



NORMATIVE ASPECTS OF INSTRUCTIONAL PLANNING ACTIVITIES OF MATHEMATICS TEACHER CANDIDATES

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Abstract: It is quite difficult to adequately describe and evaluate the developmental processes of teachers without knowing and analyzing the pedagogical communities they participate in. Teachers acquire their own professional knowledge by carrying their experiences to the educational environment. Therefore, classroom microcultures experienced by teachers and teacher candidates are important for the formation and improvement of their professional knowledge. In this context, the quality of the classroom microcultures constituted by the teacher training programs come to the forefront. Within this context, in the present study, classroom microculture belonging to mathematics education course (Methods of Teaching Mathematics-II (MTM)) which has an important place in the teacher education was examined within the framework of the classroom norms. In other words, the classroom norms regulating the instructional planning activities performed by teacher candidates were investigated and the qualities of these norms were discussed. The data of the study were obtained through observing the learning environments of the MTM course in a mathematics teacher education program at a state university in Turkey. The data of the study, which is a case study, were analyzed through constant comparative analysis method. According to the findings of the study, it can be said that teacher candidates had difficulty in sustaining and participating the norms which are related to assessment-evaluation, teaching knowledge, specifying objectives and social language used.

Key words: Norms, Classroom Microculture, Mathematics Education, Instructional Planning, Mathematics Teacher Candidates, Teachers Training

1. Introduction

Classroom microcultures experienced by teacher candidates and norms that characterize these cultures are among the important factors in the formation and development of professional knowledge. It is not possible to satisfactorily explain the developmental process of a teacher without properly analyzing the pedagogical communities in which he/she is involved (Cobb & McClain, 2001). Teachers create their professional knowledge by carrying their experiences they had as learners to learning environments (Tsai, 2007). Therefore, the classroom microcultures experienced by teachers and teacher candidates, and the norms of these cultures are important in the formation and development of their professional knowledge. In this context, the nature of the classroom microcultures constructed by the teacher education, and the nature of the norms that are the main characteristics of the classroom microcultures come into question (Cobb, Stephan, McClain, & Gravemeijer, 2001).

In teacher education in Turkey, the MTM course is one of the most essential courses with its content. With this course, it is aimed that teacher candidates have sufficient knowledge, skill and value about teaching mathematics. One of the most important objectives of this course is the activity of planning teaching of a learning outcome. Besides, planning and regulation of teaching mathematics is one of the 6 basic competences identified by the Ministry of National Education (MEB) in Turkey (MEB, 2008). Therefore, the aim of the present study is to examine the classroom microcultures of the MTM course, which constitutes an important part in the mathematics teacher education, within the framework of the norms regulating instructional planning activities. It aims to examine the norms that characterize the activities of mathematics teacher candidates to plan the teaching of a learning outcome and to share this plan with classmates, which is one of the main activities carried out in the MTM course. In this context, the answer to the question “What are the classroom norms that regulate the instructional planning

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activities of mathematics teacher candidates?" will be sought in the present study. These classroom norms, which differ from social and socio-mathematical norms as norms regulating teaching activities in a classroom for teacher education, can be addressed as an extension of social norms or normative issues of instructional planning activities. Additionally, a limited number of its examples can be found in the literature (e.g., Dick, Szctajn, White, & Heck, 2018). Many studies conducted in different classroom levels and environments regarding the importance of establishing social and socio-mathematical norms are frequently noted in the literature (e.g., elementary (Cobb & Yackel, 1996a; Levenson, Tirosh, & Tsamir, 2006; Lopez & Allal, 2007; 2009; Sekiguchi, 2005), university (Hershkowitz & Schwarz, 1999; Stylianou & Blanton 2002; Yackel, Rasmussen, & King, 2000), teacher education (Dixon et al., 2009; McNeal & Simon, 2000; Sanchez & Garcia, 2014) and professional development (Clark, Moore, & Carlson, 2008; Elliot et al., 2009; Tsai, 2004; 2007)). However, while teachers' central role in establishing and sustaining norms is known, it can be said that there are limited number of studies on teacher education and these classroom norms which are different from social and socio-mathematical norms (e.g., Dick et al., 2018; Güven & Dede, 2017). Moreover, in these studies, it is observed that the cases in which productive norms are tried to be established intentionally in classrooms in order to teach and learn mathematics, are examined. The present study aims to identify and reveal the current situation as it is.

2. Theoretical Background

2.1. Classroom Microculture and Norms

Classroom is defined as a complex environment involving individuals who come together to create a community (Levenson, Tirosh, & Tsamir, 2006). Classroom, like any other social group with continuity, also forms and develops a unity of common culture and social relationship pertaining to its members (Gallego et al., 2001). Each classroom produces, sustains, modifies or eliminates various patterns such as norm, standard, obligation, rule, routine etc. (Sekiguchi, 2005). Beyond the common characteristics of a general classroom culture, this means that each classroom constitutes and develops its own microculture (Lopez & Allal, 2007). The concept of norm can be defined as the ideas that determine the behavior, attitude, state and movements expected to be done by a group member under certain conditions (Homans, 1951). Likewise, Cobb, Wood, Yackel, and McNeal (1992), and Cobb and Yackel (1996a) also use the norm to define and meet the mutual expectations in the classroom generated through interaction between teachers and students. In addition, norms also provide concrete ideas that help to understand the activities carried out in the classroom, the characteristics of the activities, or how they are conducted (Cobb, Stephan, McClain, & Gravemeijer, 2001).

2.1.1. Social and Socio-mathematical Norms. Cobb and Yackel (1996a) distinguished the norms that regulate classroom microculture as social and socio-mathematical norms. Social norms refer to social interaction issues of the classroom that become normative (Yackel et al., 2000). These norms are general classroom norms; namely they can be applied to any content and are not directly specific to mathematics or to another content. While social norms usually show normative interactions in a classroom setting, socio-mathematical norms refer to the normative understandings of mathematics (Yackel et al., 2000). For example, whereas the understanding that during the discussion of a problem students should propose a different solution(s) than the solution(s) already being made is a social norm, the identifying and questioning of the understanding what can generate mathematical difference in these solution(s) is a socio-mathematical norm (Cobb & Yackel, 1996b; Yackel et al., 2000).

Norms are the basic thoughts and ideas that characterize classroom activities. In this context, the norms of a classroom society that conducts activities based on instructional planning would also be affected by the nature of these activities. Therefore, in these classrooms, norms which would represent the normative issues of teaching activities and differentiate from social and socio-mathematical norms, could be observed. Unlike social and socio-mathematical norms (Cobb & Yackel, 1996a), these norms are the norms that regulate and characterize activities carried out in the context of teacher education. These norms, which are specific to classrooms that conduct such pedagogical activities, can be considered as teaching norms, an extension of social norms, or normative aspects of teaching activities. Dick et al. (2018) name these norms as "socio-pedagogical norms" (p. 297).

2.2. Instructional Planning

Teachers are professionals who take professional decisions based on intuition, skill and expertise (Ball, 1991). In this context, planning teaching situations, which makes it possible to make decisions that respond to the needs of students (Bellon, Bellon, & Blank, 1992), is one of the two primary tasks of teachers to realize learning. In fact, the competence of planning and regulation of mathematics teaching has taken its place among the 6 basic competences identified by the Ministry of National Education in 2008. Teachers' competencies that are to be the basis for questioning and developing the qualities of teachers, who play a major role in learning and teaching processes, are defined as "the knowledge, skills and attitudes that teachers should have in order to perform their teaching profession effectively and efficiently" (MEB, 2008: VIII). The sub-competence of this basic competence is appropriate planning for teaching. By its very nature, teaching, which is a process of attempting to bring about positive changes in students (Arends, 1991), is a complex process that requires the teacher to conceptualize the situations that are likely to occur (Sánchez & Valcárcel, 1999). In this process, one of the most complex and important tasks of teachers is the instructional planning (Yinger, 1980; 2001). A teacher's instructional planning directly affects what happens in the classroom during teaching (Muth & Alvermann, 1992).

2.2.1. Sub-competence of Appropriate Planning for Teaching. Planning can be defined as a set of basic psychological processes in which a person visualizes the future, takes an inventory of objectives, and structures a framework to guide his/her possible actions in the future (Clark & Peterson, 1984). Instructional planning requires deciding on the most effective way of organizing the classroom and learning activities to enable students to participate in classrooms as active learners. Instructional planning involves thinking about creative ways to motivate students to explore topics that may lead them to think of questions that might help them connect with events, ideas that do not initially interest students (Singer, Murphy, Hines, & HNTN, 2003).

3. Methodology

In this study, the classroom norms that regulate mathematics teaching activities are examined in classroom microculture of a mathematics education course (MTM). In this respect, this is a case study based on the qualitative design. The existing situation of the classroom society examined without any intervention (Stake, 1995; Yin, 2013). The case investigating in the study was the classroom microculture constituted by undergraduate students and faculty member. The norms of the instructional planning activities that characterize the classroom microculture were the unit of analysis.

3.1. Study Group

In this study, since it was aimed to examine the socio-pedagogical norms of teaching, the MTM course, that is one of the courses in which teaching activities are performed at the most intensive way, was selected as the context by employing purposeful sampling method. The students who have taken this course, and the faculty member who have taught the course constitute the study group. Therefore, in the selection of students and faculty members, easily accessible and criterion sampling methods are used. In this context, the study group was consisted of students of a secondary mathematics education department from a state university in Turkey and one of the faculty members in the same department. The faculty member who is the instructor of the course has more than 20 years of professional experience. The students, who participate in the study have already taken the mathematics content courses, mathematics education courses and educational sciences courses which are the prerequisite of this course. Some of the courses that students have taken so far are as follows: Multivariable Calculus, Algebra, Measurement and Assessment, Methods of Teaching Mathematics-I, Instructional Technology and Material Development and Developmental Psychology.

3.2. Lesson Contents and Teaching Arrangements of MTM

The MTM course examined in this study aims to provide students with the basic skills of mathematics education, such as planning and organizing mathematics teaching, and assessment and evaluation. Within the scope of this course, students study in groups, and sit together with their own groups at round

tables. In this course, students are supposed to plan to the finest details designing, instructing and evaluating a course aimed at teaching a learning outcome within the mathematics curriculum, and to share it with their classmates.

3.3. Data Collection and Process

The data were collected through in-class non-participant observations and field notes regarding the course which were taken by the researchers in the lesson and after the lesson. The observations focused on the planning, performing and evaluating of teaching activities for the course that is examined in this study, the patterns and regularities in the behavior and ways of interaction of students and teachers, the process of organizing collective activities in the class society, and the planning activities of mathematics teaching, in which all individuals and the whole class participated (e.g., Cobb et al., 2001; Lopez & Allal, 2007). Observations were video and audio-recorded. The data collection process continued during two lessons per week in two months, and video recordings lasted approximately 5 hours 17 minutes. The class observations were ended at the point where it is considered that the theoretical saturation of the obtained data was achieved (Arber, 1993). In the literature for determination of norms, it is also observed that observations are made in periods close to the present study (e.g., Lopez & Allal, 2007). In the field notes, the behaviors and discourses that were predicted to be norm during the observation were recorded and compared with the analysis of the transcripts of the video and audio recordings during the analysis phase.

3.4. Analysis of Data

In the study, for the data analysis, the methodological suggestions provided by Bowers, Cobb and McClain (1999), Cobb et al. (2001), and Lopez and Allal (2007) for the identification of norms were considered. In this context, in order to determine the norms of a classroom microculture, the followings are required: (i) the behavior and ways of interaction of teachers and students during classroom discourse, and ii) social interaction patterns of the classroom, and iii) the explicit and implicit regularities within these patterns. In order to address the discourse, behavior, and thoughts as a regularity, the frequency of repetition and the acceptance by classroom society must be taken into account. Clearly expressing norms in classroom society is not a necessary condition (Sánchez & García, 2014; Sekiguchi, 2005). For example, the teacher's question 'Why?' to an answer such as 'This is the case', and the students' attempt to explain can reveal the norm in which ideas should be justified in the classroom. On the other hand, a social norm of the classroom can be expressed clearly. For example; the phrase of "Everybody should place value on learning, not the grade" is clear sign of a social norm of the classroom (Güven & Dede, 2017; Sánchez & García, 2014). Considering that a norm should be supported and implemented by the majority in the classroom society (Sfard, 2008), the following conditions should be considered for the conjectured norms, and these should be compared with each other (Cobb et al., 2001):

- The actions and discourses that could be a clue for this norm
- The actions and discourses which prove or disprove the existence of this norm
- The negative reactions to the conformity to/in violation/ignorance of this norm
- The conditions which would lead to establish a new norm

Therefore, in this study constant comparative analysis method was used to reveal the qualitative differences in the classroom microculture. These conditions were searched in the data and compared with each other, the conjectured norms were compared constantly other norms (established and conjectured).

3.5. Reliability of the Study

During the data collection phase, it was taken care to preserve the microculture of the classroom. Transcripts of the video and audio recordings were made in chronological order. Students and the faculty member are familiar the participation of the researchers and video-recording of the lessons for a year long period. For the analysis of the data, the analysis of video and audio recordings were primarily and independently made by each researcher. Then, they were handled together, and it was tried to reach a common consensus. For example, the conditions determined by the researchers as evidence for the

existence of a norm or as an example of a violation of the norm were compared, discussed in detail, and it was decided whether the norm was sustained or not.

On the other hand, in the analysis of audio and video recordings, no changes were made in terms of the statements about teacher candidates and the lecturer of the course, the statements were quoted exactly. After the transcripts made in this way, the relevant records were submitted for the approval of the teacher candidates and the lecturer. In this way, member checking was used for the reliability of the study. In addition, peer review, which is called as an external control mechanism, was also used for the reliability of the research data (Lincoln & Guba, 1985). In this context, expert opinion was obtained from two research assistants. The experts were doing Ph.D. in mathematics education. They had knowledge about the content of the MTM course, participated more than one semester to assist the lecturer to the lesson, and thus were familiar with the classroom environment closely. Experts were asked to examine whether the norms and the representative excerpts given for these norms represent each other or not, and whether there are conflicting norm or not, and the statements of norms. In the light of expert opinions, mutually inclusive or similar norms were set, and the statements of some norms were corrected. For example, the norm, "The readiness of the students should be taken into consideration in the instructional planning" is firstly stated as "The students' prior knowledge should be taken into consideration in the instructional planning". However, within the framework of the experts' opinion that this statement does not fully reflect the norm, the statement of norm was changed as readiness of the students. As a result of the analysis of all data and categories, the correlation coefficients between the researchers and the experts were calculated as 0.89 and 0.87, respectively.

4. Results and Discussion

It was determined that the findings obtained from the study, in which the teacher candidates' designing teaching activities were analyzed, fell into two main categories. These are: (i) the norms established by the classroom community; and (ii) the norms established within the classroom microculture through continuous encouragement, emphasis, and suggestion by the instructor on the explicit negotiation of norms.

4.1. Norms Established by Classroom Community

According to the findings of the study, the norms established by the classroom community are given below:

- It is important to encourage mathematical thinking in mathematics teaching.
- Learning through discovery in mathematics teaching is important.
- The readiness of the students should be taken into consideration in instructional planning.
- It should be acted within the framework of the relevant learning outcome in instructional planning

The norms determined to be sustained in the classroom microculture and the representative excerpts related to these norms are summarized in Table 1.

Table 1. *Explanations and Representative Excerpts of Norms Established by Classroom Community*

| Norms | Explanations and representative excerpts |
|---|---|
| It is important to encourage mathematical thinking in mathematics teaching. | Student (S) 1: Professor! For example, we have seen questions about abstraction. Thus, thanks to these questions, the student is gaining the ability to think mathematically in a proper way. |
| Learning through discovery in mathematics teaching is important. | S7: Professor! The questions, the activity was nice, but they could have been a little more thought-provoking. I have observed very little exploration ... orientation toward discovery. |

| | |
|--|--|
| <p>The readiness of the students should be taken into consideration in instructional planning.</p> | <p>S9: Professor, for example, I think the student would be very comfortable over this presentation. Because they've linked so much to the previous topic. If I were a student, since I know it it means that it is not something very different from what I knowit is linked... like if I know it I can make it very easily... For example, when we teach integral like this, I always say that if you know the derivative very well, you do not have any problems. I think this is the same and it has been very good. Very well placed on what the student knows. When I am teaching it, since I always link it with the derivative students get very relieved. I think this is also the same, and I mean it is very good too. It is very well added upon what the student knows.</p> <p>Or</p> <p>Instructor (I): So.... to take its symmetry... why should they take its symmetry? Why do you have students take its symmetry?</p> <p>S2: Professor! They had already learned how to take the symmetry of a function on the subject of functions while they were taking the reciprocal of a function.</p> <p>Or</p> <p>I: Can a child be asked to run who cannot walk? We're bringing the difficult one without grasping the subject.</p> |
| <p>It should be acted upon the relevant learning outcome in instructional planning.</p> | <p>S8: It led to an adequate start for students according to the limitations of the learning outcome.</p> <p>Or</p> <p>S7: I like the last question for assessment that have been very nice for students who have already finished ... but it would be even better if we make that question a little more difficult.</p> <p>S9 (Presenting Student): But there is something. Our learning outcome is about that inverse of exponential function is the logarithmic function. If it was a bit broader, as you and my friend said (he points his fellow), those might have been the questions going deeper, but since our learning outcome was the only learning outcome, there was little.</p> <p>Or</p> <p>I: In which category of the bloom taxonomy does the learning outcome fall?</p> <p>S5: Professor! Our learning outcome is in the form of writing the equation of the ellipse parabola, and performing.</p> <p>I: In which group is writing, forming? Is it in the comprehension, or the analysis or the synthesis or the evaluation?</p> |

When Table 1 is examined, it is possible to observe the active participation and emphasis of the teacher candidates in addition to the teacher's emphasis. Similarly, it is also seen on Table 1, some of the norms that teacher candidates pursue are pedagogical norms for teaching, that is, norms that should be applied by any teacher candidate (e.g., it should be acted within the framework of learning outcome in the instructional planning), while some of them are the norms that are for mathematics teaching, and should be exhibited by a mathematics teacher candidate (e.g., encouraging mathematical thinking in mathematics teaching is important). Therefore, it can be said that socio-pedagogical norms are influenced by the context in which teaching activities are carried out. Additionally, classroom community established the norm "*The readiness of the students should be taken into consideration in instructional planning*" considering hierarchical nature of the mathematics and mathematics content. The consideration of the teacher candidates about the limitations of the learning outcome is related to this readiness norm. The norm about considering the limitations of learning outcome includes next learnings of the students.

4.2. Norms Established by the Emphasis of Instructor

At the end of the study, the norms established in classroom microculture through continuous encouragement, emphasis and reminder by the instructor is given below:

- It should be revealed that whether students acquire learning outcome or not.
- The language used in this classroom is important.
- The learning outcome's significance for curriculum should be taken into consideration.
- The goals for students' acquisition of learning outcome should be specified.

The norms established with the encouragement of the teacher in the classroom microculture and the representative excerpts are presented in Table 2.

Table 2. Explanations and Representative Excerpts of the Norms Established by the Emphasis of Instructor

| Norms | Explanations and representative excerpts |
|--|--|
| It should be revealed that whether students acquire learning outcome or not. | The assessment and evaluation should be appropriate to the students' levels and the goals for students' acquisition of learning outcomes. S7 explains the objectives of asking each of the questions: S8: There are questions about writing. I think it is enough in terms of diversity ... A good assessment question is prepared based on their learning outcomes ... based on the limitations of the learning outcomes. I: Well. S8: In other words, it is for the learning outcome in a way to understand whether that it is acquired or not. |
| The language used in this classroom is important. | It means the correct use of Turkish, the correct use of the terms related to the content, and also that explanations and statements should be clear-cut. I: Do not interrupt the sentence until it reaches you to your goal. You said "Identify", and he/she identified. What will happen? You have to go to the end and ask! |
| The goals for students' acquisition of learning outcome should be specified. | I: Why would they put it as a learning outcome? S6: I think that it means approaching depending on independent variable Or I: Well. Why is such a learning outcome' acquisition by children? S5: I'm sorry but I think that the limit is like ... on everyone's mind. |
| The learning outcome's significance for curriculum should be taken into consideration. | I: You gave proofs to students. For example, do students already know proving? S7: Professor! For instance, because what we get it done in rational numbers. I: But they see the proof and proving at Grade 11, right? S6: But Professor, in the beginning of the Grade 9, they see the proof by induction. I: Will they prove this by induction? Is this learning outcome in the last curriculum? S7: Yes. I: Then, the proof activities are in the Grade 11.... Look! I caught your failure ... the learning outcome planning by a mathematics teacher... S7: No, I didn't understand it... but we did it here the last time. I: I do not know it... [To the classroom community] These friends are weak in curriculum literacy. S6: But for example, because I think the student can prove it alone. I: You need to say to us "Friends, I've reviewed that this is here, it is there in the curriculum...." |

As it can be seen on Table 2, it can be said that teacher candidates' difficulties in sustaining and participating norms are related to assessment and evaluation, teaching knowledge and identification of objectives, and the social language used. When the explanations and representative excerpts of the norms are examined, the emphasis of the instructor on the application of these norms is noteworthy. The norm that "*It should be revealed that whether students acquire learning outcome or not*" is about the assessment and evaluation. In this classroom teacher candidates and instructor consider that the planning

teaching should include planning assessment and evaluation. And according to the relevant norm, the classroom community should consider that the assessment and evaluation should be appropriate to the students' levels and the goals for students' acquisition of learning outcomes. It can be understood from the statement of S8 that "[...] A good assessment question is prepared based on their learning outcomes ... based on the *limitations* of the learning outcomes". The other norm "*The language used in this classroom is important*" includes correct use of Turkish language and the terms related to the education. This norm also necessitates the clear explanations and statements from the classroom community. The norm "*The learning outcome's significance for curriculum should be taken into consideration*" means that a teacher should know curriculum and learning outcome, and should know about the relation between the curriculum and learning outcome in terms of mathematics education. In the representative excerpts of this norm, students don't have enough knowledge about in which grade the learning outcome is. It became evident when the instructor searched their curricular knowledge about proof and proving. The norm "*The goals for students' acquisition of learning outcome should be specified*" indicates that teachers should reveal what they expect from students while and after teaching the learning outcome. Instructor's questions "why this learning outcome?" aims to make teacher candidates to think about the goals of the learning outcome.

4.3. Comparing the Norms of Instructional Planning Activities of Teacher Candidates

Teacher candidates were aware of the importance of mathematical thinking and discovery in mathematics teaching. These two norms that regulate the teaching planning activities were established by the classroom community through affected from the mathematical content. Other norms that require more encourage and emphasis are related to teaching goals, assessment and evaluation, the significance of LO for the curriculum, in other words they are related to special key points for teaching except the used language. While teacher candidates have been supporting with active participation the norm "*The readiness of the students should be taken into consideration in instructional planning*", they have experienced difficulty in sustaining the norm, which is one of the preconditions for applying this norm "*The learning outcome's significance for curriculum should be taken into consideration.*" There may be two reasons why teacher candidates experience difficulty in participating in and sustaining the norm about curriculum while trying to consider the level of readiness of students. One of them may be that teacher candidates do not have sufficient curriculum knowledge. Another reason may be that teacher candidates do not have enough knowledge that this knowledge for the readiness norm should be employed or how it should be employed. These possible reasons may also explain why the teacher candidates experience problems at the point of participating in the norm "*The learning outcome's significance for curriculum should be taken into consideration.*"

On the other hand, it is also determined that the instructor of the course experiences difficulty in establishing the norm "*The goals for students' acquisition of learning outcomes should be specified.*" The teacher candidates were not able to actively participate in and comply with the norm either. This result is also consistent with the relevant literature (e.g., Hiebert, Morris, Berk, & Jansen, 2007). This may be due to the fact that the relevant norm requires certain knowledge to be employed. In a study conducted with teachers, it was found that the teachers were partially sufficient in specifying the goals of learning outcome (e.g., Güven Akdeniz & Argün, 2018). Therefore, it can be mentioned here that the effect of the weakness of teacher candidates' knowledge about students. In the same study, it has been determined that the knowledge of the curriculum has a role in revealing the goals (Güven Akdeniz & Argün, 2018). At this point, considering that the teacher candidates cannot comply with the norm of the curriculum, the fact that the teacher candidates do not know the details of the curriculum, and the weakness of their student knowledge can be seen as the reason of the noncompliance with this norm.

5. Conclusion

Teacher candidates are expected to consciously initiate the establishment of productive norms in the classroom community which they have the teacher role. In this context, this study exemplified the norms mathematics teacher candidates had experienced in the teacher education microculture in the context of a lesson which is important for teacher training programs. Accordingly, it is thought that this study may

shed light on further studies focusing on raising the awareness of teacher candidates or teachers about norms and classroom microcultures. Additionally, one of the main differences of the study is that it examines the pedagogical norms in mathematics teaching. This study revealed the characteristics of activities that serve the purpose of MTM course that is the fundamental for a teacher training program by examining different types of norms. Thus, it provides insights for teacher training programs, mathematics teachers and teacher candidates.

In the study, the norms of the planning activities of mathematics teaching in a classroom microculture which belongs to the teacher education MTM course were investigated. According to the findings obtained from the study during the planning instruction, it was expected from the teacher candidates to encourage mathematical thinking and learning through discovery, to specify the goals and to consider students' readiness level, the learning outcome, assessment, and the language. In this context, it can be said that the norms, which teacher candidates experience difficulties in sustaining and participating, are related to assessment and evaluation, teaching knowledge, specifying objectives and social language used. At this point, while the language is related to a culturally different acquisition, it is thought that other related norms may arise from the lack of pedagogical content knowledge of teacher candidates.

It will not be realistic to expect teachers to exhibit and maintain the behaviors they do not have any experience on (McNeal & Simon, 2000). According to the studies conducted, it is observed that teacher candidates sustain the behaviors acquired through the norms they had experienced in the professional lives of the teacher candidates (Van Zoest, Stockero, & Taylor, 2012). Therefore, it has become important to ensure that teacher candidates experience efficient classroom microcultures. It can be seen in the present study that norms sustained and emphasized by the instructor are productive norms for teacher education. For example, the norm "*The goals for students' acquisition of learning outcomes should be specified*" is a productive norm. Teachers perceptions and skills that specifying what students should learn is the first step for the other planning and regulations of teaching (Ball & McDiamird, 1999; Morris, Hiebert, & Spitzer, 2009). The importance of the norms that necessitates curriculum knowledge and readiness of students can be understood from the literature that emphasizes the importance of knowing students' mathematical background (Ball, 2003), constructing of new learning on these (National Council of Teachers of Mathematics, 2000), and curriculum knowledge (Grossman, 1990; Ma, 1999).

The main function of the plan is to ensure that all the elements included in the planning and curriculum are employed as a whole in mutual interaction and the desired goals are achieved (Yılmaz & Sünbül, 2003, p.61). In this context, the following key points, that are highlighted in the identified norms, the interactions among the learning outcome, assessment -evaluation and the objectives of the curriculum are implicitly emphasized. The objectives of the curriculum are taken into account through these classroom norms and the point to be reached is determined in advance.

The norms are not psychological processes or existences that can be attributed to any person. The norms characterize regularities in classroom activities conducted collectively and are established in a participatory manner by students and teachers who are members of the classroom community (Cobb et al., 2001; Hershkowitz & Schwarz, 1999). Additionally, teachers are an institutionalized authority that initiates, organizes and guides the details of the establishment of the norms in the classroom (Cobb et al., 2001; Hershkowitz & Schwarz, 1999). Similarly, as it is seen in the present study, the teacher candidates and the instructor established and sustained the norms together collectively, however, some norms are sustained with the continuous encouragement and emphasis of the instructor.

6. Suggestions for Mathematics Teacher Education

The experience of teacher candidates on efficient classroom microcultures is important for their professional future. Although the identified norms are productive norms for teacher education in this study, these norms were mostly implicit, so there were difficulties in teacher candidates' conforming to and sustaining these norms. Therefore, it is necessary to explicitly negotiate the productive norms by classroom community. To do this, the studies to encourage teacher candidates enact and sustain the productive norms could be carried out deliberately and explicitly. As a matter of fact, teachers' ability to understand the norms, the effects and importance of the norms on learning is a first step in establishing

and developing norms in their own classrooms (Van Zoest, Stockero, & Taylor, 2012). In the literature, it has been stated that the unsuccessful practices of the teacher candidates are not entirely dependent on teacher candidates, and that teacher education programs should form a model to the teacher candidates by using different strategies, methods and techniques in the teaching (Mapolelo, 1999).

References

- Arber, S. (1993). Designing samples. In N. Gilbert (Ed.), *Researching social life* (pp. 68–92). London, UK: Sage.
- Arends, R. I. (1991). *Learning to teach (second edition)*. New York, NY: McGraw-Hill.
- Ball, D. L. (1991). *Implementing the NCTM standards: Hopes and hurdles* (Issue Paper 92- 2). East Lansing: Michigan State University, The National Center for Research on Teacher Learning.
- Ball, D. L. (2003). *What mathematical knowledge is needed for teaching mathematics?* Paper presented at the US Department of Education, Secretary's Mathematics Summit, Washington, DC.
- Baturo, A., & Nason, R. (1996). Student teachers' subject matter knowledge within the domain of area measurement. *Educational Studies in Mathematics*, 31(3), 235-268.
- Bellon, J. J., Bellon, E. C., & Blank, M. A. (1992). *Teaching from a research knowledge base: A development and renewal process*. New York, NY: Macmillan
- Bowers, J., Cobb, P., & McClain, K. (1999). The evolution of mathematical practices: A case study. *Cognition and Instruction*, 17(1), 25–66.
- Clark, P. G., Moore, K. C., & Carlson, M. P. (2008). Documenting the emergence of “speaking with meaning” as a socio-mathematical norm in professional learning community discourse. *Journal of Mathematical Behavior*, 27(4), 297–310.
- Clark, C. M., & Peterson, P. L. (1984). *Teachers' thought processes*. (Occasional paper no. 72.). East Lansing, MI: Michigan State University, Institute for Research on Teaching.
- Cobb, P., & Yackel, E. (1996a). Constructivist, emergent and sociocultural perspectives in the context of developmental research. *Educational Psychologist*, 31(314), 175-190
- Cobb, P., & Yackel, E. (1996b). Socio-mathematical norms, argumentation, and autonomy in mathematics. *Journal for Research in Mathematics Education*, 27(4), 458–477.
- Cobb, P., Stephan, M., McClain, K., & Gravemeijer, K. (2001). Participating in classroom mathematical practices. *Journal of the Learning Sciences*, 10, 113–164
- Cobb, P., Wood, T., Yackel, E., & McNeal, B. (1992). Characteristics of classroom mathematics traditions: An interactional analysis. *American Educational Research Journal*, 29, 573–604
- Cobb, P., & McClain, K. (2001). An approach supporting teachers' leaning in social context. F. L. Lin & T. J. Cooney (Eds.), *Making sense of mathematics teacher Education*, 207-231. Kluwer Academic Publisher. Printed in the Netherland.
- Crespo, S., & Nicol, C. (2006). Challenging preservice teachers' mathematical understanding: The case of division by zero. *School science and mathematics*, 106(2), 84-97.
- Dick, L. K., Sztajn, P., White, T. F., & Heck, D. J. (2018). Investigating socio-pedagogical norms: Teachers' discussions about own and others' instruction. *Teaching and Teacher Education*, 71, 297-307.
- Dixon, J. K., Andreasen, J. B., & Stephan, M. (2009). Establishing social and socio-mathematical norms in an undergraduate mathematics content course for prospective teachers: The role of instructor. *AMTE Monograph*, 6, 43–66.
- Elliott, R., Kazemi, E., Lesseig, K., Mumme, J., Carroll, C., & Kelly-Petersen, M. (2009). Conceptualizing the work of leading mathematical tasks in professional development. *Journal of Teacher Education*, 60(4), 364–379.
- Gallego, M. A., & Cole, M., & The Laboratory of Comparative Human Cognition. (2001). Classroom

- cultures and cultures in the classroom. In V. Richardson (Ed.), *Handbook of research on teaching* (4th ed., pp. 951–997). Washington, DC: American Educational Research Association
- Grossman, P. L. (1990). *The making of a teacher: Teacher knowledge and teacher education*. Teachers College Press.
- Güven Akdeniz, D., & Argün, Z. (2018). Learning Outcome Literacy: The Case of Five Elementary Mathematics Teachers. *Australian Journal of Teacher Education*, 43(11), 3.
- Güven, N. D., & Dede, Y. (2017). Examining Social and Socio-mathematical Norms in Different Classroom Microcultures: Mathematics Teacher Education Perspective. *Educational Sciences: Theory and Practice*, 17(1), 265-292.
- Hershkowitz, R., & Schwarz, B. (1999). The emergent perspective in rich learning environments: Some roles of tools and activities in the construction of socio-mathematical norms. *Educational Studies in Mathematics*, 39(1–3), 149–166.
- Hiebert, J., Morris, A. K., Berk, A., & Jansen, A. (2007). Preparing teachers to learn from teaching. *Journal of Teacher Education*, 58(1), 47–61.
- Homans, G. C. (1951). *The human group*. London, UK: Routledge & Kegan.
- Kinach, B. M. (2002). A cognitive strategy for developing pedagogical content knowledge in the secondary mathematics methods course: Toward a model of effective practice. *Teaching and teacher education*, 18(1), 51-71.
- Levenson, E., Tirosh, D., & Tsamir, P. (2006). Mathematically and practically-based explanations: Individual preferences and socio-mathematical norms. *International Journal of Science and Mathematical Education*, 4(2), 319–344.
- Levenson, E., Tirosh, D., & Tsamir, P. (2009). Students' perceived socio-mathematical norms: The missing paradigm. *The Journal of Mathematical Behavior*, 28, 171–187.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.
- Lopez, L. M., & Allal, L. (2007). Socio-mathematical norms and the regulation of problem solving in classroom microcultures. *International Journal of Educational Research*, 46(5), 252–265.
- Ma, L. (1999). *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States*. Mahwah, NJ: Lawrence Erlbaum Associates
- Mapolelo, D. C. (1999). Do pre-service primary teachers who excel in mathematics become good mathematics teachers? *Teaching and Teacher Education*, 15(6), 715-725. [https://doi.org/10.1016/S0742-051X\(99\)00012-8](https://doi.org/10.1016/S0742-051X(99)00012-8)
- McNeal, B., & Simon, M. A. (2000). Mathematics culture clash: Negotiating new classroom norms with prospective teachers. *Journal of Mathematical Behavior*, 18(4), 475–509
- Ministry of National Education (MEB) (2008). *Öğretmen yeterlikleri: Öğretmenlik mesleği için genel ve özel alan yeterlikleri*. Ankara: Öğretmen Yetiştirme ve Denetimi Genel Müdürlüğü
- Morris, A. K., Hiebert, J., & Spitzer, S. M. (2009). Mathematical knowledge for teaching in planning and evaluating instruction: What can preservice
- Muth, K. D., & Alvermann, D. E. (1992). *Teaching and learning in the middle grades*. Boston: Allyn and Bacon.
- National Council of Teachers of Mathematics (2000). *Principles and standards for school mathematics*. Reston, VA: NCTM.
- Sánchez, V., & García, M. (2014). Socio-mathematical and mathematical norms related to definition in pre-service primary teachers' discourse. *Educational Studies in Mathematics*, 85, 305–320.

- Sánchez, G., & Valcárcel, M. V. (1999). Science teachers' views and practices in planning for teaching. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, 36(4), 493-513.
- Sekiguchi, Y. (2005). Development of mathematical norms in an eighth-grade Japanese classroom. *International Group for the Psychology of Mathematics Education*, 4, 153–160.
- Sfard, A. (2008). *Thinking as communicating: Human development, the growth of discourses and mathematizing*. Cambridge, UK: Cambridge University Press.
- Singer, A. J., Murphy, M., Hines, S. M., & Holfstra New Teachers Network (HNTN), (2003). Book: proclass practices—planning, relationships, organization, community. Teaching to Learn, Learning to Teach. *A Handbook for Secondary School Teachers*. 63-71. London: Lawrence.
- Stake, R. (1995). *The art of case study research*. Thousand Oaks, CA: SAGE.
- Stylianou, D. A., & Blanton, M. L. (2002, July). Sociocultural factors in undergraduate mathematics: The role of explanation and justification. In *Proceedings of the Second Annual Conference on the Teaching of Mathematics*, Crete, Greece.
- Tsai, W. H. (2004). Supporting teachers on developing teaching norms based on children's learning mathematics. In M. J. Høines, & A. B. Fuglestad (Eds.), *Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education*, 4, 329–336.
- Tsai, W-H. (2007). Interactions Between Teaching Norms of Teacher's Professional Community and Learning Norms of Classroom Communities. In Wood, J. H. Lew, H. C. Park, K. and Seo, D. Y. (Eds). *Proceeding of the 31st Conference of the International Group for the Psychology of Mathematics Education*, 4, 217-224.
- Van Zoest, L. R, Stockero, S. L., & Taylor, C. E. (2011). The durability of professional and socio-mathematical norms intentionally fostered in an early pedagogy course. *Journal of Mathematics Teacher Education*, 15, 293–315. DOI 10.1007/s10857-011-9183-y
- Yackel, E., Rasmussen, C., & King, K. (2000). Social and socio-mathematical norms in an advanced undergraduate mathematics course. *Journal of Mathematical Behavior*, 19, 275–287.
- Yılmaz, H., & Sünbül, M. A. (2003). *Instructional planning and assessment* (Second Edition). Ankara: Mikro
- Yin, R. K. (2013). *Case study research: Design and methods*. SAGE.
- Yinger, R. J. (1980). A study of teacher planning. *The Elementary School Journal*. 80(3), 107-127.
- Yinger, R. (2001). Routines in teacher planning. *Theory into Practice*. 18(3), 163-169.

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