficiencies that are prominent in micro teaching activity. For example, the researcher has given feedback such as whether the attention of the whole class was sufficiently gathered or not at the beginning of the presentation, whether motivating the students was insufficient or not, whether the timing is precise or not etc. For the first 5 courses in the research process, observation form and field notes were filled by both researchers and the results were compared. After the comparison, the results appeared to be consistent and the first author completed the observation form, while the second author took notes. Furthermore, all of the observation forms and the researcher's evaluations were shared with the student teachers' at the end of the semester. Nearly all of the student teachers were agree with researcher's observation scores. Therefore, observation reliability and objectivity were checked and provided in a sense. Thus, the results of the observations were validated with participant confirmation.

It was tried to find an answer to the research question of the study via observation of student behaviours during the presentation, investigation of plans they made and of presentation notes, and document analysis of the materials they used.

3. Findings and Discussion

Descriptive analyzes results of the observation form data are presented in the chart below. The descriptive analysis results for 10 categories were obtained by summing up the (rubric) evaluation scores for all of the student teachers.

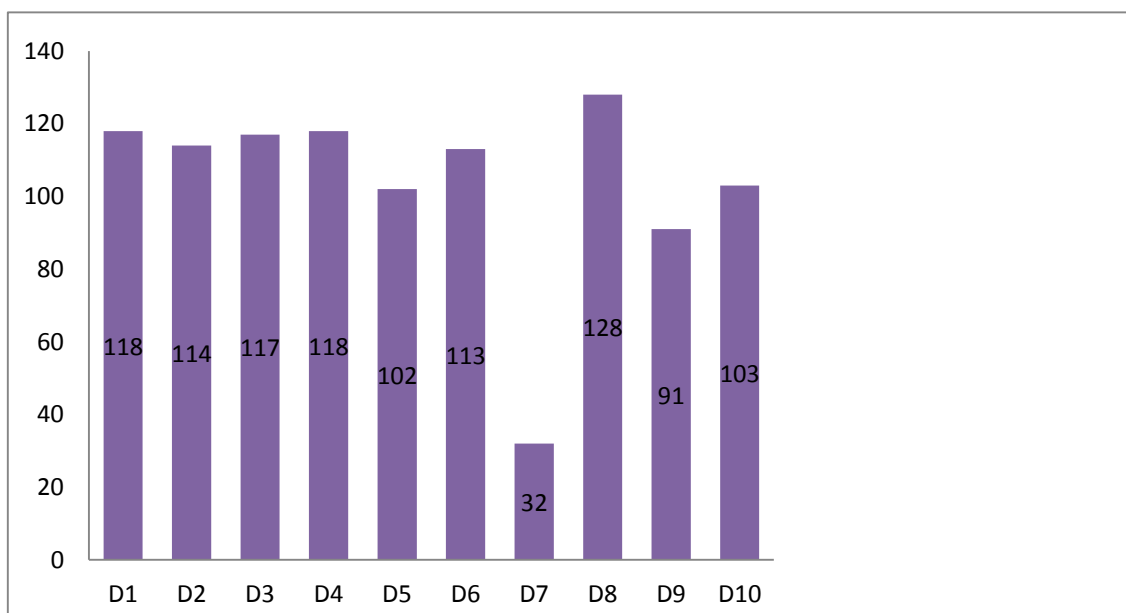


Chart 1. Behaviours exhibited by teacher candidates during presentations

According to Chart 1, 8 out of 10 determined behaviors are above 100 points. This suggests that prospective teachers show these 8 behaviors above acceptable (fair) level. Below, the scores and content of each behavior are interpreted in detail.

The first behavior (D1) in Chart 1 has been identified as introduction, greeting and reminding of pre-acquisitions (pre-learning). Total score for this behavior is 118. Therefore, it can be said that pre-service teachers performed this behavior in the scale of ‘very good’. Pre-service teachers successfully started the lecture (their presentations), greeted the students and reminded their students of pre-information required for teaching of the subject. For example, pre-service teacher who made presentation for subtraction operation has based it on addition operation and briefly reminded related pre-leanings. Additionally, it was observed that they made reminding as ‘we have learned subjects previously.’ Some examples of the researcher’s notes for this category have been given below.

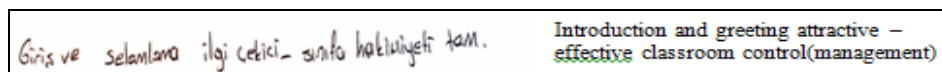


Figure 2. A section from the researcher’s notes for a student teacher.

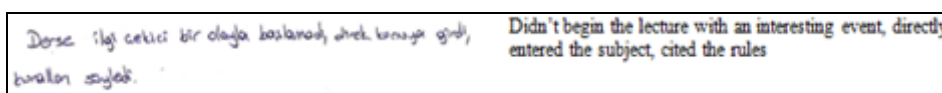


Figure 3. Another section from the notes.

From the note in Figure 2, it can be said that the pre-service teacher started with an interesting anecdote during presentation and the observer (researcher) has noticed it. Similarly, there have been pre-service teachers who prefer to start the lecture more effectively with an interesting music, video or material, and reflection on an interesting contemporary subject. On the other hand, in the observation note in Figure 3, it was noted by the observer that the introduction method of the pre-service teacher was not appropriate. Presentations of a small number of students were not satisfactory. They were unable to make an impressive introduction, did not focus on the subject of interest, and have not explained definitions and terms in detail.

The D2 behaviour in the chart has been identified as ‘attainment, skills, and the field of learning’. Accordingly, appropriateness level of the student teachers’ presentations for the attainments they aimed was evaluated. According to the results, total score of the student teachers for this behaviour is 114. In other words, they have performed this behaviour on a scale right between the ‘fair’ and ‘very good’ values. In other words, student teachers were successful to exhibit this behaviour. It can be suggested that this situation shows pre-service teachers had gathered sufficient knowledge of the curriculum and its content. This serves as an acknowledgement that they will be successful in fulfilling program requirements for teaching activities.

D3 behaviour has been identified as, ‘use of technology, tools and materials’. The total score of pre-service teachers in performing this behaviour is 117. Therefore, a score closer to the value of ‘very good’ is obtained. It has been detected that nearly all of the pre-service teachers utilized at least a presentation application (power point). In addition to this, the observers noted that the students used films and videos, played music and games which are available online. They have brought numerous simple tools and gadgets to class and utilized them in lecturing such as various vegetables and fruits, sticks, pencils, unit cubes etc. In general, while the pre-service teachers utilized substantial material and technology, it was also observed that some deficiencies came up especially, effective use of them. For example, although almost all of the students used presentation application, it was noted that some of the presentations were poorly prepared (e.g. too much informations were present in slides) and that some of the slides were unable to be used effectively. For instance, although the emphasis on the amount given in the fractions may vary according to the denominator on the topic of fractions is an important element in the understanding of fractions for the students; the pre-service teachers did not pay attention on slides.

The behaviour D4 has been identified as ‘explaining symbols and concepts, emphasis on important points.’ Total score of pre-service teachers for this behaviour is 118. Thus, they have exhibited it near to the scale of ‘very good’. Some of the researcher’s notes regarding the situations are as follows:

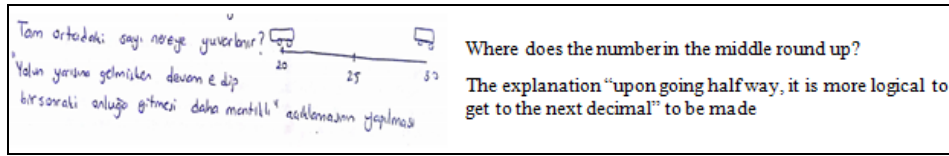


Figure 4. A section from the notes for a pre-service teacher who discusses the subject, ‘rounding up to the nearest decimal’

In Figure 4, it is seen that the pre-service teacher has used the metaphor of route of a car, explaining the operation of rounding up to the nearest decimal, during the presentation. Similarly, the explanations of the students lecturing on calculation of area have been given below:

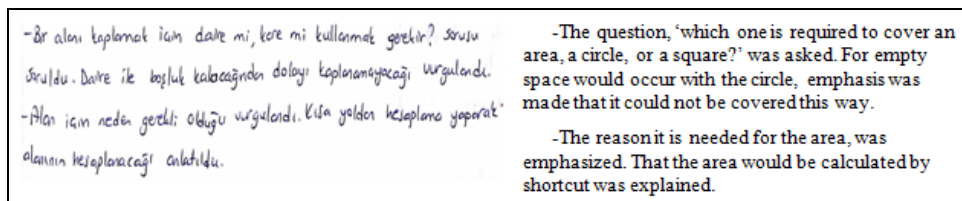


Figure 5. A section among the notes for a pre-service teacher lecturing on the subject of area

The notes in Figure 5 about the use of unit squares for calculation of areas may be a sufficient explanation for its comprehension.

The behaviour D5 is identified as, ‘emphasis on the textbook’. Total score of the pre-service teachers for this behaviour is 102. According to this core, it may be said that their performance on using the textbook and orienting the student towards it was at the level of ‘fair’. An example note regarding this is given in Figure 6.

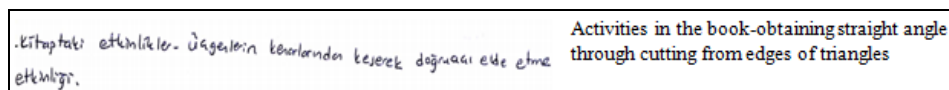


Figure 6. A section from the notes for a pre-service teacher who discusses triangles by angle

As seen in the note in Figure 6, the pre-service teacher has preferred to use an activity in the book while presenting the subject. Furthermore, it was observed that some of the pre-service teachers directed students like ‘let’s look at ...th page of your text book’. Besides, the textbook was also used actively while giving assignments. However, based on observations, most of the sources used for presentations were internet based in general.

The behaviour D6 is determined as ‘alternative activities and examples’. Here, extra activities were evaluated such as various games used by prospective teachers during the lecture, exercises over black/whiteboard in which students actively participated, small activities played in groups etc. In general sense, the total score (113) has been considered to be between fair and very good. Thus, the student teachers have fulfilled this criterion. Numerous alternative activities in this sense were observed. For example, most of the students related the attainments with real life and elaborately ensured the comprehension of the important points. Examples for this from the observation notes are given below.

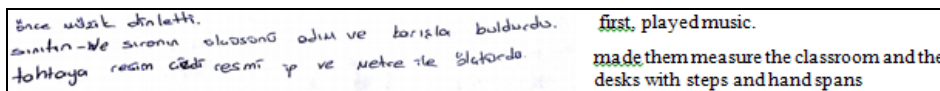


Figure 7. A section from the notes for a pre-service teacher who makes application for evaluation purpose.

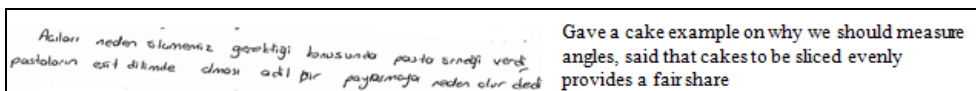


Figure 8. A section taken from the observation notes for a pre-service teacher who lectures measurement of angles

In Figures 7 and 8, it is seen that the pre-service teachers conducted alternative applications for various purposes during lecturing. On the other hand, some of the student teachers based their lectures solely on definitions and rules and lacked to conduct activities. Some of the performed activities by students are as: playing games with whole class (for special relationships for instance, ‘put hands under and over the table upon respective commands, in rhythmic counting finding the numbers on the unit cubes which were handed to the students and made them play with, to the common table classifying and discriminating the shapes in the jar etc.), dramas (partitioning ten, making dramas for addition and subtraction, and recording and playing its video), origami activities, bar charts with legos, cake-pizza activities for division, activities with various materials etc..

The total score for the behaviour of ‘problem solving and problem posing’ (D7) is calculated as 32. Problem solving and problem posing is an important method in a mathematics course. Here, it was aimed to observe whether the pre-service teachers practiced a problem oriented teaching or not. In other words, it was considered whether the pre-service teachers had a teaching activity which allowed different student ideas to be voiced, involved open-ended problems, in which the answer was evaluated by the student or the activities providing the student to set problems were used. The results show that the participants were poor in exhibiting this behaviour. Despite it was discussed and persistently focused in the theoretical part of the course. The posed and used problems contained only routine ones. Even if some of the activities made were exploratory, this was not sufficiently reflected on the problems. In the attainments, expressions like ‘solves and sets up problems’ were observed to be present, and this was observed to be mostly done by the student teachers. Besides, since not every attainment involves problem solving, it can be thought that students did not spare time for problem solving in their presentations. Moreover, almost no application regarding to problem posing was encountered. Researchers have only 2 observation notes for problem posing as follows.

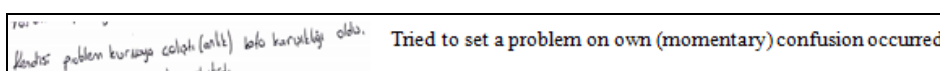


Figure 9. Observation note for a pre-service teacher who tried to involve a problem posing activity

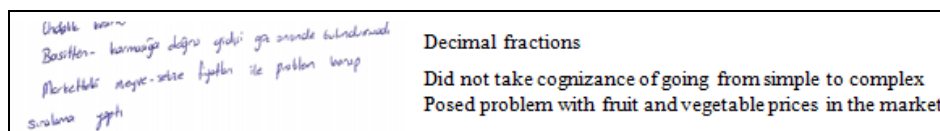


Figure 10. Observation note for a pre-service teacher who involves problem posing in the presentation

As can be seen in Figure 9 and Figure 10 pre-service teachers have been unable to achieve it, even when they tried to set up problems. This might be related to various reasons. However, problem posing skill is considered as an important skill it is recently involved in the curriculum so that it has not been reflected sufficiently in the teaching activities. That is, routine problem posing activities are yet to be reflected in practical teaching activities. Hence prospective teachers were unable to exhibit this behaviour.

The behaviour of ‘compliance with duration-level and discussion steps’ (D8) has been identified as the behaviour in which pre-service teachers scored highest. The order and presentation times defined and

set up at the beginning of the semester. This might have ensured that they were meticulous about efficiently using their time. Further, they mostly used curriculum, textbooks, and the internet sources for their presentations. It is known that in those sources, detailed explanations exist regarding how to teach in an attainment. Therefore, the sources they had access to might have caused them to perform well in complying with discussion steps. Another one could be the discussions in the theoretical parts of the course. Thus, the student teachers were careful for these situations and they had skills to fulfil them.

The total score of the behaviour ‘giving feedback, assigning homework and evaluation’ (D9) is 91. This may be called barely fair. Nearly all of the student teachers have handed and circulated different worksheets to their peers. Therefore, it can be thought that all prospective teachers approved assigning homework. However, upon examination of their contents, it was seen that almost none of them were authentic, but just for the skills of the students for making calculations faster. This suggests that although propensity to give assignments is present, there are problems regarding content. For the rest, they have tried to give feedback regarding the answers for the questions they have asked in the classroom. For instance, one of the assignments given for ‘operation of subtraction by column method’ by a pre-service teacher is given below.

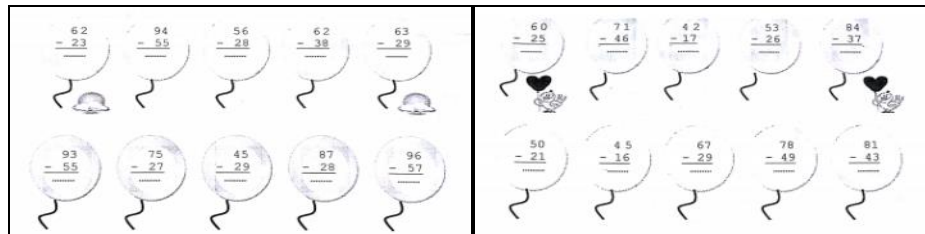


Figure 11. An example from the assignments given by a pre-service teacher

As seen in Figure 11, it may be said that the assignment given to the students to do subtraction by column method was a kind of monotonous ‘exercise’ in which ‘minuend’ and ‘subtrahend’ were given and ‘difference’ was asked. This kind of homework would possibly strike the students as boring. Evaluation of assignments avoided and remained for the following lesson. Therefore, none of the student teachers have evaluated any homework. By examining the characteristics of the given assignments, it can be stated that assignments have poor quality to express in which stage the student may had difficulties. Also, no feedback was given. Hence an appropriate evaluation could not be made.

The behaviour D10 has been identified as, ‘attention to participation’. Total score of the participants for this behaviour is 103. The lecturing pre-service teachers were somehow careful for drawing attention and motivating students to make them involved in by warnings.

All over of these results, the researcher also identified some critical behaviour which are important in mathematics teaching as well. One of them is misconceptions during the presentations. Some of them handled and presented some topics in a way which may cause misconceptions. An example for this is given below.

Kardan adamlarka basta bir nesnenin toplamının goneslere astiladi!

Equated the sum of snowmen with another objects to the Suns

Figure 12. A section of the notes for a pre-service teacher lecturing addition operation.

Upon looking at Figure 12, it is stated that the pre-service teacher who lectured on addition operation had equated the sum of two distinct objects to a completely distinct object. Here, considering at least, the sum of two distinct objects should be equated to an object which is the common attribute of the both (such as, 2 apples plus 3 pears for instance makes 5 fruits). It has been concluded that this summation by the pre-service teacher was false. The other students in the classroom have also objected to it, and corrected this mistake of the presenter.

4. Conclusion

The scores from the 10 exhibited behaviours, 9 out of 10 behaviours were concluded to be above fair level. Among these, the one which the pre-service teachers performed most successfully was identified to be ‘duration-level, compliance with discussion steps’. It is assumed that detailed discussion of the curriculum in the theoretical parts of the course has been effective on this score. In the curriculum, for each attainment sub-attainments and their explanations are presented step by step. Although the behaviour of ‘attainment skill compliance’ was in a very good level, the skills such as reasoning, problem solving, and association were reflected insufficiently on the presentations. This shows that while the students recognized the attainments of the program, they were not much able to focus on the skills which were intended to be given via these attainments. This is noteworthy. This proves that only subjects appearing in the attainments were presented. In fact, targeted skills, along with the content must be built in accordance. Again, even though all of the pre-service teachers utilized technology (using PowerPoint) during presentations, it was concluded that they were not able to use it sufficiently and effectively. Besides this, tools of online source such as videos, short animations and music were used. Again, it was observed that education oriented, field specific software programs (such as Excel, GeoGebra, Sketchpad) were not used. In general sense, it was concluded that the pre-service teachers used the computer as well as a concrete material, but not efficient enough, such as unit cubes, blocks, geometric objects, and fraction sticks, which were advised to be used in primary school. Moyer (2001), in his study, made observation and interviews throughout an academic year to reveal how and why teachers use tools, supplies and materials. Therefore, at the beginning of the study, the teachers took a two-week course on materials used in math courses and conceptual understanding. Later, in his study the teachers declared that material use made the lecture entertaining but they were not necessary for teaching of mathematics. Pre-service teachers, in this study too, might have used the materials for getting attention and giving presentations. Therefore, we encounter the question of how much these materials, which they cannot use effectively, contribute to learning in their teaching lives. But in mathematics education, the use of tools of this kind, especially for primary students who has not reached mental maturity in grasping abstract mathematical concepts, the use of concrete materials are supported by various theoreticians, and in the curricula of developed countries, usage of tools-supplies-materials is emphasized (Common Core State Standards Initiative [CCSSI], 2010; MONE, 2013; National Council of Teachers Mathematics [NCTM], 2000; Piaget, 1952). In this sense, it is rather important to analyze ‘how’ primary teachers use the materials than whether they use them or not. Lampert (2005), associates this with the relation between playing the piano and learning the theory of playing it, in order to play piano, it is insufficient to learn the theory, one has to sit down at the piano and receive feedback perpetually (quoted in Grossman et al., 2009). Therefore, primary teachers need along with the undergraduate course ‘teaching of mathematics 1-2’, courses focusing on the practice of teaching of mathematics.

In addition to all, it was observed that the student teachers tried to give concrete examples as much as possible, yet were unable to make applications for students to discover sufficiently. This shows that in teaching activities, the classic method of presentation is efficient but other teaching methods and alternative techniques are mostly absent. In general, pre-service teachers were observed to be partly incompetent in exhibiting a teaching, seen in the constructivist learning environments needed by current society, which makes people think, is collaborative and reveals different opinions (Arkün and Aşgar, 2010). Moreover, it has also been observed that they were unable to diverge from official sources. This may be caused by having limited time or the audience being their peers rather than their students. Thus, it was observed that they were excited, uneasy of being in front of their peers and expressed this situation.

This study, although planned as the rehearsal of a lecture in front of primary students in class environment, was not conducted in natural classroom environment, which is the environment of primary school students. Yet while this seems as the greatest limitation of the study, with such a lecture, lecturing of all of the students were able to be investigated. As a matter of fact, it is known that, in the scope of teaching practice, pre-service teachers are unable to conduct applications sufficiently for the reasons such as the primary teacher trying to finish the curriculum in time, the excess of intern students (Eraslan, 2009). Upon considering studies dealing with the lecturing

performance of pre-service teachers, it was seen that these studies were made in actual classroom environment, however a smaller number of pre-service teachers were able to be observed. For example, in a study with those studying in Chemistry Teaching, lectures of 6 pre-service teachers, twice each, were observed in a high school (Gürses, Bayrak, Yalçın, Açıkyıldız and Doğar, 2005). It was observed that the pre-service teachers were able to reflect on their presentations sufficiently, the behaviours such as explaining fundamental concepts and subjects of chemistry, exhibiting the role and attitude required by their profession, and utilizing teaching technologies, especially on their second presentations.

It is important that in this study, not much issues of field knowledge have been encountered. Especially, there was no significant error by the students in handling mathematical concepts and operations. This is significant result. Building field knowledge through time, and handling it correctly in teaching activities were considered as an important development for student teachers. Above all, it will help to minimize potential errors and misconceptions in learning and teaching mathematics.

One of the most important results is that a known reality about teacher training was observed once more. Pre-service teachers are more successful in exhibiting the experience that they have gathered through their training in teaching and practical activities. The points which were discussed and persistently dwelled on, in the first part of this study and in the first term of the course were observed more clearly in micro teaching activities. For instance, in theoretical parts, the primary mathematics curriculum was discussed and examined in detail with the student teachers, as well as with planning. Points discussed during these activities (acquisitions and handling, duration, level, tools-supplies, examples etc.) were shown more successfully in micro teaching practices. However, the subjects which were relatively less discussed (such as using different teaching method, problem solving and posing, use of technology, project) were reflected less in the practices. This shows that in teacher training activities, along with widening the perspective, there is a need to analyze the details. With this respect, giving field knowledge along with activities to widen the perspectives and let them improve individually should be present in teacher training activities. Potential probabilities for each single attainment should be clarified to pre-service teachers via most concrete exemplification and activities.

5. Suggestions

In parallel with the results obtained from this study, various suggestions have been made in terms of gaining basic skills such as problem solving, reasoning and generalization of pre-service teachers. This study reveals the necessity of increasing the practical courses as much as possible so that prospective teachers can identify and apply the desired (especially research and inquiry-based, technology supported) teaching method successfully. Similarly, the necessity for students to design an appropriate classroom environment for mathematics courses, envisages the increase in the number of mathematics teaching and technology (computer) supported mathematics courses. Furthermore, compulsory courses for problem-based teaching or problem-solving that will contribute to effective mathematics teaching should be included in the program.

In this study, it was tried to determine the performance of pre-service teachers within the undergraduate course. A more comprehensive study, including the opinions of the pre-service teachers during preparation and lecturing of their presentations may be conducted. In addition, the main differences between the two lectures of the participants can be studied by determining the performances in the scope of faculty-school cooperation.

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