AN INVESTIGATION OF PRESERVICE MIDDLE SCHOOL MATHEMATICS TEACHERS' FORMATIVE ASSESSMENT APPROACHES THROUGH LESSON PLANNING

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Approval of the Graduate School of Social Sciences

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ABSTRACT

AN INVESTIGATION OF PRESERVICE MIDDLE SCHOOL MATHEMATICS TEACHERS' FORMATIVE ASSESSMENT APPROACHES THROUGH LESSON PLANNING

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This study attempted to investigate senior preservice middle school mathematics teachers' formative assessment approaches they planned to implement in a real classroom setting. A basic qualitative research design was employed in order to answer the research question of the study.

A total of 27 senior preservice middle school mathematics teachers who were enrolled in Elementary Mathematics Education Program (EME) during 2014-2015 Spring semester in a public university in Ankara participated in the study. A lesson plan task including an incomplete and improper lesson plan on equivalent fractions, a case in which preservice teachers assumed to be an inservice mathematics teacher, and four open-ended questions related to the lesson plan was administered. One-to-one interviews were conducted with 11 participants in line with their diverse answers to the questions in the given task.

Findings of the study revealed that preservice teachers were unable to determine the improperness of some basic concerns that should be taken into account in lesson planning. Moreover, they made little or no benefit of questioning and observation which could be utilized to enhance students' learning process. The participants were disposed to use questioning rather than observation method as a formative assessment strategy and they mostly tended to ask questions for recalling the previous knowledge of the students or drawing their attentions to the current topic. Findings also indicated that all preservice teachers underlined very similar purposes in preparing the assessment part of the lesson plan, all of which related to the teacher actions.

Keywords: Formative Assessment Strategies, Teacher Education, Questioning, Preservice Mathematics Teachers.

ÖZ

ORTAOKUL MATEMATİK ÖĞRETMENİ ADAYLARININ BİÇİMLENDİRİCİ DEĞERLENDİRME YAKLAŞIMLARININ DERS PLANLAMASI YOLUYLA İNCELENMESİ

Kaplan, Gözde

Yüksek Lisans, İlköğretim Bölümü

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Bu çalışmada son sınıf ortaokul matemaktik öğretmeni adaylarının gerçek bir sınıf ortamında uygulamayı planladıkları biçimlendirici değerlendirme yaklaşımları araştırılmıştır. Araştırma sorusuna yanıt aramak için temel nitel araştırma yöntemi kullanılmıştır.

Çalışmaya 2014-2015 Bahar döneminde Ankara'da bir devlet üniversitesinde İlköğretim Matematik Öğretmenliği (İMÖ) programına kayıtlı olan 27 son sınıf ortaokul matematik öğretmeni adayı katılmıştır. İçerisinde tamamlanmamış ve hatalı bir ders planı, katılımcıların kendilerini ortaokulda çalışan bir matematik öğretmeninin yerine koymaları gereken bir durum ve ders planıyla ilgili dört tane açık uçlu soru bulunan ders planı testi katılımcılara uygulanmıştır. Katılımcıların teste verdikleri farklı yanıtlar doğrultusunda 11 öğretmen adayıyla bireysel görüşmeler yapılmıştır.

Çalışmanın bulguları öğretmen adaylarının ders planlamasında dikkat edilmesi gereken temel unsurlardaki hataları fark edemediklerini ortaya koymuştur. Ayrıca öğretmen adaylarının öğrencilerin gelişimleri hakkında bilgi sahibi olmak için en çok kullanılan sorgulama ve gözlem yapma yöntemlerinden öğrencileri değerlendirmede ya az faydalandıkları, ya da hiç faydalanmadıkları görülmüştür. Öğretmen adaylarının öğrencileri değerlendirmede gözlemden çok sorgulama yöntemine başvurdukları ve sorgulama yöntemini en çok öğrencilere bir önceki derste yapılanları hatırlatmak ve onların derse olan ilgilerini arttırmak için kullandıkları belirlenmiştir. Bunun yanında katılımcıların neredeyse tamamı, ders planının değerlendirme kısmından elde edilecek olan dönütten öğrencilerin de yararlanabileceği gerçeğini görmezden gelmişlerdir.

Anahtar Kelimeler: Biçimlendirici Değerlendirme Stratejileri, Öğretmen Eğitimi, Sorgulama, Matematik Öğretmeni Adayları.

To Memory of My Lovely Father

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LPT	Incomplete and Improper Lesson Plan Task

CHAPTER I

INTRODUCTION

In today's world, it is necessary for all human beings to understand and do mathematics and gain sufficient mathematical competence to shape their futures and to be successful in life (Ministry of National Education (MoNE), 2009). In order to achieve this competence, classroom instruction in schools needs to be more effective and direct students to be more productive. This occurs when the teachers understand what students have already know and need to learn, and then they challenge and reinforce students to learn it well (NTCM, 2000). There are many ways to make class instruction more effective, one of them could be done through assessment.

Assessment is a very broad term and complex process describing students' achievement and improvement by measuring both learning process and the end product (Doğan, Atmaca, & Yolcu, 2010). In the past, assessment was seen as a tool used for only grading purposes in order to investigate to what extent students had reached the intended objectives. Today, it is realized that assessment is more beneficial and has an effect on all stages of learning process (Segers, 2003). The role of the assessment in education have changed and gained importance as a significant factor in effective teaching and learning in the recent years (Black & William, 1998b). Since assessing students has a very crucial role in students' learning progress, preservice teachers need to realize the usefulness of assessment in instruction (Graeber, 1999) and have knowledge of monitoring how well students learn. One of the way of gathering information about students' learning progress is the formative assessment which can be used to improve students' performance and to shape learning (Wiliam,

2007). Hence, this study mainly focused on preservice teachers' formative assessment approaches they planned to implement in a real classroom setting.

1.1 Forms of Assessment

Assessment is defined in *Assessment Standards* as "the process of gathering evidence about a student's knowledge of, ability to use, and disposition toward mathematics and of making inferences from that evidence for a variety of purposes" (NTCM, 1995, p.4). This process is illustrated in Figure 1.1.

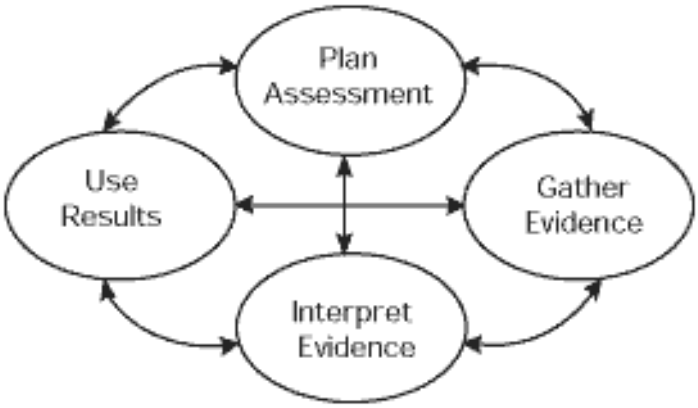


Figure 1.1 Four Phases of Assessment. (NCTM, 1995, p.4)

As it is seen in the figure, the assessment process involves four interrelated but non sequential phases. Decisions and actions, which occur within each phase, characterize the assessment process.

The phases of assessment are explained as follows (NCTM, 1995). Planning the assessment phase includes deciding the purpose the assessment will serve and the framework to be used for focusing on the activities. Also this phase involves the action of determining different methods used for assembling and interpreting evidence (NCTM, 1995). In gathering evidence phase, assessor creates or selects the activities and methods in order to engage students in the class procedures. NCTM (1995) states that interpreting evidence phase serves to identify the quality of the evidence gathered in the preceding phase and to decide on the criteria which is applied to evaluate the performances. Finally, the decision about how to report the findings and how to make inferences from those findings are the characteristics of the using results phase.

Moreover, in that phase, assessor can decide on the necessary actions based on the inferences (NCTM, 1995). These four phases show that assessment is a complex process in which the purposes of assessment are clarified, the decisions are made and the standards which assessment hold are set. Regardless of the assessment and the assessor, all phases which constitute the assessment process include some decisions and actions which affect each other. Hence, even though a role is assigned to each phase, the phases are interactive and they cannot be separated.

Assessment can be categorized based on its purpose into three as evaluative, summative, and formative assessments. Evaluative assessment examines into the quality of institutions or educational programs (Wiliam, 2007) and can be used as an indicator in order to take necessary actions to improve the quality of them (Perie, Marion, & Gong, 2007). Summative assessment also called as *assessment of learning* reveals the potential of the students (Wiliam, 2007). That is, it shows the level of accomplishment acquired by the students and it focuses on only measuring the students' learning rather than enhancing it (NTCM, 2007). On the other hand, formative assessment or *assessment for learning* is used purposefully *for learning* (Laud & Patel, 2013). Hence, it is different from the assessment which serves for certifying the competence (NTCM, 2007). It provides information to the teachers or to the students about the students' performance and teachers' instruction (Sadler, 1989). This information can be used as an evidence in order to make necessary chances in the teaching ways and strategies to meet students' learning needs (Black & Wiliam, 1998b; Wiliam, 2007) and to promote their learning (NTCM, 2007).

Formative assessment is crucial in understanding and doing mathematics and gaining mathematical competence by supporting and promoting learning (NCTM, 2000). Any assessment can be formative if it is used to gather evidence about students' learning progress and to identify their current level of understanding the concept (Heritage, 2007). In addition, it is necessary to make instructional adjustments according to students' needs (Wiliam, 2007). In formative assessment, students are actively engaged in classroom practices and they are responsible for their own learning (Heritage, 2007). Hence, establishing *where students are*, and *where they are going in*

their learning progress (Ramaprasad, 1983 as cited in Black & Wiliam, 2009) is the primary mission of the teachers to make students liable for their own learning.

Formative assessment should be seen as a significant and valuable process that can be followed in order to have information about students' learning. Hence, each step of the assessment needs to be decided and planned continuously (Heritage, 2007). Teachers should think and decide beforehand about how they will elicit students' thinking and understanding during the instruction.

1.2 Assessment in Lesson Planning

According to Tyler's (1950) linear-relational model of instructional planning, teachers are supposed to decide how to evaluate students before instruction begins (as cited in Campbell & Evans, 2000). These predetermined goals help teachers be aware of whether learning objectives and assessment are aligned with each other. Furthermore, since linear-relational model of instructional planning supports teachers to be more focused and have more sense of control during instruction, it is easy to manage classroom and assess students' achievements and teachers' instruction (John, 2006).

The Curriculum Leadership Institute (CLI) (2004) developed a Lesson Plan Resource System based on Tyler's Rationale. This system consists of files and lesson plans prepared by teachers. Each lesson plan was prepared regarding to some elements one of which is having an assessment part in each lesson plan. Moreover, it was proposed that a lesson plan resource should contain additional information about the description of assessment, administration guidelines for this assessment, criteria that describe the successful performance of assessment, rubric for scoring assessment and a context which current learning can be transferred (CLI, 2004). By this way, the teachers focus more on evaluating whether instruction and assessment are aligned with each other and they have a chance to revise their plan and self- assess it (Craft & Bland, 2004).

There are some other research conducted to develop a guide for teachers in order to help them organize their teaching practices. The Institute of Education Sciences (IES) (2007) prepared a practice guide which aims to provide teachers recommendations for

how to organize instruction and improve students' learning. In this practice guide, they offer some strategies to assist students in order to adapt what they have already known for the new situations. They provide seven recommendations, three of which is about what teachers can do as formative assessment practices. The IES (2007) recommends using quizzes in order to introduce a new topic and help students recognize knowledge of the subject longer. Also they advise providing feedback to incorrect responses of the conducted tests and quizzes to assist students improve the knowledge of content they have not mastered yet. Furthermore, they recommend asking deep questions to the students in order to support them build profound understanding of the topic. The IES recommendations (Pashler, Bain, Bottge, Graesser, Koedinger, McDaniel, & Metcalfe, 2007) guide elementary teachers while planning high quality mathematics lessons (Ding & Carlson, 2013).

Lesson planning is a significant process that should be considered in mathematics teaching since the quality of plans may have an impact on the quality of lessons (Morris, Heibert, & Spitzer, 2009). Achieving quality in plans also relies on carefully planned formative assessment practices. That is, teachers need to think and decide beforehand how they will assess students' learning and how they will make inferences from learning outcomes. Even though teachers' formative assessment approaches are documented in the literature, how formative assessments are developed and embedded by the teachers is little known (Ayala et al., 2008). On the other hand, how preservice teachers plan formative assessment practices for an effective mathematics teaching is important for their future teaching and their students' learning.

Knowing how to plan and implement formative assessment is essential for the teachers since they are supposed to organize their instruction to enhance students' learning with respect to their students' needs (Wiliam, 2007) As future teachers, preservice teachers also need to be qualified in planning and using formative assessment practices. Hence, teacher education programs play an essential role in raising the awareness of the preservice teachers about the importance of formative assessment practices and in teaching them how to plan and use formative assessment in their classes effectively as future teachers.

There are studies conducted to reveal formative assessment strategies which can be planned and enacted in the classrooms. Wiliam and Thompson (2008) improved a framework which was formed by building on the suggestions of Black and Wiliam (1998b); namely, questioning, feedback, sharing criteria, and self-assessment for formative assessment practices of the actors, teacher, peer, and learner in the classroom. These suggested strategies were examined within the scope of a research in order to determine the teachers' planned formative assessment strategies (Black, Harrison, Lee, Marshall, & Wiliam, 2003). The framework which the present study was also grounded on will be introduced in the literature chapter in detail.

Since lesson planning is a significant and necessary phase for organizing instruction in order to enhance students' learning, teachers need to employ relevant forms of assessment while they are preparing lesson plans for an effective teaching. Planned formative assessment is considered as one of the reasons underlying students' learning progress and teachers' effective classroom practices. While teachers are expected to conduct formative assessment in their teaching, how preservice teachers consider formative assessment issues in their planning also becomes important for their future teaching. However, to what extent preservice teachers employ formative assessment in their lesson planning has not been investigated much.

1.3 Purpose of the Study

The purpose of this study was to reveal senior preservice middle school mathematics teachers' formative assessment approaches they planned to implement in a real classroom setting. These approaches were investigated with respect to the formative assessment framework developed by Wiliam and Thompson (2008). More specifically, the research question that guided this study was as follows:

> What are the senior preservice middle school mathematics teachers' formative assessment approaches they integrate in a lesson plan?

1.4 Significance of the Study

Integration of the assessment and instruction is very essential in order to teach the concepts more effectively. Especially, formative assessment is the desirable one since the information gathered from the formative assessment feeds back and is used to enhance the formative assessment system itself (Wiliam, 2007). As one of the important part of the formative assessment system, teachers need to know much about how they can use formative assessment to enhance students' learning and to organize their instruction according to students' learning needs. Kaya (2009) emphasized the importance of assessment practices of preservice teachers as well and asserted that although there were 154 credits of course work which a preservice teacher had to complete, there was only one 3 credit course, measurement and assessment, which included assessment strategies and techniques. Hence, it is not known that whether the preservice teachers have graduated from their teacher education programs with sufficient knowledge of formative assessment strategies for their teaching and their students' learning. The findings of this study might be compared with other researchers conducted in order to provide information for the teacher education programs. By this way, the findings of the study might yield to changes in design of the assessment and practice teaching courses.

With the reform of the assessment and evaluation procedures, alternative assessment tools such as portfolio, concept maps, observation, self-assessment and project assessment have begun to be taken into account in measuring and assessing students' learning (Lee, Park, & Choi, 2011; MoNE, 2009). This reform leaded the researchers to conduct studies related to the beliefs or perceptions of teachers about the effectiveness of alternative assessment (Lee, Park, & Choi, 2011; Restorff, Sharpe, Abery, Rodriguez, & Kim, 2012), the usage or effectiveness of these newly introduced alternative assessment techniques (Buldur, 2009; Çetin, 2011; Miller & Smith, 2001; Orhan, 2007; Watt, 2005) and the impediments in the usage of these tools (Erdal, 2007; Gelbal & Kelecioğlu, 2007; Watt, 2005). However, how Turkish preservice teachers benefit from formative assessment in the field of mathematics has not been investigated much and the number of studies related to the formative assessment

practices of preservice teachers are very limited especially in mathematics field in Turkish literature (Köğce, 2012). Therefore, investigating how Turkish pre-service middle school mathematics teachers plan formative assessment practices would provide information on a rather neglected but important aspect of assessment.

Studies based on the theoretical basis of formative assessment approaches improved by Wiliam and Thompson (2008), are less common in the literature (Marshall & Drummond, 2006). Hence it is worthy to do an investigation related to the preservice mathematics teachers' formative assessment approaches they planned to integrate a lesson plan on the base of current theoretical framework. Besides, conducting a research based on this framework is significant in terms of having information about the usefulness of the framework.

1.5 My Motivation for the Study

Throughout my undergraduate study, I had a chance to improve my mathematical knowledge and teaching skills by means of the variety of courses I was offered. I have always wanted to learn more about the underlying theories of learning and instruction and this direct me to study a Master's degree related to Elementary Mathematics Education. Besides, especially Measurement and Assessment course I took during my undergraduate study, aroused my interest to the educational statistics and motivated me to study Measurement and Assessment in Education as the second Master's degree which strengthened my statistics background. The courses that I was offered in both Master's degree programs stimulated me to combine these two areas and to conduct my graduate study.

Another major motivation for me to conduct this study was to see the impact of preservice teachers' training in the teacher education program on their teaching practices. I believe in that the teacher education programs give several opportunities to the teacher candidates which they have never experienced when they were students. During my assistantship in Elementary Mathematics Education (EME) program in which the participants of the current study enrolled, I have had the opportunity to monitor what types of assessment methods or strategies they have been taught to

implement in their classrooms and how they have engaged in the valuable teaching practices and effective assessment strategies. These methods were new for them since throughout their primary, secondary and high school education, their learning were assessed through traditional assessment strategies. Hence, I was curious about whether preservice teachers could internalize these newly introduced assessment strategies and planned to implement them in a real classroom setting. This curiosity also directed me to conduct the current study.

1.6 Definition of Important Terms

Senior preservice middle school mathematics teachers are 4th year students of Elementary Mathematics Education program. They are trained to teach mathematics to grades 5 to 8 in middle schools.

Formative assessment refers to the classroom structures used to provide valuable information about teachers' instruction and students' performances. This information can be used to modify the teaching practices in order to meet students' needs (Black & Wiliam, 1998b; Wiliam, 2007). Within the scope of this study, clarifying learning intentions and success criteria, implementing questioning and observation, providing feedback to both the teacher and the students, and employing peer and self-assessments are the set of guiding principles which constituted formative assessment.

Lesson planning refers to making plans for anticipated classroom actions and responses that happen during the instruction. It is structured to promote the engagement of students with relevant real-world activities by considering their needs (Swearingen, 2014). In mathematics lesson planning, students' mathematical reasoning, their conceptions and misconceptions, common errors, procedures, and usage of multiple representations are taken into consideration by the teachers (Ball, Sleep, Boerst, & Bass, 2009). The way of lesson planning varies, but in this study participants were expected to consider learning objectives, introduction to the concept, organization of classroom activity or discussion, guidance for the activity or discussion, end of lesson review/summary, and assessment of students' learning in lesson planning.

Observation is the basis of teachers' formative assessment practices and a fundamental method by which the teachers gather information about what students understand and do (Torrance & Pryor, 2001). In this study, observation was used as a formative assessment strategy and specifically defined as the process of observing conditions, classroom discourse, and individual or groups of students while they were engaging in activities in order to gather evidences of their learning.

Questioning is a way to gain information about students' learning, stimulate their participation and promote and challenge their thinking (Black & Harrison, 2001) through asking questions.

Feedback is the information that the students and the teacher receive through the classroom practices concerning the relevance and accuracy of students' work (Eggen & Kauchak, 2004) and teachers' instruction. In this study, feedback also referred to the any response to students' misunderstanding and errors.

CHAPTER II

LITERATURE REVIEW

The purpose of this chapter is to present the theoretical background of formative assessment and related studies. This chapter begins with previous research which reveals why formative assessment is important and continues with describing the development of Wiliam and Thompson's (2008) theoretical framework on formative assessment. Then the review of the previous studies related to formative assessment practices of preservice and inservice teachers will be presented.

2.1 Research on the Importance of Formative Assessment

Employing formative assessment in classrooms has a substantial impact on students' learning. Some research concluded that providing formative classroom discussions and feedback improve students' performances in achievement tests (Dawes, Mercer, & Wegerif, 2000; Meisels, Atkins-Burnett, Xue, Bickel, & Son 2003). However, other research revealed that the effectiveness of power of feedback depends on the type of given feedback and its property. Finding of these research indicated that especially written comments had very significant effect on students' learning since when it was provided to the students, quality of their work (Butler, 1987, 1988) and achievement (Wilkinson, 1981) had improved; whereas those given other types of feedback had made no progress (Butler, 1987, 1988; Wilkinson, 1981) like those given no feedback (Butler, 1987).

Several studies have indicated that giving feedback increase the attitude of students as well as students' achievement. The research conducted by Elawar and Corno (1985) showed that the students receiving the constructive feedback, had higher scores on the achievement posttest than the students who were given only grades to their homework.

Also the students receiving the constructive feedback had higher average attitude scores on posttest than did the students given only grades. These results are consistent with literature which addresses that positive learning gains secured by formative feedback are associated with more positive attitudes toward learning (Black & Wiliam, 1998a; C. C. Kulik, Kulik, & Bangert-Drowns, 1990). Research findings which showed that the written feedback had positive effect on both students' attitudes and achievement (Tekin, 2010) is also presented in Turkish literature.

2.2 Theoretical Background of Formative Assessment

There is no single, universally agreed definition of formative assessment. However, educators have called the term *formative* after Scriven (1967) introduced it (as cited in Popham, 2008). He proposed to use the terms formative and summative in order to differentiate the role of educational evaluation. After Scriven, Bloom (1969) emphasized the same differentiation in classroom testing. He claimed that formative evaluation was more effective when it was not used for grading purposes and rather used to support teaching. After decades, this strict distinction between formative and summative testing was replaced with the idea that the same assessment can have both summative and formative function. Therefore, an assessment is formative if it shapes students' learning (Wiliam, 2007).

Black and Wiliam (1998b) defined formative assessment as all activities which provide feedback for adjusting teaching activities and instruction. It can be used by both the teacher and their students in order to assess their teaching and learning. Marzano (2006) mentioned the same aspects of formative assessment and added that it provides students information about their progress, and assists them to improve their learning through feedback.

Sadler (1989) defined formative assessment as the judgments about the quality of students' responses. He pointed out that it could be utilized to improve students' competence. With this point of view, he proposed a formative assessment framework. In this framework, he emphasized on the importance of teacher and student interaction and collection of assessment data in order to inform teachers about the students'

learning progress. Sadler (1989) stated explicitly in the framework that the learner has to (a) aim a reference level (standard) to achieve, (b) compare and contrast the current level of learning with the reference level (standard one), and (c) participate in appropriate action to improve his/her competence by eliminating the gap between the standard and current level of performance. The first two conditions in the framework are involved in grading processes since it is necessary to compare students' performance with the reference level or with one or more other similar cases while grading students' current performances. However, controlling of this process is assumed to include all conditions. In many cases, judgment of students' performance is derived from assessment practices without the engagement of students even if it is shared with the learners occasionally (Sadler, 1989).

Black and Wiliam (1998a) built their framework on Sadler's (1989) formative assessment framework with additional features as follows: (i) "the interactions between teachers and students and students with one another" (p.16) is a key issue for students' learning progress; (ii) feedback information has to be used in determining the nature and structure of the task in order to improve students' learning; (iii) "self and peer assessments by and between students are an important feature" (p.17); and (iv) students' confidence and motivation have an enormous impact on the effectiveness of students' work.

The interactions between teachers and students, and self and peer assessment were seen as essential elements of formative assessment and included in Black and Wiliam's (1998a) framework. Sadler (1989) also emphasized on peer appraisal as that it reduced the assessment workload of the teachers but he did not include this feature in his framework. In addition, the importance of students' confidence and motivation was emphasized as different features in Black and Wiliam's (1998a) framework and the usage of feedback was seen crucial in improvement of students' performances similar to the third condition of Sadler's framework.

Wiliam and Thompson (2008) focused on three instructional processes emphasized in Ramaprasad's (1983) definition of feedback. According to Ramaprasad, teachers are

traditionally responsible for establishing "where the learners are in their learning", "where they are going" and "what needs to be done to get them there" (1983, as cited in Black & Wiliam, 2009, p.7). However, the role undertaken by learners and their peers shouldn't be forgotten. Teachers are responsible for designing and implementing effective learning environments, whereas ideally the learners are responsible for making use of these environments (Black & Wiliam, 2009). Teachers also should clearly convey criteria or standards in order to create a productive learning atmosphere and learners should be aware of learning intentions and criteria for success. Furthermore, since all of these would occur in a community of learners, peers are also responsible for supporting the learners. Learners should help each other to learn more and to improve all individuals' success in the group (Wiliam, 2007).

By involving three instructional processes suggested by Ramaprasad (1983) and by considering the reality of peer-teacher-learner interactions, Wiliam and Thompson (2008) improved the framework of Black and Wiliam (1998a) and suggested another formative assessment framework shown in Table 2.1. According to this framework, formative assessment consists of five key strategies which are (i) "clarifying and sharing learning intentions and criteria for success"; (ii) "engineering effective classroom discussions and tasks that elicit evidence of learning"; (iii) "providing feedback that moves learners forward"; (iv) "activating students as instructional resources for one another"; (v) "activating students as the owners of their own learning" (Wiliam & Thompson, 2008, p.63) and one *big idea*.

Table 2.1

Framework Relating Strategies of Formative Assessment to Instructional Processes (Wiliam & Thompson, 2008, p.63)

	Where the Learner Is Going	Where the Learner Is Right Now	How to Get There
Teacher	Clarifying and sharing learning intentions and criteria for success	Engineering effective classroom discussions and tasks that elicit evidence of learning	Providing feedback that moves learners forward
Peer	Understanding and sharing learning intentions and criteria for success	Activating students as instructional resources for one another	
Learner	Understanding learning intentions and criteria for success	Activating students as the owners of their own learning	

At first, the *big idea* is that the outcome of students' learning processes can be used in order to make necessary changes in the instruction with regard to students' needs (Wiliam & Thompson, 2008). For the five strategies, learners constitute their learning rather than teachers do. In this context, teachers' role is only to scaffold learning. Hence, the teacher can be regarded as responsible for "engineering" an effective learning environment. The teachers generate this environment by creating valuable discussion context and learning tasks, asking deep questions and observing the learning progress (O'Connor, 2002). Learners' active engagement is associated with challenging activities and providing feedback for these activities. Such feedback is directly connected with students' achievement. It helps to improve students' learning (Black & Wiliam, 1989a). Also, feedback serves to make inferences about students' progress. According to these inferences, teachers have an intention about where students are and they adjust teaching practices and instruction in order to move learners forward (Laud & Patel, 2013).

In general, students do not have any opinion about where their learning is going since the teachers do not generally share their reflections about what they mean to do in the classrooms. As students clearly need to understand the learning intentions and

standards against which they will be assessed, clarifying and sharing learning intentions and success criteria with the students is very important (Wiliam, 2007). Besides, activating learners as instructional resources for one another and for themselves, is vital for any assessment approach (Berry, 2008). Self and peer assessment yield learners reflect on their own learning progress. Through these assessment types, learners enhance their self-control for learning and they reflect alternative perspectives and strategies on problems (Nicol & Macfarlane-Dick, 2006). Also by commenting on peers' work, learners develop the ability to judge and they can also make appropriate decisions about what to do next as a result of evaluating their own and peers' work (Berry, 2005).

2.2.1 "Clarifying and Sharing Learning Intentions and Criteria for Success" (Wiliam & Thompson, 2008, p.63)

Providing clear and understandable picture of learning targets to the students is the first step in formative assessment. However, it is generally misunderstood and misused by the teachers. Some teachers assume that writing objectives on the board or stating them verbally is sufficient for having students understand what these objectives mean (Moss & Brookhart, 2009). However, clarifying and sharing objectives requires more than establishing those (Moss & Brookhart, 2009). Students need to comprehend the meaning of the lesson objectives. That is, students should grasp the meaning of the objectives and be aware of what they are supposed to do. Clarifying learning intentions directs teachers as well as students. O'Connor (2002) claimed that teachers cannot pursue whether the assessment includes what is taught without clarifying learning targets. With the knowledge of students' typical learning progress that they follow to achieve the objectives, they can plan and actualize the further instructional steps.

Setting the specific success criteria for students' work in a rubric and sharing them with the students is also crucial in terms of formative assessment (Wiliam, 2007). The other common misunderstanding that teachers poses is related to the way of sharing these criteria. Teachers generally suppose that proving a rubric to their students is enough for having students internalize the criteria (Moss & Brookhart, 2009).

However, whether the students comprehend the criteria should be ensured before expecting good performance from them.

2.2.2 "Engineering Effective Classroom Discussions and Tasks that Elicit Evidence of Learning" (Wiliam & Thompson, 2008, p.63)

Teachers can utilize a broad range of different strategies in order to reveal students' current level of learning. These strategies range from formal-embedded testing, through classroom activities to discussions (Wiliam, 2007), questioning of students' understanding, and observation of learning (Schachte, 2009). Many teachers spend considerable amount of time in classroom discussions and question-answer sessions (Leahy, Lyon, Thompson, & Wiliam, 2005). However, their effectiveness depends on listening students *interpretively* rather than *evaluatively* (Davis, 1997).

Questioning is an essential classroom activity if it is used to promote thinking (Black et al., 2003). This addresses active and efficient classroom discourse in which the teachers provide information about students' current level of learning. The lesson was managed by formative assessment evidences when the teachers use this information for adjusting the learning practices and instruction, or planning further steps in learning (Black et al., 2003). However, many teachers have some misconceptions in usage of questioning. They generally think that the primary usage of questioning is to elicit what students have already known (Moss & Brookhart, 2009). High quality questions support students' engagement in classroom discourse. When teachers ask effective questions, they direct students' attention to learning objectives and assist them to realize *where they are*, *where they are going*, and *what they need to do in order to get them there* (Moss & Brookhart, 2009). Another misconception that the teachers hold is the idea of asking good questions "on the fly" (Moss & Brookhart, 2009, p.102). The teachers assume that there is no need to plan for questions of good quality since they are able to ask their students questions with high-quality during the instruction without any preparation. However, it is not the case and the power of questioning in formative assessment comes from preparation period of associating questions with the objectives (Moss & Brookhart, 2009).

2.2.3 "Providing Feedback that Moves Learners Forward" (Wiliam & Thompson, 2008, p.63)

Feedback has a very significant role in formative assessment. (Black et al., 2003; Black & Wiliam, 1998b; Cowie & Bell, 1999; Sadler, 1989; Wiliam, 2007). According to Ramaprasad (1983) information gathered through teaching practices needs to have some effect on itself; if not, it is not feedback. He defined feedback as "the information about the gap between the actual level and the reference level of a system parameter which is used to alter the gap in some way" (Ramaprasad, 1983, p.4). Sadler (1989) commented on this definition and remarked on that information about the gap "is considered feedback only when it is used to alter the gap" (p.121). Regarding to this view, it can be deduced that feedback cannot be separated from the instruction and it is formative when the information gathered from feedback is used for improving learners' performance (Wiliam, 2007).

The information provided by feedback can be used by both the teacher and the students (Sadler, 1989). Teachers take advantage of it while specifying students' needs and making the decision of adjustments for the further instructions (Wiliam, 2007). Students apply it while monitoring their performances in terms of their strengths and weaknesses (Moss & Brookhart, 2009). Moreover, they use feedback to learn how to modify and improve their performances (Shute, 2008) in order to reach reference level. Hence, its positive influence on students' learning and achievement is inevitable. Hattie (1999) reworded this idea as the feedback is "the most powerful single moderator that enhances achievement" (p.11).

2.2.4 "Activating Students as Instructional Resources for One Another" (Wiliam & Thompson, 2008, p.63)

When learners communicate with their peers about their ideas, learning goals, and classroom activities, they participate in interactions which are formative and essential to learning (Moss & Connie, 2009). Hence, giving a place to peer-assessment during the instruction is valuable in several aspects. One is that such assessment improves students' motivation (Black et al., 2003). This leads some changes which make

instruction more effective and productive, and make students friendlier and cooperative workers (Sadler & Good, 2006) and increase students' achievement (Wiliam, 2007) as well. Another aspect is that while students are communicating, they use common language forms and reasonable models. In this way, the knowledgeable ones transfer the meaning of the lesson content to others who are still struggling (Black et al., 2003). Using the common language also yields that students more often accept criticism of their work from one another rather than accepting from the teacher (Black et al., 2003). The act of criticizing each other's work gives some opportunity to the students in order to strengthen their understanding and knowledge of the subject (Sadler & Good, 2006). The use of peer assessment also decreases the assessment workload of the teachers (Sadler, 1989). By this way, while students involve in peer-assessment, the teacher have an opportunity to observe how students engage in assessment and if necessary provide supportive interventions (Black et al., 2003).

2.2.5 "Activating Students as the Owners of Their Own Learning" (Wiliam & Thompson, 2008, p.63)

Formative assessment assists students generate and strengthen one of the important components of students' motivation to learn, self-assessment (Moss & Connie, 2009). Self-assessment is defined as the students' "act of observing, analyzing, and judging" their own learning with respect to the criteria and deciding how to enhance it (Moss & Connie, 2009, p.16; Black et al., 2003). In other words, it helps students to identify their strengths and weaknesses. In this way, students can decide how they progress on achieving the learning targets and what they need to do next (Moss & Connie, 2009). It could be considered shifting the control of teacher to the students so that the students can become independent learners (Sadler, 1989). According to Sadler (1989), in order to provide self-assessment practices, three conditions need to be satisfied. The first one is that the students need to know what accounts for quality. That is, they need to have clear understanding of learning targets and success criteria (Moss & Connie, 2009). Furthermore, the teachers need to provide completely independent environment to the students since the originality and innovation are emerged in these kinds of environments (Sadler, 1989). In addition, students need to be able to select the

appropriate strategies in order to move their own learning closer to the learning targets (Sadler, 1989) and this ensures when the teacher gives opportunity to the students to self-assess.

2.3 Research on Formative Assessment Approaches of Preservice and Inservice Teachers

The impact of formative assessment on promoting students' learning has been investigated for decades and well established in the literature. To illustrate, a meta-analysis of 250 studies published through 10 years was conducted by Black and Wiliam (1998a). As a result of their analysis, they concluded that formative assessment yielded enhancement of students' achievement between 0.4 and 0.7 standard deviation which revealed the power of formative assessment. However, defining and planning formative assessment is a troublesome task and there is a shortage of the studies especially related to the implementation of formative assessment in the literature (Ayala et al., 2008).

One of the studies which aimed to explore how teachers understood and implemented formative assessment was conducted by Antoniou and James (2013). They worked with two third grade and two fourth grade teachers with 8-18 years of experience. Classroom observations, interviews with the teachers, and students' work revealed five formative assessment practices the teachers employed during the instruction. They were clarifying expectancy and success criteria, collection of information, interpretation of information, providing feedback, and adjustment of learning. In particular, data analysis specified that the teachers considered formative assessment significant since it was effective in promoting teaching and learning. However, the observational data displayed the teachers' weaknesses in implementation of formative assessment. During the instruction, teachers mainly asked questions to check students' understanding and to review the lesson rather than to check whether the students had achieved the objectives. They also could not specify the purpose of the activity and criteria to succeed it.

Teacher questioning promotes meaningful learning when strategic and open questions were framed and asked during the formative discourse (Moss & Brookhart, 2009). M. Heritage and Heritage (2013) conducted a research in order to examine teacher and student interactions in terms of construction of open questions and to reveal the further steps taken by the teacher in order to support students' learning. One teacher and her two fifth grade students participated the study. Interactions between each student and the teacher were videotaped and constituted the data of the study. Videotapes were analyzed with respect to the sequence of interaction in order to examine the teacher questioning. The findings of the research showed that asking open questions was one of the key formative assessment strategy in eliciting students' current level of learning. Also, it had a very crucial role in the decision of further steps to promote students' learning. In addition, classroom routines, clarification of learning targets and activities that were implemented during the instruction were substantial support for all stated processes.

Tan (2007) also aimed to reveal classroom questioning behaviors of the teachers and students in terms of quality of the questions. Moreover, he investigated what the teachers aimed in asking questions. Nine English teachers with different years of experiences participated to the study. Classroom observation, semi-structured interview with teachers and focus group discussions with the students indicated that the most frequently used questions (87% of the total questions) were in low quality (in retrieval level) and they were all originated by the teachers during the discourse. Only 15% of the questions were responded voluntarily. Remaining 85% were generally nominated by the teachers. Additionally, most frequently asked questions were aimed to check task comprehension while a few of them were directed to the students in order to prompt them to think. Besides, the teachers asked questions to take students' attention to the task, to keep discipline, to ensure the authority of the teacher, and to gain students' respect.

The investigations on questioning strategies also have played significant part in assessment of mathematics teaching and learning. Moyer and Milewicz (2002) examined the questioning strategies of 48 (3 males, 45 females) senior preservice

elementary mathematics teachers. Each participant was provided an interview protocol including a fraction task and sample questions and interviewed with one student about the task. The interviews were audiotaped and analyzed by participants in order to be used in self-reflection on their own questioning. The data analysis was carried out in order to develop general categories of questions asked by preservice teachers during the interviews. The findings showed that they most frequently asked questions for *checklisting.* That is, the preservice teachers asked a question then immediately another one by showing little interest to students' response. Some of them either did not ask follow up questions or asked the questions which included verbal check marks. Preservice teachers also asked questions for instructing rather than assessing, which meant that they asked leading questions to direct students to the response. Another category of questions consisted of probing and follow-up questions. Several preservice teachers used followed-up questions for only incorrect answers. However, those preservice teachers asked questions with lack of specificity.

The effect of questioning on students' learning is another issue that have been investigated. Ruiz-Primo and Furtak (2006) conducted a study in order to investigate whether there was a relationship between different levels of questions used as the method of informal formative assessment and students' level of learning. Four middle school mathematics teachers participated the study. The data were collected by videotaping of 19 lessons hours of these teachers. In the analysis of these data, the researchers focused on whole-class discussions as formative assessment conversations which were described as four–step cycles, (1) where the teacher poses a question, (2) the student answers, (3) the teacher identifies the questions posed by the students, and (4) benefitted from the information for students' learning. The result of the study revealed that the teachers whose students displayed higher performance on assessment tests were the teachers who provided discussion environment to the students and asked questions in order to elicit students' conceptual understanding.

The issue of subject specific assessment was investigated by Hodgen and Marshall (2005). They examined one English and one mathematics lessons and discussed the assessment techniques applied in these two classes. Since these two lessons were

drawn from different projects, data collection procedures were not the same. The English class was observed by one of the researcher of this study and right after, the teacher were interviewed. During the observation of the class hour, the researcher took detailed field notes. The mathematics lesson was only videotaped. The researchers did not contact with the teacher directly. Instead, mathematics teachers wrote brief reflections on their classes. After the qualitative analysis of these two lessons, it was deduced that even if the nature of the subjects were very distinct, the reasons of what makes them formative were very similar. Both teachers organized a feedback pattern as a result of prompting students to think and have them justify their reasoning. They scaffolded students through the activities and triggered peer interaction. The study did not explore differences in construction of both subject knowledge. However, the activities and form of feedback applied by the teachers were different from each other. The researchers attributed this difference to the nature of the subjects which are different in type of the concepts, abstract or concreate and the frequency of dialogic patterns in which the teacher gives feedback.

Feedback can be provided both in verbal form such as brief student-teacher dialogs and in written form (Schachte, 2009). Çimer, Bütüner, and Yiğit (2010) observed three classroom teachers working in the same primary school to investigate the quality of verbal and written feedback they provided for the students. The findings of the study revealed that the most of the verbal feedback and all of the written feedback given by the teachers were evaluative. That is, rewarding, punishing, approving and disapproving were used mostly both in verbal and written feedback. The teachers also applied to descriptive feedback while specifying wrong and correct answer. This is a positive approach with respect to what Stiggins, J. Chappuis, Chappuis, and Arte, (2004) suggested. They recommended to give students descriptive feedback rather than grades in order to have students see their strengths and weaknesses and to emphasize on how close they are to the achievement of the learning targets.

Türkdoğan (2011) investigated the types of verbal feedback teachers gave to the students to eliminate their mistakes through intensive observations. The relationship between the types of verbal feedback and mistakes was also investigated. The findings

showed that the students made four types of mistakes related to the academic language, process and strategy, deduction and induction, and classification. The teachers used twenty-eight different types of verbal feedback which were categorized in six groups to eliminate these mistakes. These six category of the types of feedback were ignoring the mistake or considering it as true, specifying the answer, telling that it is wrong, constituting a contradiction, simplifying and associating.

Another research from Turkish literature about proving written feedback in mathematics field was conducted by Köğce, Çalık, Aydın, and Baki (2008). They conducted the study in order to describe senior preservice mathematics teachers' views on feedback. Another reason for conducting the study was to determine whether preservice teachers gave feedback consistent with the criteria that was indicated by them while describing the features of feedback. A total of 56 senior preservice mathematics teachers were asked to give feedback to an examination paper in order to see if the provided feedback was consistent with the criteria. The findings of the study revealed that the most of the preservice teachers could not define feedback properly. Majority of them focused on only one aspect of it while describing feedback. Three fourths of them stated that feedback should be used for indicating students' failure and misunderstanding. In addition, most of the students claimed that feedback should help students to realize their strength and weaknesses. Preservice teachers' written feedbacks to the examination paper were mostly for indication of failure of the students. Hence, they were not consistent with the criteria. Also half of them preferred to ask questions in order to prompt students re-think on his own answer in the examination paper. The researchers attributed this preference to the complementary role of formative assessment for further learning.

2.4 Research on Planned Formative Assessment Approaches of Preservice and Inservice Teachers

Effective teaching requires deciding on how to assess students' learning progress before instruction. In this regard, many studies have been conducted to reveal the substantial benefits of planned formative assessment practices of the teachers and

preservice teachers. Studies with preservice teachers are rather scarce in the literature. Studies in the accessible literature are introduced below in detail along with studies conducted with teachers.

Lesson planning is considered one of the significant component of the teaching cycle (Morris, Heibert, & Spitzer, 2009) and it needs to include assessment part in order to focus more on instruction (IES, 2007). Campbell and Evans (2000) investigated 65 preservice teachers' assessment practices by analyzing a sample of 309 lesson plans. They examined the prepared lesson plans with respect to inclusion of assessment, type of assessment, degree of match between objectives and assessment and inclusion of a scoring rubric to guarantee fair scoring. They concluded that 59 lesson plans did not contain any method of assessment. In 2 plans among 59 lesson plans it was explicitly stated that the students' achievement would not be assessed in this context. In 82 plans from the remaining 250 plans, written assessment were provided while in others the necessity of assessing students' achievement was only mentioned. Even if there was a consensus among preservice teachers that assessment was important for students' evaluation, preservice teachers did not follow many of the assessment practices that they learnt in teacher education.

The quality of lesson plans prepared by preservice teachers was also investigated by Ruys, Van Keer, and Aelterman (2012) in terms of their formative assessment strategies in collaborative learning (CL). In order to acquire a comprehensive view of preservice teachers' competence in planning, a rubric which contained three domains; instruction, organization and evaluation was developed by the researchers to analyze 323 lesson plans prepared by 100 (86 females and 14 males) sophomore preservice teachers. The result of analysis revealed both strengths and weaknesses of the lesson plans in terms of formative assessment strategies of preservice teachers. As the strengths of the lesson plans, preservice teachers paid at least adequate attention (it was seen in 65.9% of the lesson plans) to the evaluation of product. They mostly planned to create a discussion environment at the end of the lesson but they generally emphasized that if they have time, they will organize whole class discussion. This showed that preservice teachers did not consider evaluation as an innate part of a lesson

plan. As the weaknesses of the lesson plan, preservice teachers did not mention what they would do during collaborative works of the students in 84.8% of the lesson plans and they rarely (9%) referred to how they would monitor collaborative works. Moreover, while evaluation of the learning product was emphasized in 65.9% of the lesson plans adequately, evaluation of process was only addressed in 16.7% of the lesson plans in the appropriate way. With regard to the evaluation domain of the rubric, preservice teachers focused mainly on the learning product especially at the end of the instruction rather than the process. Monitoring the learning was also absent in the lesson plans. In this study, although preservice teachers were taught about the theoretical background and implementation of the collaborative learning, they were not successful in integrating them to the lesson plan. Based upon these findings, it was concluded that teacher education programs needed some innovations regarding to the instructional planning (Ruys, Van Keer, & Aelterman, 2012).

Ambrosio, Seguin, Hogan, and Miller (2001) conducted a comprehensive project to uncover in which aspects preservice teachers gave importance while preparing a multicultural/diversity (MCD) lesson plan. A total of 310 elementary and 51 secondary preservice teachers (84 males, 277 females) were asked to prepare a lesson plan that included a multicultural objective with teaching strategies for a diverse classroom. A rubric consisting of four components; objectives, mechanics, rationale and inclusiveness, was developed in order to evaluate preservice teachers' lesson plans. After the analysis of 361 lesson plans, it appeared that nearly half of the participants scored below on each rubric component. The success of the participants in mechanics component in which the ability to analyze lesson objectives with activities and assessment evaluated, was 49%. That is, they demonstrated at least minimal skills in this component. Almost 100 participants (27.1%) did not complete this part of the lesson plan and 86 of them (23.8%) were unsatisfactory in preparing this component. They either omitted assessment, applied informal assessment strategies or assessed only one group of students. Other half of the participants gained developing or proficient scores since they could not assess beyond the knowledge level.

Black et al., (2003) conducted a comprehensive study which revealed the benefit of teachers' planned formative assessment practices. The research formed by two phases with 36 secondary science and mathematics teachers in order to reveal the impact of usage of assessment on students' achievement. In the first phase of the study, eight workshops was arranged to underlie how assessment supports learning. Also in this workshops, teachers developed their lesson plans and shared and discussed their plans with their colleagues. For the first 6 months of the study, some strategies and techniques such as deep questioning, providing feedback in the form of comments, sharing learning intentions and success criteria with the learner and students' peer and self-assessment were suggested to be used in their lesson plans. These suggestions were from Wiliam and Thompson's formative assessment framework (2008). After the investigation of these lesson plans, it was seen that almost every teacher improved their questions. However, only 11 of them gave details about their questions in terms of types of the questions and where they would use them. Almost half of the teachers mentioned using comments as a feedback and only 6 of them included feedback specifically in their plans. For sharing objectives of the lesson, teachers generally wrote about their intentions and half of them mentioned success criteria which were the works from previous years. Furthermore, almost all teachers included self-assessment in their plans and mentioned group work which provided the teacher with an indication of students' understanding. In the second phase of the research, researchers visited the schools and discussed with the teachers about the reflections of putting their lesson plans into practice. As a conclusion of the research, students of these teachers performed significantly better on teacher produced and external state mandated tests when they were compared with the students from the same school.

When students are prompted deep explanation and justification of relationships and communication with mathematical ideas, effective learning occurs (Chi et al., 1994). One of the way to do it is asking deep questions and providing deep explanations for proposed questions (Pashler et al., 2007). Ding and Carlson (2013) conducted a study based on the conceptual framework formed considering three of Institute of Education Science (IES) recommendations, one of which was asking deep questions in order to

provide students self-explanations. The aim of the study was to display how these recommendations could be utilized to support mathematics teachers through lesson planning. Thirty-four K-3 teachers participated in the study and they took a summer course in which these recommendations were introduced and teachers were asked for designing their own plans. First, they were provided a textbook page about inverse relations between addition and subtraction as a basis of their lesson plans. They were expected to ask deep questions signed to the relationship and foresee students' explanations to these questions. After teachers submitted their plans, they were given feedback by the researchers and they revised their lesson plans according to the specified suggestions. For the revision of the lesson plans same procedure was followed. Finally, at the end of the course, they generated another lesson plan as the final project. Teachers' initial, revised and final lesson plans (102 plans) were analyzed with respect to a 0-2 scale rubric developed by the researchers. The result of the study indicated that 25 initial plans needed some attention. One of the plans did not include any question and others presented their questions at the beginning or end of the lesson plan without commenting on in what context the questions would be asked. Also, these presented questions were not deep in order to address inverse relations. In a few of the remaining 9 plans, teachers asked deep questions suggested in the textbooks. In the revised version of the lesson plans and final ones, the number of teachers who could ask deep questions increased. More than half of the teachers addressed asking deep questions and others proposed questions which needed only yes-no answer. Some of the teachers who asked "why" questions as deep ones explained the answer their selves. This showed that the mean of asking deep questions was not understandable by the teachers and it was a challenging issue for them while preparing their lesson plans.

2.5 Summary of the Related Literature

In this chapter, first, research which reveals the importance of formative assessment is presented and then, historical stages of the development of formative assessment framework were introduced. Finally some research related to preservice and inservice teachers' formative assessment practices were addressed. Literature review showed that the studies related to the formative assessment have mainly focused on the effects

of formative assessment on students' achievement and they generally approached the formative assessment from a single perspective. In the accessible literature, there is very limited number of studies related to the effectiveness of classroom discussions. The results of the accessible ones show that it improves students' performances. The studies which focused on the teacher questioning were basically related to the effectiveness of the questions of different quality on students' achievement in both Turkish and international literature. There is a small sample of studies in the international literature which focused on the purpose of questioning and some of them were summarized in this chapter. The findings of these studies revealed that the most frequently asked questions by teachers aimed to check task comprehension while a few of them were directed to the students in order to prompt them to think. Also, teachers asked students leading and not specific questions. In addition, research about feedback investigated mostly its impact on students' achievement in the literature. They revealed that the effectiveness of feedback might be related to the subject of the study, type and timing of feedback. In Turkish literature, especially in the field of mathematics education, there is very limited number of studies with respect to the feedback and they generally focused on the usage and effectiveness of verbal and written feedback. The findings of the studies related to the planned formative assessment basically revealed that preservice teachers did not follow many of the assessment practices that they learnt in their teacher education programs.

CHAPTER III

METHODOLOGY

The aim of this study was to reveal senior preservice middle school mathematics teachers' formative assessment approaches they planned to implement in a real classroom setting. Document analysis of responses to a lesson plan task and one-on-one interviews with senior preservice middle school mathematics teachers were used as the data source of the investigation. Participants' formative assessment approaches were identified from the Incomplete and Improper Lesson Plan Task (LPT) and Semi-Structured Interview data by using the formative assessment framework described in the previous chapter. The research question which guided the study was:

> What kind of formative assessment strategies do senior preservice middle school mathematics teachers integrate to a given lesson plan?

In this section, the methodology of the study will be explained in detail. First, the design of the study will be introduced and then the participants and instruments will be explained in detail, followed by data collection and data analysis procedures of the study. Then, it will continue with the trustworthiness of the study. Finally, ethical issues and limitations of the study will be addressed.

3.1 Design of the Study

In this study, in order to acquire more detailed information about how senior preservice middle school mathematics teachers integrated their formative assessment approaches in a given lesson plan, a qualitative research design was employed. Qualitative research design is mainly employed to capture the individuals' ideas and perspectives related to real-life events they encounter (Yin, 2011). Qualitative researchers are

especially interested in how individuals interpret the things occurred in natural settings (Fraenkel & Wallen, 2006) and how they generate their own meaning for what they experience (Merriam, 2009).

Qualitative research has several types. Among all, Merriam (2009) introduced the basic qualitative studies in which researchers are "interested in (1) how people interpret their experiences, (2) how they construct their worlds, and (3) what meaning they attribute to their experiences" (p.23). Since the overall purpose of this study was to reveal preservice middle school mathematics teachers' formative assessment approaches they planned to implement in a real classroom setting, basic qualitative research was employed in the study.

3.2 Context of the Study

Elementary Mathematics Education (EME) Program constituted the context in which the study was investigated. The EME program is a four-year teacher education program in an English-medium public university in Ankara, Turkey. The program aims to educate middle school mathematics teachers to teach mathematics in the middle schools (grades 5-8).

The EME program offers mainly mathematics, science and introductory education courses in the first two years and mathematics teaching courses in third and fourth years of the program. Measurement and Assessment course, which was set as one of the criteria to select the participants in this study, is offered in the Spring semester of the second year of their education. Methods of Teaching Mathematics I and Methods of Teaching Mathematics II courses are taken by the preservice teachers in the third year of the program while School Experience course is offered to them in the first semester of the fourth year and Practice Teaching in Elementary Education is offered in the second semester.

Measurement and Assessment course focuses on the development of classroom assessment materials with regard to the lesson objectives, the interpretation of the results of the tests and some basic statistics (METU Academic Catalog, 2015).

Moreover, the role of measurement and assessment in instruction is emphasized within the context of this course. Additionally, preservice teachers are presented alternative assessment types and taught measureable objectives and goals followed by informal observations and questions within the scope of some chapters. They were also expected to prepare an achievement test and administer it to a target group as a final project, and they are required to conduct a set of analysis in order to gather validity and reliability evidences by using the data collected through the achievement test. The course syllabus is presented in Appendix A.

In both Methods of Teaching Mathematics I and Methods of Teaching Mathematics II courses, preservice teachers are introduced basic principles of mathematics teaching, teaching methods and materials (METU Academic Catalog, 2015). Every week, preservice teachers are expected to prepare a lesson plan related to that week's topic (such as numbers, geometry, and proportional reasoning) and present it to their classmates. They especially discuss their peers' lesson plans in terms of the activity located in the middle part of the lesson plan. Also, how preservice teachers are supposed to implement beginning, middle and end part of the lesson plan is emphasized while discussing their lesson plans. In Methods of Teaching Mathematics I, preservice teachers are also expected to prepare a problem-based lesson plan as a project. A rubric which mainly emphasizes what is expected from the preservice teachers while they are preparing the beginning, middle and end part of a lesson plan is provided to them. Besides, they are presented different assessment tasks and taught how to use observation in assessment, followed by grading issue within the scope of a chapter. The course syllabuses of Methods of Teaching I and Methods of Teaching II are presented in Appendix B and C respectively.

Within the context of School Experience course, preservice teachers were expected to complete 40 class hours observation of their mentor teachers' instructions in selected cooperating schools throughout the first semester of the fourth year of the program. Preservice teachers observe several teaching and learning activities and examine the teaching materials and written sources. They also observe and internalize the rules and policies of their practice schools. During the semester, they are required to write two

observation/investigation reports. One is about how their mentor teachers teaches a specific mathematics concept and how students learn it. Another one is written to introduce the culture of their practice schools and the class they observe the most. Moreover, they are expected to prepare and implement learning center which includes activities related to specific curricular subjects in their practice school. The course syllabus is available at Appendix D.

In Practice Teaching in Elementary Education course, preservice teachers are required to complete a minimum of six hours of classroom observation/participation per week throughout the second semester of the fourth year of the program in their cooperating schools. Each preservice teacher is expected to teach at least two class hours one of which observed by a graduate assistant of the course and the other one observed by their mentor teacher. They are also required to make a presentation to their classmates as campus teaching and prepare two lesson plans; one is for their presentation at campus, the other is for the school teaching observed by the course assistant. Moreover, they are expected to teach in their groups aside from campus teaching and videotape themselves while they are teaching in their groups. The course syllabus is presented in Appendix E.

3.3 Participants

According to Merriam (2009) there are two main types of sampling procedures which are random and nonrandom sampling. Since generalization is not the main concern in qualitative research, nonrandom sampling-purposeful sampling (Patton, 2002) is the most appropriate sampling strategy in a qualitative research. In purposeful sampling, researchers select the sample they believe that it will provide data they need by relying on prior information (Fraenkel & Wallen, 2006). Providing rich information about individuals' views and perspectives is the strength of the purposeful sampling (Patton, 2002).

In the current study, a total of 27 senior preservice middle school mathematics teachers who were enrolled in Elementary Mathematics Education Program (EME) during 2014-2015 Spring semester in a public university in Ankara participated. Convenience

sampling strategy is employed when the researcher decides to make participants' selection based on money, time, location and availability of participants (Merriam, 2009). In this study, due to the convenience of location and availability of participants, they were selected from the university in which the researcher worked as a research assistant. According to Merriam (2009), it is necessary to decide what the selection criteria are before starting a purposive sampling. After deciding on the criteria, it is necessary to "review and study all cases that meet some predetermined criterion of importance" (Patton, 2002, p.238). Participants were selected among the preservice middle school mathematics teachers who were taking the Practice Teaching in Elementary Education course. Having completed the Methods of Teaching Mathematics I, Methods of Teaching Mathematics II, and Measurement and Assessment courses successfully were set as the criteria to select the participants from the students of the practice course. About 35 senior preservice middle school mathematics teachers who ensured the criteria were asked if they would like to voluntarily participate in the study. The first data collection instrument, LPT, was implemented to 27 of the 35 senior preservice middle school mathematics teachers who volunteered to participate. Their answers to the given task were analyzed according to Wiliam and Thompson's (2008) formative assessment framework. Then, 11 senior preservice middle school mathematics teachers were selected for the interviews for their diverse answers to the questions in the given task. The predetermined criteria set by the researcher to ensure variation in the selection of interview participants were as follows:

1. Participants who mentioned none of the formative assessment strategies were selected to understand the reason behind not referring any formative assessment strategy. (N=3)
2. Participants who had responses that would indicate one of the formative assessment strategies were selected to elicit whether their expressions were for formative assessment purposes or not. For example, P13 was selected for the interview since her answer to the first question in task was that *"I first try to learn the level of students' previous knowledge about fraction concept";* which

might imply questioning as a way of learning the level of students' previous knowledge. (N=4)

3. Participants who mentioned at least one of the formative assessment strategies were selected to understand deeply in what respect they answered the questions, their reasoning in selecting that formative assessment strategy and their further reflections about the usage of the formative assessment strategy they planned to apply. (N=4)

The purpose of such a criterion based selection for interview was not to differentiate the groups of participants, but to eliminate the possible limited environment of the given task caused by its responded time and the nature of the questions provided in the task. As a result of the analysis of the responses of the preservice teachers, 14 senior preservice mathematics teachers who possessed one of the above criteria were asked to interview. At the end, 11 preservice teachers (3 males and 8 females) were interviewed since 3 of them were not willing to participate in the interview.

Participants' responses were not categorized based on the selection criteria. Rather, commonalities among responses were the focus of the analysis.

3.4 Instruments

In order to answer the research question of the study, two instruments were administered to the participants consecutively as data collection tools. Research question and associated data sources were summarized in Table 3.1.

Both data collection instruments were generated by the researcher, during the Fall semester of 2014-2015 academic year in line with the research question. The process of development of the each instrument is presented below.

Table 3.1

Research Questions and Related Data Sources

Research Question	Data Source
What kind of formative assessment strategies do senior preservice middle school mathematics teachers integrate to a given lesson plan?	Incomplete and Improper Lesson Plan Task Semi-Structured Interview Protocol

3.4.1 Incomplete and Improper Lesson Plan Task

The aim of using the researcher-generated documents is to collect more data about context and participants' ideas being investigated (Merriam, 2009). Hence, for this study, the researcher developed a LPT in order to have deep information about preservice teachers' formative assessment strategies.

The task was administered as the first data collection instrument in order to understand what formative assessment strategies senior preservice middle school mathematics teachers planned to use in a hypothetical classroom environment. The task included a lesson plan on equivalent fractions, a case in which preservice teachers assumed to be an inservice mathematics teacher implementing this lesson plan (supposedly prepared by another teacher) and four questions related to the lesson plan.

Among the different methods of investigating preservice teachers' prior knowledge of teaching presented in the literature, requesting the participants comment on a given lesson plan (van der Valk & Broekman, 1999) was employed in his study. It has the advantage that the content is structured beforehand. This may enable the researcher discuss the common issues easier. For this reason, the researcher preferred to develop a lesson plan as a one of the component of the LPT in order to ask participants reflect their formative assessment strategies on it.

A basic lesson plan template used in the EME program courses, which handled the lesson in beginning, middle and end sessions, was used for the study to provide the

participants rather with a familiar task. At the beginning of the generated lesson plan; a part addressing prerequisites for the implementation was provided for the preservice teachers. They were informed about the topic, duration and objectives of the lesson accompanied with the grade level and prerequisite knowledge of the students. Also, teaching methods planned to be implemented during the lesson were included in this part of the lesson plan. Prerequisites part of the plan can be seen in Figure 3.1.

Title/Topic:	Equivalent-Fraction Concept		
Grade Level:	6^{th}	Duration:	45 minutes
Resources/Materials:	Dot paper, ruler, pencil, rubber		
Objectives:	➢ Students should be able to develop a conceptual understanding of equivalent fractions. ➢ Students should be able to explore the same quantity can have different fractional names. ➢ Students should be able to look for patterns in equivalent fraction.		
Prerequisite Knowledge:	Fraction concept		
Teaching Method(s):	Questioning, Discussion, Discovery, Cooperative learning		

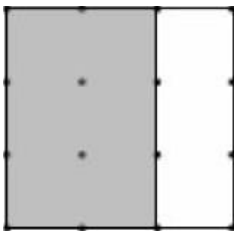
Figure 3.1 Prerequisites Part for Implementing the Lesson Plan

The lesson plan was called *improper* on the ground of the first objective which was *"students should be able to develop a conceptual understanding of equivalent fractions."* Since the lesson objectives are supposed to be measureable (Goldston, Day, Sundberg, & Dantzler, 2009) and observable (Campbell & Evans, 2000; John, 2007), this objective was not appropriate to be included in the lesson plan. During the implementation, preservice teachers were expected to detect the improperness of the first objective. This was the first feature of the lesson plan that the researcher considered while preparing it. Additionally, for the development of the lesson plan, the formative assessment framework improved by Wiliam and Thompson (2008) was

considered. In the framework, five key formative assessment strategies which suggested to be included in a lesson plan prepared for teaching (Black et al., 2003) were indicated. Hence, with the purpose of revealing senior preservice mathematics teachers' formative assessment approaches, the beginning, middle and end parts of the lesson plan were excluded from any wording that implied any of the formative assessment strategies. This was the reason of calling the task as *incomplete.* These parts of the lesson plan are shown in Figure 3.2.

- *Beginning*
  - Begin with simpler version of the task.

    On the board, draw a 3 by 3 rectangle and shade in $\frac{2}{3}$ of it as shown here

    Repeat a few times the statement: "Two students look at the picture and each saw different fractions" in order to ensure that students understand what it means.
  - Have students discuss on different explanations for how these two students saw different fractions although they saw the same drawing.
  - When students agree on why these two students saw different fractions, draw the corresponding unit fractions on the board to strengthen their understanding.
  - Before starting the activity form 4 groups of 3 students.
  - Distribute activity sheet and dot grid paper to the groups.
- *Middle*
  - Have students complete the activity in 15 minutes.
- *End*
  - For each drawing on the activity sheet, make a list of groups' answers.
  - Let students share their ideas.
  - At the end of the discussion, summarize the main idea and make students aware of even if the fractions are different; they are representing the same drawing.

Figure 3.2 Beginning, Middle and End Parts of the Incomplete and Improper Lesson Plan.

To illustrate, in the middle part of the lesson plan, only the sentence *"have students complete the activity in 15 minutes"* was placed. Instead, in this part, there should have been questions that would prompt students to think or expressions that would indicate the teacher did observation during the instruction. Accordingly, in the course of the implementation, the senior preservice mathematics teachers were expected to realize the nonexistence of any formative assessment strategies and to integrate one or more strategies they preferred in the given lesson plan. This was the second feature that the researcher considered while preparing the lesson plan.

A lesson plan needs to include an assessment part in order to focus more on instruction (IES, 2007). This part of the lesson plan should be prepared by taking into consideration of some properties such as consistency between objectives and questions/problems (Ambrosio et al., 2001; John, 2007; Theoharis & Causton-Theoharis, 2011), inclusion of rubric for fair scoring (Campbell & Evans, 2000) and quality of the questions/problems (Moss & Brookhart, 2009). As the third feature of the lesson plan, the assessment part refined from stated properties and senior preservice mathematics teachers were anticipated to notice the absence of these properties. Figure 3.3 presents four yes-no questions placed in the assessment part. This was another reason for calling the task as *improper*.

Assessments:

For each equivalence please write T in the given blank if it is correct; write F if it is false.

A) $\frac{3}{4} = \frac{6}{8}$ (__)

B) $\frac{46}{14} = \frac{23}{6}$ (__)

C) $\frac{5}{12} = \frac{20}{36}$ (__)

D) $\frac{37}{74} = \frac{1}{2}$ (__)

Figure 3.3 Assessment Part of the Incomplete and Improper Lesson Plan

A summary of the characteristics of the LPT is given in Table 3.2.

Table 3.2

Summary of the Characteristics of the LPT

Characteristics	Underlying Reasons
Incomplete	Exclusion from any wording that imply formative assessment.
Improper	Immeasurable and unobservable first objective. Inconsistency between objectives and questions in the assessment part. Nonexistence of rubric for fair scoring. Weak structure of the questions in the assessment part.

In addition to the Incomplete and Improper Lesson Plan, a case in which senior preservice mathematics teachers were required to undertake inservice mathematics teacher role to implement this plan and four questions related to the incomplete and improper lesson plan were prepared. The case and the four questions were for guiding the senior preservice teachers to suggest their formative assessment strategies and strengthen the lesson plan's assessment part. Questions mentioned were presented in Table 3.3.

Table 3.3

Questions Related to the Given Incomplete and Improper Lesson Plan

- What is your general view about the given lesson plan? Do you prefer to enact the lesson plan in this form?
- What are the strengths of this lesson plan?
- What are the weaknesses of this lesson plan?
- How would you strengthen and organize this lesson plan with regard to the deficiencies you found?

After preparing the initial version of the LPT, expert opinions of three inservice mathematics teachers who graduated from the same teacher education program (EME) at the same university, three research assistants from EME program who often gave

feedback and grade preservice teachers' lesson plans and one mathematics education researcher were obtained in order to ensure the content related-evidence of validity. They examined the lesson plan in accordance with its clarity, applicability, and weaknesses. In addition to those aspects, the mathematics education researcher scrutinized whether the task served its purpose for the study. That is; whether the questions were sufficient and qualified in order to elicit what kind of formative assessment strategies senior preservice middle school mathematics teachers preferred to integrate in a lesson plan. Besides, pilot study of the task was conducted in order to finalize the developmental process of the first data collection instrument.

3.4.1.1 Pilot Study of Incomplete and Improper Lesson Plan Task

LPT was piloted with three recent graduates of the EME program at the same university as they have completed the same courses with the targeted preservice teachers. They participated in the pilot study voluntarily. LPT was implemented in a classroom environment similar to the one in the actual study. After completing the task, participants of the pilot study were asked for commenting on the clarity of the given case, questions and statements presented in the task. Moreover, their answers to the questions were analyzed to see if the task was serving its purpose for the study. Pilot study resulted in two changes in the data collection instrument.

In their comments, pilot study participants expressed that they could directly edit the given lesson plan rather than responding the questions in the given blanks. Hence, the sentence, "*If you wish, you can edit the given lesson plan. If you prefer editing on the lesson plan, please indicate the number of the question you suggest changes about*" was inserted after the given case. Pilot study revealed that participants' responses to the questions involved general arguments. To illustrate, one pilot study participant commented to the first question that it could have been clearer and another one commented on an issue in the activity sheet. Hence, questions were restricted to some aspects such as lesson plan design, mathematical concept, objectives and assessment in order to obtain relevant data to the purpose of the study. Moreover, in case of participants' demand to add comments on different aspects, the phase "Anything you

want to add" included at the end of the last question. Revised version of the questions is listed in Table 3.4. The final version of the LPT was given in Appendix F.

Table 3.4

Revised Questions Related to Given Incomplete and Improper Lesson Plan

1. What is your general view about the given lesson plan? Do you prefer to enact the lesson plan in this form?
2. What are the strengths of this lesson plan? Please examine it within the scope of below headings:
   - Lesson design:
   - Mathematical concepts:
   - Objectives:
   - Assessment:
3. What are the weaknesses of this lesson plan? Please examine it within the scope of below headings:
   - Lesson design:
   - Mathematical concepts:
   - Objectives:
   - Assessment:
4. How would you improve this lesson plan with regard to the weaknesses you found within the scope of below headings?
   - Lesson design:
   - Mathematical concepts:
   - Objectives:
   - Assessment:

   Anything you want to add:

3.4.2 Semi-Structured Interview Protocol

For this study, a semi-structured interview protocol was developed by the researcher as another data collection instrument. Interview protocol included eight main open-

ended questions to uncover the ideas which were remained hidden in the LPT. In addition to these questions, follow-up questions were prepared to deal with possible emerging issues. The examples of questions are given below in Table 3.5.

Table 3.5

Examples of Main and Follow-up Questions in the Interview Protocol

- If you had prepared the given lesson plan, how would you have designed the beginning part of it?
  - Which kind of questions are you planning to ask? What is your intention of asking those questions? (In case they mention asking question to their student).
- If you had prepared the given lesson plan, how would you have designed the middle part of it?
  - What is your intention of observing students' group work? (In case they mention observation of students' work).
- If you had prepared the given lesson plan, how would you have designed the assessment part of it?
  - What kind of a question would you write instead of that one? (In case they want to change the given question).

After preparation of the interview protocol, the researcher consulted the expert opinion of three research assistants from Elementary Education program and one mathematics education researcher. They analyzed the questions according to their clarity, understandability and feasibility. Subsequently, the pilot study of the interview protocol was conducted with two senior preservice middle school mathematics teachers who participated in the implementation of LPT but who were not interview participants.

3.4.2.1 Pilot Study of Semi-Structured Interview Protocol

After preliminary analysis of the LPT, two senior preservice teachers who participated in the instrumentation of the task were asked to participate in the pilot study.

Participants of the pilot study were selected based on the predetermined criteria indicated before in participants section. They attended to the pilot study voluntarily. Since the purpose of the interview was to understand deeply what type of formative assessment strategies senior preservice teachers integrated in the LPT and how and for what purpose they planned to implement these strategies, the lesson plan were provided to them during the interview. At the end of the interview, participants were asked to comment on whether the questions were understandable and they felt comfortable with responding to the questions. Comments of experts and two senior preservice teachers yielded no change in the Semi-Structured Interview Protocol. Complete interview protocol was presented in Appendix G.

3.5 Data Collection Procedures

Data of the study were collected from senior preservice middle school mathematics teachers during the Spring semester of 2014-2015 academic year. At the beginning of the semester the two sections of Practice Teaching in Elementary Education course taken by only 4th year preservice middle school mathematics teachers were visited with the permission of the instructors. Preservice teachers were informed about the study and asked if they would like to participate in. The researcher emphasized that the participation to the study was voluntary and the findings were not to be shared and used for grading purposes. Twenty-seven preservice teachers were willing to participate in the study and LPT was implemented to them during the visited course hour. At the beginning of the implementation of the task, the researcher explained that her interest was about how they would redesign the given lesson plan which they would conduct in a real class setting. Preservice teachers completed the task in about 50 minutes.

After one month of analysis period of responses to the given task, eleven senior preservice teachers were selected to be interviewed separately in one-on-one setting. They all participated in the interview sections voluntarily. Time and location of the meetings were arranged according to the convenience of the participants and the researcher. Since the interviews were conducted to understand senior preservice

mathematics teachers' formative assessment approaches they had specified in the LPT, the lesson plans which were redesigned or edited by the participants were provided to each of them. Interviews lasted between 30 to 80 minutes and were audio-recorded with the permission of the participants. At the beginning of and during the interviews, participants were reminded that there was no best way in editing the lesson plan and interest of the researcher was their ideas and thoughts. Also, they were informed that the findings would not be shared and used for grading purposes. Moreover, participants' answers to the first task were reminded with the purpose of eliciting whether they wrote the responses for formative assessment purpose or not when they did not advert to the same issues during the interview. Participants were given the time they required to respond the questions and they were provided pencil and paper to be used when they needed. At the end of the interviews, participants were asked whether they wanted to add anything different than the questions directed to them in order to make sure not to miss any related thought with the purpose of the study.

3.6 Data Analysis

Bogdan and Biklen (1998) defined the data analysis as practicing with the data that is, organizing the data, searching for patterns, separating them into units according to the patterns, deducing the important parts and deciding what to tell to the audience. According to Merriam (2009), all qualitative data analysis is content analysis since the focus is on the content of interview and document while analyzing the data. Since the focus of the researcher in the current study was on what senior preservice mathematics teachers expressed about the content during the implementations of the data collection instruments, content analysis was utilized for both LPT and Semi-Structured Interview.

The data of the study were participants' written responses to the lesson plan task and the transcriptions of the audio-recorded interviews. For the data analysis, the same procedure was conducted for both task and interview data. First, participants' answers were read several times and any expression related to the preservice teachers' formative assessment approaches were categorized by the researcher according to the

broad conceptions of three relevant subdomains of the framework (Wiliam & Thompson, 2008, p.63) namely, "clarifying and sharing learning intentions and criteria for success", "engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding" and "providing feedback that moves learners forward". Then, these expressions were grouped to smaller sub-categories based on the descriptions (codes) defined in the literature. This process was rather interactive in terms of data and the codes. The researcher went back and forth between the data and the codes in order to place the expressions under the sub-categories.

At the end of the categorization, participants' answers to the first two categories obtained through both task and interviews were grouped separately based on the responses. After this process, the data were coded once more by the researcher and this coding was discussed by another researcher in the field of education based on the codes and the categories. This discussion served as a peer-review process for the data analysis. During this process, new codes were emerged, some others were excluded and some intertwined codes were came together under one code and named differently after both researchers agreed.

After the necessary changes were completed, six codes were decided under the first category. Under the second category, questioning and observation sub-categories were emerged and five codes were generated for each sub-category. For the third category, the researcher analyzed the participants' responses according to who benefitted from the feedback which was proposed by Sadler (1989). Although the task and interviews did not direct participants to any formative assessment practices, data analysis resulted in only the three categories and related codes summarized in Table 3.6. The categories of "Activating students as instructional resources for one another" and "activating students as the owners of their own learning" (Wiliam & Thompson, 2008, p.63) were not revealed during the analysis of data.

Table 3.6

The Summary of the Codes Used for the Three Categories.

Category	Codes
"Clarifying and Sharing Learning Intentions and Criteria for Success"	Using activity/task/questions that matches the learning goal (Moss & Brookhart, 2009). Providing students examples with different levels (Moss & Brookhart, 2009; Leahy et al., 2005). End of the lesson review (Black et al., 2003). Consistency between the plan's assessment and learning target (Moss & Brookhart, 2009). Giving clear directions to the students (Moss & Brookhart, 2009). Observable and measureable learning outcomes (Moss & Brookhart, 2009).
"Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding"	To arouse students' interest and remind them of prior knowledge. (Black et al., 2003). To learn about and "challenge common misconceptions" (Black et al., 2003, p.39). To promote discussion (Black et al., 2003). To make students discover To examine students' learning. (Leahy et al., 2005).
"Providing feedback that moves learners forward"	Feedback for student (Sadler, 1989) Feedback for teacher (Sadler, 1989) Consideration of tasks for feedback (from data)

3.7 Trustworthiness of the Study

While referring the credibility of the study, similar criteria for reliability and validity are utilized in both qualitative and quantitative research (Schreier, 2012). However, for qualitative studies different terminology is used than the quantitative studies (Shenton, 2004). There is a consensus among researchers about using the term *trustworthiness* for qualitative studies (Loh, 2013) more as an umbrella term. The term *trustworthiness* ensures that the research findings are "worth paying attention to" (Lincoln & Guba, 1985, p.290). Lincoln and Guba (1985) asserted four trustworthiness criteria namely, *credibility, transferability, dependability,* and *confirmability*. In this

section, three criteria; credibility, transferability and dependability of the study were discussed.

3.7.1 Credibility

Credibility or internal validity of a qualitative study "deals with the question of how research findings match the reality" (Merriam, 2009, p.213). That is, in order to ensure credibility, researchers are required to describe the picture of the situation deeply and accurately, and then interpret the findings consistently (Shenton, 2004). Merriam (2009) suggested different strategies in order to increase credibility of a study; triangulation, member check, adequate engagement in data collection, researcher's position (reflexivity), and peer review. In this study, triangulation, researcher position and peer review strategies were employed to increase credibility**.**

Triangulation is provided by employing multiple and different sources, methods, investigators and theories to confirm emerging data (Creswell, 2007; Merriam, 2009). Since in qualitative research, humans are the primary source of data collection, reality is accessed through the observations and interviews. Hence, in order to interpret the reality, it is important to use multiple methods of data collection which is a kind of triangulation (Merriam, 2009). In this study, interviews were used to triangulate the findings of document analysis. First, LPT was given to senior preservice mathematics teachers in order to deduce their formative assessment approaches. Then, a Semi-Structured Interview was conducted to understand deeply in what respect they answered the questions and the reasoning behind their answers to the questions presented in the given task. If there was an inconsistency between preservice teachers' answers to the question in LPT and the interview, researcher asked follow up questions in order to elicit the reason behind their answering differently.

Researcher's position or reflexivity is also important factor that affects credibility of the findings. Well-defined assumptions and perspective of the researcher shows the reader researcher's possible influence on the conclusion and interpretation of the findings (Maxwell, 2005). Hence, to increase the credibility of the findings, the researcher needs to explain her "biases, dispositions and assumptions" (Merriam,

2009, p.219) regarding to the research. For this study, one of the concerns was that the researcher had graduated from the same teacher education program (EME) at the same university with the participants. She took the same courses with the assistance of different instructors. Since the researcher knew the participants' experiences with the courses, she was aware that she might interpret findings subjectively. However, being in the same context also provided the researcher with some advantages in preparing the LPT and Semi-Structured Interview Protocol, and in revealing the general tendency of participants, which was one of the aims of the study.

Another concern was the relationship between the researcher and participants of the study. The first contact of the researcher with the participants was not due to the study conducted. The researcher was the teaching assistant of "Community Service" course which was offered by EME program to the junior preservice middle school mathematics teachers in 2013-2014 Spring semester. During the assistantship, the researcher and preservice teachers did not have close contact due to the nature of course offered. Even if there was not close relationship between the researcher and preservice teachers, participants were willing to being a part of the study and provided the researcher with detailed responses during the interview. In order to supply comfortable environment with regard to timing and transportation, interviews with participants were made in a silent room in the Faculty of Education where they studied. For the confidentiality of the data, it was reminded to the participants during the interviews several times that the interest of the researcher was their ideas and thoughts and their ideas would not be judged. When participants asked the researcher to confirm their ideas or thoughts, it was reminded that there was no best way to answer the questions. This approach was assumed to make participants motivated to reflect their ideas and thought without hesitation.

As another method of increasing the credibility of the findings, peer review was used. Peer refers to the committee or a colleague who is at least familiar with the topic and research methodology (Merriam, 2009). For this study, the researcher asked a research assistant in the department she was working in, who was experienced in conducting qualitative research to examine the collected data and assessed if the findings were

conceivable regarding to the data. The supervisor of the researcher also monitored the data collection and analysis procedures in order to ensure the relevance of findings to the data.

3.7.2 Dependability (Consistency)

Dependability or reliability in qualitative research refers to "whether the results are consistent with the data collected" (Merriam, 2009, p.221). Merriam (2009) suggested four strategies; namely, triangulation, researcher's position, peer review and audit trail, which can be applied by the qualitative researchers to ensure consistency. In this study, in order to see the consistency of the results, findings of the different data sources which were used for triangulation, was utilized. In addition to the triangulation, peer review was applied and researcher's position was explained deeply to obtain congruent data. How the researcher applied these strategies was discussed in credibility section.

3.7.3 Transferability

Transferability of external validity is considered as generalizability of the findings of the study to the other contexts or situations (Fraenkel & Wallen, 2006). However, in qualitative studies, generalizability or transferability is different from quantitative tradition. It means *rich and thick description* of the setting, participants and especially the findings with sufficient evidence gathered through instruments (Merriam, 2009). Extensive description of the context of the study assists the reader in deciding whether the situation of the study is similar to the one which they are concerned and provides the reader with the transfer of the findings of the study in other similar settings (Shenton, 2004). Hence, in this study, the researcher attended to provide sufficient and detailed description of context and phenomenon of the current study in order to allow the reader to apply the findings of the current study to other situations; that is, ensuring the transferability of the findings.

3.8 Ethics

Ethics issues concern about any psychological and physical damage that happen to any participants of the study as a result of the conducted research (Fraenkel & Wallen,

2006). In order to prevent participants from any possible damage caused by the research, some issues should be addressed in every study.

First of all, necessary permissions for conducting the current research were received from ethics committee at the university where the participants enrolled (see Appendix H). In order to protect participants from any possible harm, the researcher informed the preservice teachers about the purpose of the study and procedures that would be followed during the study in oral and written way. At the beginning of the both implementation, the researcher emphasized that the participation in the research was completely voluntary and preservice teachers might choose not to participate without any penalty. Also they were informed that the findings of the study would not be graded under the extent of any course. A consent form in which this information was specified was given to the participants and they singed it before the interviews began. During the interview, the researcher was careful about not judging participants' answers and they were reminded that there was no best way to answer the questions. In this way, the research tried to provide participants a pleasant non-judgmental environment.

For ensuring the confidentiality of the data, participants were informed that their answers to the questions would be kept confidential and only the researcher and her advisor had access to the data in both oral and written way. Also while presenting the findings of the study, their names were coded randomly such as P1 and P2 so that there would be no direct connection between the data and the names of the participants.

3.9 Limitations of the Study

The study had several limitations. The first one was about the insufficient experience of the researcher in conducting qualitative research. The researcher had conducted a basic qualitative research study with one of her colleagues before the current study proceeded. However, she was untrained and unexperienced in carrying out one-to-one interviews. In order to overcome this limitation, the researcher made preliminary preparations before conducting the current study. She collected necessary information by reading articles and books about how to ask good questions (Merriam, 2009) which

is the key issue to collect valuable data. Moreover, the pilot studies of the both data collection instrument provided the researcher a chance to test the questions presented in the task and the interview protocol. Additionally, the advices of colleagues and the supervisor of the researcher which arose after the pilot study, helped the researcher to improve herself in conducting qualitative research study. Furthermore, the researcher explained her position in detail in credibility section with the purpose of reducing possible biases.

The second limitation arose in the study was applying only one type of triangulation, namely multiple data sources. Other triangulation types such as multiple methods of data collection could be used in order to ensure the credibility of the findings. The researcher developed a document and interview protocol so that findings of the document analysis could be checked through the findings of the interview. However, in this study, it was not feasible to make the observation of the participants' work due to the time limitation.

The third limitation of the study was the employed sampling procedure. In this study, convenience and criterion sampling were used purposively in the selection of the participants. They were chosen from the same teacher education program (EME) at the same university. Hence, they had similar educational background. Besides, the university was one of the small number of universities whose language of instruction was English. Hence, the sample of the study was not representative of senior preservice students from other universities whose language of the instruction was Turkish. The other limitation related to the sampling procedure was selection of eleven participants to conduct the interview. They were selected among twenty-seven participants who attended the implementation of LPT due to the convenience of the researcher and participants. Thus, not being able to conducting an interview with all participants who attended to the implementation of the task was one of the limitations of the study.

The final limitation of the study was the task itself since it included only one learning area which was equivalent fractions. Even if the questions related to the task were generated by using general issues independent of the content, such as strength and

weaknesses of the lesson plan; participants might have answered the question by taking into account of the equivalent fraction concept. Last, the findings of the study were limited to the responses given to the task.

CHAPTER IV

FINDINGS

This chapter of the study consists of three sections. Findings related to three subdomains of formative assessment framework, “clarifying and sharing learning intentions and criteria for success”, “engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding” and “providing feedback that moves learners forward” (Wiliam & Thompson, 2008, p.63) will be reported in three separate sections. In each section, first, findings from the implementation of the task will be presented and then findings from the interview data used for obtaining more reflection about the preservice teachers’ formative assessment approaches will be addressed. At the end of the chapter, a summary of the formative assessment strategies of preservice teachers will be presented.

In the data analysis, the researcher examined whether the participants emphasized on the stated codes and what they suggested for implementations of the codes. The quality of their suggestions is beyond the scope of the current research.

As an answer of the “How would you improve this lesson plan with regard to the weaknesses you found within the scope of below headings?” question in the given task, some participants made descriptions or suggestions while the others provided specific examples to their suggestions. These two kinds of responses will be reported separately under the following headings.

4.1 "Clarifying and Sharing Learning Intentions and Criteria for Success" (Wiliam & Thompson, 2008, p.63)

In the first section, one of the subdomains of the formative assessment framework, "clarifying and sharing learning intentions and criteria for success" (Wiliam & Thompson, 2008, p.63) will be addressed. Clarifying learning targets and success criteria is mainly about the comprehension of what the objectives mean by the students. It will be examined under six codes shown in Table 4.1.

Table 4.1

The Summary of the Codes Used for the First Category.

Category	Codes
"Clarifying and Sharing Learning Intentions and Criteria for Success"	Using activity/task/questions that matches the learning goal (Moss & Brookhart, 2009).
	Providing students examples with different levels (Moss & Brookhart, 2009; Leahy et al., 2005).
	End of the lesson review (Black et al., 2003).
	Consistency between the plan's assessment and learning target (Moss & Brookhart, 2009).
	Giving clear directions to the students (Moss & Brookhart, 2009).
	Observable and measureable learning outcomes (Moss & Brookhart, 2009).

4.1.1 Using Activity/Task/Questions that Matches the Learning Goal

The findings of the task analysis revealed that the most frequently mentioned feature that should be considered in lesson planning was the consistency between activity and

the learning goal. Almost half of the participants emphasized that there was an inconsistency between activity and objectives. One participant suggested a change at the beginning activity of the lesson plan and another participant approved the alignment between objectives and activity.

Eleven of the twenty-seven participants underlined the nonexistence of an activity related to the third objective, "students should be able to look for patterns in equivalent fractions" in different ways. Six of these participants mentioned this feature while answering the question related to the weaknesses of the lesson plan. For instance, P9 stated that *"there [was] not any question or activity for the (third) objective*." P25 expressed the same thing in a different way as *"there should be more emphasis on the (third) objective. I believe that other two objectives are achieved."* These six participants did not suggest anything to strengthen the weaknesses of the lesson plan which they indicated. Other five participants expressed the necessity of inclusion of activities with respect to the third objective when they offered their suggestions to strengthen the lesson plan. To illustrate, P20 suggested that *"[some] activities related to the (third) objective could have been included in the middle part [of the lesson plan]"* and P13 indicated that *"sufficient activity can be added [to the lesson plan] for the (third) objective."* They mentioned adding the activities for the third objective but they did not give any specific example of activity or question except P20. She included two questions in the middle part of the lesson plan so that the third objective was achieved by the students. The questions she added were "*Do you think that there is a relationship between numerator and denominator of the fractions that you found?"* and "*What kind of a relationship did you observe between numerator and denominator of the different fractions?"* While almost half of the participants reached a conclusion about the inconsistency between activities and objectives, one participant, P11 asserted that *"the activity [was] consistent with the objectives."*

Participants' focus was not on only the third objective. P19 suggested changing the beginning activity of the lesson plan. She explained her reasoning as *"for the (first) objective, the same figure was divided into different unit fractions. If it had given as*

two figures, it would have been more suitable for the objective." However, she was the only participant who recommended this change.

During the interview, five participants among eleven underlined the inconsistency between objectives and the activity. In order to eliminate the inconsistency, three of them suggested adding questions or tasks along with specific examples for their suggestions. One participant mentioned the possibility that the teacher had planned to address the third objective but did not include it to the lesson plan.

Three among the five participants who mentioned the inconsistency between objectives and activity were reminded their answers for the task since they did not refer per se. The conversation between the researcher and one of these participants, P15, was as follows:

> **R (The researcher):** You had written that "the activities were only for the second objective [and] it was difficult to form the mathematical link between equivalent fractions."*(The researcher referred to the task.)*
>
> **P15:** For instance, what is the relationship between these two? *(She showed the numerator and denominator.)* I thought that these were not included and [examples] were insufficient. I would ask the students about the kind of relationship between them *(numerator and denominator)*.

Additionally, three participants included either some questions or tasks to the lesson plan so that students realized the pattern between equivalent fractions. To illustrate, P13 inserted a task to guide students notice the pattern in equivalent fractions. She tried to have students notice the pattern between the equivalent fractions by multiplying numerator and denominator by the same numbers:

> **R:** You had stated that "sufficient activity can be added [to the lesson plan] for the (third) objective."
>
> **P13:** Yes. I had thought that there was not (enough) emphasis on those. *(She referred to the pattern in equivalent fractions.)*
>
> **R:** How will you interrelate them? How will you express [the pattern in equivalent fractions] to the students?

P13: For instance, isn't it possible by multiplication? I thought I could write it in this way: $\frac{1}{2} = \frac{1x2}{2x2} = \frac{1x3}{2x3}$.

P27 pointed out that what the teacher planned to perform in the class for the third objective might not have been included to the lesson plan and she explained her reasoning in this way:

R: Why don't you think that the objectives can be achieved [by the students]?

P27: *(She read the third objective).* What does the teacher do for [the third objective]? Nothing or even if the teacher does something for that, [s/he] (does) not tell us in this middle part [of the lesson plan]. [...] Maybe, the teacher planned to reach the objective but [s/he] did not write it on the plan. For this reason, I thought that [the students] could not achieve the objective.

In summary, eleven of the twenty seven participants specified the requirement of using activity that matches the lesson objectives during the task implementation. Six of them underlined this as a weakness of the lesson plan. Other five participants suggested adding examples or questions related to the third objective. One participant in the task implementation and three participants during the interviews specified the questions they could have asked to the students in order to have them realize the pattern which was indicated in the third objective. Even if these eleven participants stated this feature as the weaknesses of the lesson plan, most of them did not suggest the particular examples in order to eliminate this feature.

4.1.2 Providing Students Examples with Different Levels

Findings of the task analysis indicated that providing students examples with different levels was another most frequently mentioned feature that participants considered in lesson planning. Nearly half of the participants commented on the necessity of increasing the number of examples in the lesson plan considering different aspects. One participant claimed that the lesson design was strong since it included questions with varying difficulty levels.

Eleven participants among twenty-seven emphasized adding more questions or examples especially to the beginning part of the lesson plan. Four of these participants suggested including examples with different shapes. To illustrate, P2 expressed her reasoning in adding various shapes as *"Distinct shapes had not been included in [the lesson plan]. [The concept] should be introduced by providing [students] different shapes and examples."* Another participant, P1, addressed the same idea in a different way as *"first, students should face with varied representation of the shapes*." Regarding the difficulty level, only one participant, P7, expressed her view: *"The points that students would have a difficulty had not been included [to the lesson plan]. If I prepared the lesson plan, I would add some examples that students would confuse and I had them make mistakes."* These five participants suggested including distinct examples with varied shapes and difficulty levels; however, they did not provide any specific examples for their suggestions.

Among the other six participants who suggested inserting questions or examples to the lesson plan, three asserted different reasons for adding examples. To exemplify, P12 preferred to add examples in the beginning part of the lesson plan because *"Students need to support their learning with more activities. In order to motivate [students], arouse [their] curiosity and force [them] to think, more examples should be included in the beginning [part of the lesson plan]."* Unlike P12, P20 chose the middle part to insert examples. Her rationale was that *"before moving to the activity, more examples would be provided in the middle [part of the lesson] so that the concept is understood better."* Other three participants did not specify any reasoning behind adding more examples. For instance, P16 only indicated that *"there is insufficient number of examples"* and P25 stated that *"the number of examples should be increased."* Different from P16 and P25, P3 specified the location where she would insert examples in this way: *"more examples should be given in the beginning [part of the lesson plan]."* Although these six participants thought that the number of examples were insufficient, they did not specify any particular example like the other participants. While answering the question related to the strengths of the lesson plan, one participant, P18, asserted that *"asking easy questions at the beginning and more*

difficult questions in the middle of the lesson is one of the strengths of the lesson plan." This answer was an exceptional one since other participants either emphasized on the necessity of increasing the number of examples and difficulty levels or did not mention on this feature.

During the interview, six participants among eleven mentioned the importance of providing students examples with different levels. Four of them suggested beginning with easy examples then moving to the difficult ones. One participant suggested asking easier questions in the case that students had difficulty in solving proposed questions. Another one suggested including examples with different shapes as he mentioned during the task implementation.

From one of the four participants who suggested beginning with easy questions and then moving to the more difficult ones explained her reasoning as follows:

> **P24:** Asking easier and then more difficult questions is important. First, you [as a teacher] should [make students] comprehend the concept and then you should prompt (them) to think.
>
> […]
>
> **R:** Why do you think that the teacher should ask easy-to-difficult questions?
>
> **P24:** When a student begins with a difficult question, [s/he] is puzzled. [S/he] does not understand what to do. You [as a teacher] try to familiarize (the students) with the concept through easy [questions]. […] For instance, if you [as a teacher] ask difficult questions to the student, [s/he] tries not to give an answer. S/he even does not look at your eyes. However, if you ask an easy question, all students will be willing to [answer it].
>
> **R:** You mean asking easy questions motivates the students.
>
> **P24:** Exactly.

The similar reasoning was used by other three participants who recommended directing easy questions first to the students.

One participant, P21, mentioned asking easy questions in a different context. He suggested asking easier questions when students made a mistake while solving proposed questions. The conversation between the researcher and P21 was as follows:

> **R:** If the students offer incorrect answers to the questions, how do you respond to students?
>
> **P21:** We can provide them other examples. We can skip the question that they offer incorrect answer and pass to the easier ones. Then again, we can turn back to the (original) question.

He thought about showing students examples of easy questions when students get stuck with difficult ones. That is, he planned to adjust the task to the capabilities of the students.

During the interview, these five participants who suggested adding examples in different difficulty levels, did not propose any specific example to their suggestions as in the task implementation. Only P23, who suggested including examples with different shapes as he did during the task implementation, exemplified his suggestion as:

> A square, a circle or any rectangle would be [shown to the students] in order to have them realize that every shape can be divided [into parts]. For instance, when I was a child, I thought that in order to divide [a shape], it required to be in square form.

As a result, during the task implementation, eleven of the twenty-seven participants specified the necessity of including more examples in the lesson plan considering different aspects. Only one of them mentioned adding questions in different difficulty levels and according to the one participant, it was already ensured. Besides, they mostly asserted to increase the number of examples without mentioning their quality or without grounding it to any reasoning. In the interview, participants focused more on adding questions in different difficulty levels. They stated that it was necessary to present easy questions first to motivate students (P24) and to familiarize them to the concept (P18, P22). In conclusion, these participants who referred to adding examples

in the lesson plan focused more on the number of the questions, rather than their quality/difficulty level.

4.1.3 Consistency between the Plan's Assessment and Learning Target

The third more frequently mentioned feature that should be taken into account while preparing a lesson plan was the necessity of the consistency between the plan's assessment and the learning targets. In total, seven participants among twenty-seven emphasized on this issue during the task implementation. Five of them asserted that there was an inconsistency between the questions in the assessment part of the lesson plan and lesson objectives while other two stated an alignment between them.

Five of the participants underlined that the questions in the assessment part of the lesson plan were not qualified to assess the lesson objectives while answering the question related to the weaknesses of the lesson plan. To illustrate, P16 stated that *"[the questions in the] assessment part of the lesson plan were not proper for the objectives."* Beside the inconsistency between assessment part and the objectives, P4 commented on the quality of the questions: *"It seems like the questions in the assessment part are for the third objective. I think that they are not aligned with the activities implemented during the lesson. They are drill for practicing [the concept]."* P10 emphasized on the same idea and she made suggestions improving the assessment part of the lesson plan as *"I do not think that the objectives are consistent with the assessment [part of the lesson plan]. More visual questions would be included in this part. [The students] would be (asked) to explain why the statements were true or false."* While five participants derived a conclusion about the inconsistency between the questions in the assessment part and objectives, two participants, P6 and P26, claimed the opposite that the questions in the assessment part were consistent with the objectives and "*whether the objectives are achieved can be understood through these questions"* (P6).

In the interview, three participants among eleven asserted that the lesson objectives were not aligned with the questions in the assessment part. In order to eliminate the inconsistency, they all suggested adding more visual questions to the assessment part

of the lesson plan. Furthermore, one participant recommended to change the option b in the assessment part since it included an improper fraction. P4's ideas about the consistency between two objectives and the questions in the assessment part and her reasoning behind her answer in the task implementation is as follows:

> **R:** In your opinion, were the questions in the assessment part [sufficient] to have students achieve the related objectives?
>
> **P4:** Perhaps for the third objective. However, I think we cannot understand whether [the students achieved] the second objective. Some shapes would be drawn [for the second objective].
>
> **R:** Then, you say that the assessment part does not (help) you to understand whether [the students] achieved the first and second objectives.
>
> **P4:** Yes. Maybe for the third objective, they are ok.
>
> […]
>
> **R:** In your opinion, what are the characteristics of an assessment part of a lesson plan?
>
> **P4:** It should include questions related to the objectives. […]

Other participant, P21, explained why the questions in the assessment part were inconsistent with the objectives as follows:

> **R:** In your opinion, are the questions in assessment part of the lesson plan aligned with the lesson objectives?
>
> **P21:** No.
>
> **R:** Why do you think so?
>
> **P21:** In the second objective, it is stated that "the same quantity can have different fractional names." However, in the assessment part the quantity can only be represented as numbers [rather than shapes]. Maybe students could not relate the numbers with the quantity. The questions should focus mainly on the shapes. [As a teacher] we cannot (notice) whether the students understand the logic behind the equivalent fractions or the fractions represents the same

quantity. We can only understand whether the students can simplify or enlarge the fractions.

He referred in this conversation that the questions in the assessment part of the lesson plan did not assist the teacher to understand whether the students achieved the first and second objectives. The questions could be used only for having students practice on simplification and enlargement of the fractions.

Different from others, one participant focused more on the inconsistency between the activity and the objectives. She preferred to change option b in the assessment part since it was related to improper fractions which were not mentioned in the middle part of the lesson plan. The conversation between P13 and the researcher was as follows:

R: What are the characteristics of the assessment part of a lesson plan?

P13: There should be questions related to the subject [of the lesson].

R: Is this assessment part related to the subject of lesson?

P13: Not exactly… If the improper fractions had been mentioned [in the middle part of the lesson plan], the assessment part would be related [to the lesson subject]. Here *(assessment part)*, there was an example of improper fraction *(option b)* which was not emphasized [in the middle part]. [The activity] was only related to the proper fractions.

In summary, five participants among twenty-seven realized the inconsistency between lesson objectives and the questions in the assessment part whereas two participants claimed the opposite. In the interview, only three participants among eleven pointed out this issue and they suggested adding visual questions. Other participants did not write any expressions and comment on this feature during both the task implementation and the interview. To conclude, it seemed that the most of the participants could not detect the inconsistency between objectives and the questions in the assessment part which was one of the reasons for calling the task improper.

4.1.4 End of the Lesson Review

Task analysis revealed that the fourth more frequently mentioned feature that should be taken into account while preparing a lesson plan was the end of lesson review. Five participants among twenty-seven referred to the end of lesson review or summary of the content of the lesson. However, they did not explain how they would review or summarize the lesson.

Four participants mentioned this feature while answering the question related to strengths of the lesson plan. They stated that the subject of the lesson was summarized and the ideas were shared with all class in the end part of the lesson plan. P15 expressed her opinion as *"sharing ideas and summarizing the (content) [of the lesson in the end part] is the strength of the lesson plan."* P18 mentioned the same idea and added also that this feature should be considered during lesson planning. She reflected her idea as *"summarizing the content of the lesson and emphasizing on derived conclusion were supposed to be done [at end of the every lesson] and this have already been done in this lesson plan."* One participant, P8, addressed this feature when she offered some suggestions to strengthen the lesson plan. She claimed that the lesson plan was weak in terms of the lesson summary and she suggested that *"the teachers would make a general explanation about the equivalent fractions at the end of the lesson."* Even if they mentioned the necessity of the end of the lesson review, they did not specify how it should be done.

In the interview, all eleven participants emphasized on the end of the lesson review since the researcher directed a question "If you had prepared this lesson plan, how would you design the end part of the lesson plan" to the participants in order to understand their considerations while preparing the end part of the lesson plan. All participants found this part of the lesson plan sufficient and four of them specified the questions they could ask to the students while summarizing the lesson. P24 expressed her agreement with the end part of the lesson plan as follows:

> I would prepare it in the same way. *(She referred to the lesson plan).* […] After everything is understood and students (grasped the main idea), the teacher should

> summarize [the concept] as "today we learnt equivalent fractions, equivalent fraction is this etc." [The teacher] should finish the lesson in this way.

P4 addressed some questions that she planned to ask students at the end part of the lesson in order to summarize the concept. She explained her ideas as:

> I would (write) the questions that I planned to ask [in the end part]. I would ask [the students] "What did we learn today?" They would all say "equivalent fractions" because it was the heading of the lesson. Then, I would ask "What is equivalent fraction?", "What is the pattern in equivalent fractions?" and "What is the relationship [between numerator and denominator in equivalent fractions.]" Then I would summarize the lesson as "today, we learnt this, relation is this and we did this."

To sum up, five participants among twenty-seven mentioned the end of lesson review during the task implementation and they attributed this feature as strength of the lesson plan. On the other hand, all interview participants emphasized the necessity of summarizing the lesson content during the interviews. They either planned to summarize the lesson themselves or they preferred to ask questions to the students in order to have them summarize the content of the lesson. It seemed that all participants agreed on including end of lesson review to the end part of the lesson plan since they considered it necessary in lesson planning. However, they preferred to use different methods while summarizing the concept.

4.1.5 Observable and Measureable Learning Outcomes

Task analysis revealed that the necessity of including observable and measureable learning targets in a lesson plan was the fifth most frequently mentioned feature that should be considered in lesson planning. A limited number of participants commented on the characteristics of the lesson objectives during the task implementation and one of these participants suggested adding different objectives instead of the first one.

Three participants among twenty-seven emphasized on the characteristics of the lesson objectives. All three found the first objective "students should be able to develop a conceptual understanding of equivalent fractions" problematic. Two of them underlined the generality aspect of the objective. P23 stated that *"the first objective is*

so broad. It can be narrowed down or not be written." P21 asserted the similar ideas as *"the first objective is not clear, it is general."* In addition, he suggested including other objectives instead of the first one. The objectives he added to the lesson plan were *"[students] know the definition of the equivalent fractions"* and *"[students] obtain equivalent fractions by simplifying and enlarging the given fraction."* Furthermore, P15 addressed another characteristics of the first objective, measurability. According to her *"it is difficult to measure the first objective."* The conversation between P15 who addressed the characteristics of measurability in the task implementation and the researcher was as follows:

> **R:** You had written that it was difficult to measure the first objective.
>
> **P15:** Yes. I do not know how we can measure that students had achieved the first objective…
>
> **R:** In your opinion, should every lesson objective be measured?
>
> **P15:** According to what we learnt, we should write measurable objectives.
>
> **R:** What do you think about it?
>
> **P15:** I agree with that. We do not write attitudes which we cannot measure as objectives. I do not know… I think the objectives should be measurable.

Although P15 agreed that the objectives should be measurable, she could not explain her reasoning. The other participant, P23, also could not express the observability aspect of the first objective in his answer:

> **R:** You had written that the first objective was so broad. It could be narrowed down.
>
> **P23:** *(He read the first objective)*. I wrote it since the instructors said that the objectives should be specific.
>
> **R:** In your opinion, why should the objectives be specific?
>
> **P23:** We try to teach specific things. (To develop a conceptual understanding) is so broad for me. Student understands equivalent fractions, but what is it that we

want? Well…Does it mean [the students] understand logically or conceptually? That's why I wrote it in this way.

R: Why is writing broad objectives undesirable?

P23: How I can explain.... the reason is maybe, I did not come across [with broad objectives] I do not get used to see them. When we wrote broad objectives, the instructor always warned us as "it is so broad, narrow it down."[...] Maybe it is only memorization.

R: In your opinion, why did your instructor tell you this?

P23: Let's say the objectives are broad. I want to assess students' [level of knowledge] or the teacher taught according to the broad objective... I guess… I cannot guess...equivalent fractions... Now [writing broad objectives] comes to me more logical...Maybe I did not notice the word conceptual [during the task implementation].

Same three participants who mentioned this feature in the ask implementation commented on this feature also during the interview. Other eight participants did not address it similar to their responses in the task implementation.

To sum, three of the twenty-seven participants found the first objective problematic. In the task implementation and during the interview, two participants emphasized on the generality of the first objective and another participant underlined that the objective was not measurable. Moreover, one participant who mentioned on the generality of the first objective, suggested adding two objectives instead of the first one. In conclusion, only three of the participants detected the improper aspect of the first objective; however, these participants were not able to explain their reasoning.

4.1.6 Giving Clear Directions to the Students

Task analysis showed that only one participant from twenty-seven underlined informing students about the activity before continuing the instruction. There were other participants whose responses would also be considered under this heading. P17, who mentioned the necessity of giving information about the activity, made some suggestions that could be implemented during the instruction. She recommended that *"the teacher should inform [students] about the activities that will be implemented (in*

the middle part of the lesson). If s/he gives information about how long the activity takes, whether s/he will answer the students' questions and give some hint when the students have difficulty [in solving the questions], it will be better for both the teacher and the students." One participant, P27, implicitly mentioned giving clear directions in her response. She claimed that *"there is no information about how the teacher (guides) the students in the middle part of the lesson"* which might indicate giving directions. However, it was not clear whether the directions were for the teacher or for the students.

Additionally, three participants had different perspectives on the same issue. They asserted that the explanations and directions in the lesson plan were insufficient for the teacher while responding the question about the weaknesses of the lesson plan. For instance, P4 stated that *"the explanations that the teacher would address [during the instruction] or cautions about the possible misconceptions had not been included [in the lesson plan]."* P15 commented on the same issue as *"the explanations in the middle part are not sufficient for the teacher."* She also made some suggestions as *"the questions related to the activities and the students' possible answers to these questions should be added [to the lesson plan]"* and she exemplified her suggestions as *"there should be (more) directions in the middle part of the lesson plan [for the teacher] such as "explain the activity [to the students]" or "after the students complete the first activity, want students express their ideas"."*

Seven participants among eleven interview participants asserted their ideas about this feature during the interview. Six of them considered that the students needed to understand what they were supposed to do as significant. However, the remaining participant preferred to give direction for the teacher rather than the student. P13, one of the six participants, explained what she planned to do at the beginning of the lesson in order to inform students about the lesson subject as follows:

P13: I would tell the subject before the lesson began.

R: How do you do that? Let's think it as a case.

P13: There can be short recalling [session] about what the proper fraction is. [I would tell to the students] "We learnt the proper fractions. Now, we will move on a different topic about fractions. The current topic is equivalent fractions. We will look for equivalency in fractions."

During the interview, P27 mentioned the inclusion of some expressions for the teacher in the middle part of the lesson and she exemplified them. The conversation between the researcher and P27 was as follows:

R: If you had prepared the given lesson plan, how would you design the middle part of the lesson plan?

P27: For example, the preparation of the lesson plan is wrong. What does the teacher do in fifteen minutes? Will s/he sit without doing anything? I mean the teacher should write what to do in the middle part. For example, the teacher should write [whether] the kid first will do (activity) a then b, or first the kids will discuss on (activity) and then complete (activity) b. [S/he] needs to write the questions that [s/he] will ask [during the instruction].

In brief, only one participant among twenty-seven addressed giving directions to the students during the task implementation. Three participants focused on the nonexistence of the directions for the teacher. During the interview, seven participants from eleven mentioned on this feature and some of them exemplified their suggestions. One participant from these seven participants mentioned giving directions to the teacher rather than the students. It seemed that in the task implementation, the participants except P13 did not emphasize giving directions to the students, rather they focused on the necessity of directions for the teacher. On the other hand, during the interview more participants emphasized on this feature and they underlined giving directions to the students rather than the teacher.

4.2 "Engineering Effective Classroom Discussions and Other Learning Tasks that Elicit Evidence of Student Understanding" (Wiliam & Thompson, 2008, p.63)

In the second section, one of the subdomain of the formative assessment framework "engineering effective classroom discussions and other learning tasks that elicit

evidence of student understanding" (Wiliam & Thompson, 2008, p.63) will be addressed. It will be examined under two sub-categories which are questioning and observation. These sub-categories will be analyzed with respect to the five codes shown in Table 4.2. The last code, to examine students' learning (Leahy et al., 2005), will be only addressed while reporting the findings of interview since the participants did not mention it in the task implementation.

Table 4.2

The Summary of the Codes Used for Questioning and Observation.

Category	Codes
"Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding"	To arouse students' interest and remind them of prior knowledge. (Black et al., 2003). To learn about and "challenge common misconceptions" (Black et al., 2003, p.39). To promote discussion (Black et al., 2003). To make students discover. To examine students' learning. (Leahy et al., 2005).

Since monitoring the participants in a real class environment was not possible due to the nature of the study, the participants' responses as "asking questions" could not be determined as to whether it refers to questioning or asking a single question. Hence, in this study, the terms, "questioning" and "asking questions" were used interchangeably.

4.2.1 To Arouse Students' Interest and Remind them of Previous Lesson

Both task and interview analysis revealed that the most frequently emphasized usage of teacher questioning that should be considered in lesson planning was to arouse students' interest and remind them of previous lesson. In the task implementation, two

among twenty-seven participants suggested asking questions related to the prior knowledge of the students in the beginning part of the lesson plan. Moreover, four more participants mentioned the review of the prior knowledge of students; however, they did not state how they planned to do it. During the interview, almost all participants mentioned asking questions in the beginning part of the lesson for both reminding students' prior knowledge and arousing their interest to the lesson.

Two of the twenty-seven participants emphasized on asking questions for reminding students of their prior knowledge when they offered their suggestions to strengthen the lesson plan. One of them also exemplified her suggestion by adding specific questions to the lesson plan. To illustrate, P22 stated, *"I would ask questions to help the students remember their prior knowledge rather than starting with an example to the lesson."* P27 also expressed her ideas in a similar way: *"First, at the beginning [part of the lesson], the questions related to the prior knowledge of the students can be asked."* Moreover, she specified a sample of questions that could be asked before the instruction began. The questions she added were *"What is the meaning of the fraction?"* and *"What do the numerator and denominator mean?"* In addition, four participants mentioned the review of prior knowledge; however, they did not offer any method to do it. For instance, P13 specified that *"First, I would try to learn students' level of knowledge in fraction [concept]."* P23 remarked on the nonexistence of the reminding session as the weaknesses of the lesson plan and he stated that *"Beginning to the fraction concept with only one example instead of reminding [students their] previous knowledge is the weaknesses of the lesson plan."* In order to understand whether they planned to use questioning method to remind students of their previous knowledge, further questions were asked during the interview.

Ten among eleven interview participants mentioned asking questions in the beginning part of the lesson either for reminding students' prior knowledge or to arouse their interest to the lesson during the interview. Most of them also provided examples of questions they planned to ask.

One of the participants who emphasized on the necessity of asking questions to remind students about previous concepts explained his reasoning as follows:

> **R:** You had written in the task implementation that you planned to ask questions for reminding students of previous knowledge.
>
> **P22:** The students will come from fifth grade. *(Since the lesson plan was for sixth graders)* [Hence,] I ask questions whether to see the students remember the fraction concept. For instance, "What does $\frac{1}{2}$ mean to you?" "Are 1 and 2 separate numbers [in the fraction]?" or "Does division has a meaning?"
>
> **R:** How will you make benefit from this information?
>
> **P22:** In this way, students will construct new knowledge on strong basis.

Some participants mentioned to evoke students' previous knowledge in the task implementation; however, they did not indicate whether they planned to use questioning method to do that or not. Hence, further questions were asked to these participants during the interview. P23 underlined that he would use questioning method to check students' prior knowledge and to draw attention to some mistakes that students make frequently. The conversation between the researcher and one of these participants, P23, was as follows:

> **R:** What are the points that you pay attention while preparing a lesson plan?
>
> **P23:** […]. What have students already known? What will we add on [their previous knowledge?]. (In my opinion), students' prior knowledge is important.
>
> **R:** How do you comprehend what students have already known?
>
> **P23:** I think it can be done through questioning. I can ask what we get when we compute this $(\frac{1}{5}+\frac{2}{5})$ operation. […] For instance, during one of my presentation, I asked this question and all of my classmates gave the answer as $\frac{3}{5}$. Then I told them my answer was $\frac{3}{10}$. Everybody was surprised. Students make this kind of mistakes. I can check whether the misconceptions were eliminated or their prior knowledge settled. I think we can understand those through questioning.

The importance of arousing students' attention also emphasized by the participants during the interview. The following conversation included P18's explanations about underlining reasons of its importance, and a sample of questions that she planned to ask in the beginning of the lesson:

> **R:** What are the points that you pay attention while preparing a lesson plan?
>
> **P18:** […]. In the beginning [of the lesson], previous lesson is (recalled) as "we mentioned this before." Then an interesting question can be asked while moving to the next topic. I mean, students' interests should be drawn while starting to the new concept. […]
>
> **R:** If you had prepared the given lesson plan, how would you design the beginning part of it?
>
> **P18:** The fraction concept can be recalled.
>
> **R:** How do you recall it?
>
> **P18:** Well… "What is fraction?" "What do you remember [about it]?" You need to have students recall rather than you explain it.
>
> **R:** Can you give an example of what [kind of question] you would ask to the students?
>
> **P18:** Well. The Ayşe's mother made a cake for her daughter' birthday. She invited such a number of person. If eight pieces are eaten from ten pieces of cake, how many pieces were eaten?
>
> **R:** What is your purpose in asking this question?
>
> **P18:** In order to prepare students for the lesson. And also to recall the previous lesson.

In addition, one participant, P23, among eleven interview participants expressed that he would learn about students' previous knowledge by observing as well as questioning them as follows:

> **R:** How do you imagine the classroom environment? I mean, what do you do while students are working in their groups?

P23: I walk around the class and observe students. I answer (their) questions.

R: What do you expect to observe?

P23: Well. Students know the representations of the fractions. They [need to] move to the equivalent fractions. Do they have sufficient prior knowledge so that I will move to the equivalent fractions? In order to get the answer of this question, I would observe [the students].

To sum, almost all participants stated that they would ask questions for reminding students of previous concept during the interview while only two participants referred this in the task implementation. Some of them also emphasized on the importance of drawing students' attention to the current topic. In order to do that, they preferred to ask questions especially from the daily life context. They all directed questions in the context of division of a cake, pizza or an apple. It seemed that, almost all interview participants agreed on including questions for recalling the previous knowledge of the students or drawing their attentions to the current topic. Moreover, only one participant mentioned classroom observation as a way of understanding of students' prior knowledge. It can mean that, these participants were prone to using questioning rather than observation method in order to understand whether their students had sufficient prior knowledge or not.

4.2.2 To Learn about and Challenge Common Misconceptions

According to the findings of the task analysis, the second most frequently mentioned feature that should be considered in lesson planning was asking questions to learn about and "challenge common misconceptions" (Black et al., 2003, p.39). In the task implementation, two among twenty-seven participants mentioned challenging misconceptions. However, only one of them suggested asking questions in order to overcome the misconception. During the interview, eight participants underlined that students could have some misconceptions and five of them suggested to ask questions in order to specify students' misconceptions.

The participant who suggested asking questions stated that the lesson plan was weak since it did not include questions for possible misconceptions. She explained her

reasoning as *"there are some deficiencies in the beginning, middle, and end part of the lesson plan. In order to notice students' possible misconceptions, some strategies can be added such as asking questions"* (P17). Another participant, P14, pointed out that possible misconceptions should be handled by the teacher. She explained her ideas as follows: *"I think that the teacher needs to be more efficient in the middle [part of the lesson]. [S/he] should assist students [to overcome] possible misconceptions."* However, she did not mention how the teacher could handle the possible misconceptions.

During the interview, eight among eleven participants emphasized that students could have some misconceptions related to the topic. In order to learn about their misconceptions, five of these eight participants planned to ask questions and two of them specified their possible questions. To overcome the potential misconceptions, some of these participants preferred to explain the concept themselves rather than students explored it. Remaining three participants asserted that they ask questions in order to overcome the misconceptions and they all provided their probable questions.

One of the five participant, P13, explained how she could learn about students' possible misconceptions in the following way:

> **R:** If you had prepared the given lesson plan, how would you design the beginning part of it?
>
> **P13:** I thought that this figure could be misleading. *(She referred to the figure in the beginning part of the lesson plan)* […] I do not know…but I had thought that we could be faced with a misconception.
>
> […]
>
> **R:** How do you understand whether the students have a misconception?
>
> **P13:** From their answers and the feedback that they gave to me. Well…I understand through their answer to my questions.

P17 also provided some examples of questions that she planned to ask to learn about students' misconceptions. She thought that the students could have some

misconceptions and she could learn about their misconceptions while they were solving option b of the task:

R: How do you know whether the students have misconceptions or not?

P17: How do I know….I ask them.

R: What kind of questions do you ask them?

P17: Well… [I can ask] "How did you solve it? How did you add them?"

Afterwards, she continued to explain how she could overcome the misconception related to the addition of two fractions as follows. However, she did not mention about questioning:

P17: If they say "we add numerators and denominators of the first and second fraction…."

R: How do you respond them?

P17: Probably, I will be shocked. Well… I can use two shapes. Two wholes which have different denominators (*two wholes divided into different number of parts*) can be given to them. I can divide the wholes to get the same denominator (*she will equalize the denominators)*. Afterwards, we add those parts. I can show them in this way.

Three interview participants stated that they would ask questions in order to handle students' misconceptions. One of these participant, P27, explained how she could overcome students' possible misconceptions as follows:

(She wanted to change one of the assessment questions to $\frac{15}{20} = \frac{20}{25}$ *(__) since she thought that students could have a misconception on this issue).*

R: How do you understand if the students have misconception about this?

P27: I say [to the student] "You said these [fractions] were equal." Or I say to [the student] "Show me [their equality]." We have dot paper. I can (specify) a whole and I (can ask) "Can you show me both fractions in this whole?" Let's say [s/he] showed me. Then, I can ask to the student "Do these two [fractions] represent the same area?" They do not represent the same area. "Then, can we

call them as equivalent fractions?" No, we cannot. That is to say, we cannot equate fractions by adding and subtracting. I can overcome the misconception by this way.

Additionally, two of the eleven interview participants, asserted that they could notice whether the students had a misconception or not while observing their group works. To illustrate, P18, stated that the lesson plan was weak since it included nothing except the information about timing. She also specifically emphasized on the nonexistence of expressions related to observing students' group works in the lesson plan as presented in the following conversation:

R: If you had prepared the given lesson plan, How would you design the middle part of it?

P18: Here, the only written information is that "have students complete the activity in 15 minutes." There is no other information except this one. For instance, some expressions related to the observing students may be [added]. We learnt several methods. Checklist may be used. […]

R: Why does the teacher observe?

P18: […] Maybe the student did not comprehend the division of the whole into equal parts. Maybe I did not realize it at the beginning but I will notice it in the activity session. […] I can find out some misconceptions that students have [while observing them].

To sum, in the task implementation two among twenty-seven participants mentioned challenging students' misconception and one of them suggested asking questions in order to overcome these misconceptions. During the interview, eight of the eleven participants suggested asking questions either to learn about students' misconceptions or to challenge them. However, some of these eight participants preferred to explain the concept themselves rather than students explored it through questioning while challenging the misconceptions. Furthermore, only two participants used the observation method as a way of clarifying students' misconceptions. It seemed that these participants were depending on using questioning rather than observation method for both clarifying and challenging the misconceptions. On the other hand,

they mostly applied questioning method while learning about students' misconceptions rather than challenging them.

4.2.3 To Promote Discussion

Task analysis revealed that the third most frequently mentioned usage of teachers' questioning that should be considered in lesson planning was to promote discussion environment in the classroom discourse. Only one participant among twenty-seven highlighted asking questions to encourage the classroom discussion in the task implementation while seven among eleven participants expressed that they planned to ask questions in order to direct students to discuss the concept in both middle and end part of the lesson plan during the interview. In addition, another participant also emphasized on creating discussion environment in the task implementation; however, she did not mention how she would provide that environment.

The participant who desired to add questions for promoting discussion environment expressed her idea as *"more encouraging studies can be included [to the lesson plan] in order to create the discussion environment. For instance, additional questions can be asked in the middle part [of the lesson]"* (P14). The other participant, P15, mentioned creating discussion environment as well. She stated that *"I would have students understand the question in the beginning [part of the lesson plan] by discussing it."* However, she did not specify whether she would use questioning for providing classroom discussion or not. Hence, in order to understand if she planned to use questioning method, further questions were asked during the interview.

During the interview, seven among eleven participants stated that they planned to ask questions in order to direct students to discuss the concept while commenting on both middle and end part of the lesson plan. All of these participants provided their possible questions as well.

Three participants asserted that they would create discussion environment by asking students some questions in the middle part of the lesson plan. One of these three participants, P15, who did not explain the method she planned to use for creating

discussion environment in the task implementation, emphasized on the nonexistence of the questions related to the relationship between the equivalent fractions. She suggested to add these kind of questions to the lesson plan in order to create a discussion environment as follows:

> **P15:** […]. The lesson plan is insufficient since the teacher (did not emphasize on the relationship between equivalent fractions). I think the teacher should add this to the middle part of the lesson plan.
>
> **R:** How do you add it to the lesson plan? I mean, what do you say to the students?
>
> **P15:** Probably I would ask them to write the value of the fractions and want them discuss on the relationship between them (numerators and denominators). For instance, the students multiplied both [numerator and denominator] and they got this. I would ask them "What is the relationship between them?" or "What kind of pattern did you observe?" [to discuss the relationship].

Other four participants planned to ask discussion questions at the end part of the lesson plan. One of them, P24, explained her reasoning and specified a sample of questions as follows:

> **R:** If you had prepared the given lesson plan, how would you design the end part of it?
>
> **P24:** I think I would prepare it like this one (the given lesson plan) because first, the responses of the groups are written on the board. If there are different answers, for instance, first and second groups answer differently, then questions like "Why did you do that?", "What did you think while doing it?" or "Do you think that the way your friend solve the question is correct?" are asked. Discussion environment must be created in some way.

Although in the task implementation only one participant mentioned this feature, more than half of the participants emphasized on creating discussion environment during the interview and they suggested asking questions for ensuring that environment. Also, all of the participants who addressed to include discussion questions either in the middle or end part of the lesson plan, gave a sample of examples of questions that they planned to ask. To sum, these participants highlighted the usage of questioning in enhancing

classroom discussion whereas they did not mention using observation method in promoting discussion environment.

4.2.4 To Make Students Discover

According to the task analysis, the fourth most frequently mentioned usage of questioning which should be considered in lesson planning was to make students discover the concept. One among twenty-seven participants drew attention to ask questions in order to make students discover the pattern in equivalent fractions while they were working on the activity. She also provided some examples of questions that serve this purpose. On the other hand, during the interview, six among eleven participants drew attention to have students discover the concept and they suggested asking questions in order to direct them to explore the concept.

P27, who underlined this feature in the task implementation, expressed her ideas and specified some questions to have students discover the patter in equivalent fractions as follows:

> Questions should be asked to the students while they were working on the activity with dot paper [such as] “Do all fractions that you write represent the same area?” then “Are they equivalent?” and “Why are they equivalent?” After students responded the questions, the teacher should summarize that these fractions were equivalent even if their numerators and denominators were different and s/he should ask whether they realized a relationship between these fractions or not.

During the interview, six among eleven participants emphasized on the power of having students discover the concept rather than the teacher explained it. In order to direct students to explore the concept, they favored asking questions. Moreover, these participants provided some possible questions that could be directed to the students in stated situations.

One of these six participants, P21, explained and exemplified how he would have students discover the equality of fractions as follows:

> **R:** How will you have students discover this (the equality of fractions)?

P21: Well, (by asking questions) [such as] "How do you define it (the shaded area in option b in the activity) as a fraction?" When students respond, I can ask "Can we express it in another way?" or "How did you find the answer?", "Did you count the triangles or squares?", "If you counted squares, what would be [the answer]"? We [as a teacher] can try to obtain equivalent fractions in this way. Afterwards, even, we can divide the squares [into more parts]. For instance we can divide each squares into two. By this way, we may say that we can generate infinite number of equivalent fractions.

Another participant, P17, preferred to start the lesson by asking a "real-life" example. She aimed to prompt students to think and have students discover the equality of fractions like P21. She expressed her ideas as follows:

R: What kind of a question would you direct to the students?

P17: […]. Let's say we have a cake or a pizza. She divided it into four and took two pieces. Her brother divided it into six and took three pieces of it. Which one of them did take more? I can ask this kind of a question to mislead them or to prompt them to think.

[…]

P17: The level of the students can be average. Maybe more questions can be asked in order to make them discover. Maybe specific questions cannot be written in the lesson plan but at least I do not know…. Sometimes the idea in the mind and in the lesson plan are not the same.

R: Do you have any question in your mind that you can write it to the lesson plan?

P17: "When we look at the shape, how do we express this fraction (representation of the shaded area of the figure in the beginning part of the lesson plan)? For example, they say $\frac{2}{3}$. "Do we express it with only $\frac{2}{3}$?" Maybe I can ask this question too: "Can we express it with another fraction as well?"

As a result, while only one participant underlined this usage of questioning in the task implementation, six participants commented on this feature during the interview. These participants also provided some possible questions that could be directed to the students in order to have them discover some properties of fractions. On the other hand,

none of the participants mentioned the usage of the observation in order to have students discover the concept. It seemed that these participants preferred to create question-answer session to help students discover rather than explaining the properties of fractions themselves.

4.2.5 To Examine Students' Learning

This feature will be only addressed while reporting the findings of interview data since none of the participants mentioned this feature in the task implementation.

During the interview, all eleven participants were directed a question "How do you understand whether students achieved objectives or not during the lesson?" in order to reveal their considerations of formative assessment. Seven of them used questioning as a way of checking whether the students have understood the concept or achieved the lesson objectives. They also specified the sample of questions except P15. She asserted another way that would help to understand students' competence as well as questioning.

P27, one of the seven participants who applied questioning in order to see students' knowledge level, reflected her ideas as in the following conversation:

> **R:** How do you understand whether students have achieved objectives or not during the lesson?
>
> **P27:** I always understand through my questions. Especially, at the end, we summarize the lesson. When the teacher creates a question-answer [session] rather than [s/he] summarizes the lesson himself, (it can be understood) clearly whether the students learn [the topic] or not. Then I [as a teacher] can know whether the students achieved the objectives.
>
> [...]
>
> **R:** If you had prepared the given lesson plan, how would you design the end part of the lesson plan?
>
> **P27:** In the end, I would ask "What did we learn today?" to summarize the lesson. I would turn back to the questions in the beginning part and [ask to the students] "What do you think about this question now?" If the students

understand the topic or achieve the objectives, they say "A-ha! They are the same." *(She referred to the equality of the fractions).* Then I would ask "How do you understand that they are equivalent?"... I summarize the topic through the questions.

P15 also asserted that she asked questions to examine if the students achieved the objectives but she did not give any specific example of her possible questions. Besides questioning, she mentioned another way that she would use to check students' understanding in the following conversation:

R: How do you understand whether students achieved objectives or not during the lesson?

P15: I probably ask questions from time to time throughout the lesson. Well…People say whether (the students) learn the topic is understood from the eyes.

R: Do you agree with this view?

P15: I agree with that because it is understood from their eyes if they do not understand the topic. Well… When they look with empty eyes, (you can) realize that they do not have interest. Sometimes they really look at with shining eyes. I mean, it is understood from their eyes if they (get the point) but I can ask questions as well. Asking questions is needed in order to keep students active.

Besides using questioning to examine students' learning, P24 also agreed on the idea that the teacher can realize from students' eyes whether they understand the concept or not. She explained her reasoning as follows:

R: How do you understand whether the students learn the topic?

P24: First, I ask the question that "Who understands the question?" rather than solving the question myself. I want a student who understands the question explain it or I want first the question is clarified. Well, also there are students who cannot say that they have not understood. How will we detect these students? They are sometimes detected when you look at their eyes. I think we find out the students who did not understand by asking "Did you understand?" or "What did you understand?"

Additionally, three participants emphasized on examining students' learning while answering the questions about the usage of observation and its benefit. They provided a range of different fields that the observation could serve for. They did not exactly use the expression that they would observe students to check their understanding but they asserted some ideas that implied it. To illustrate, P25 expressed how she would benefit from observing the students as follows:

> **R:** How do you benefit from classroom observation?
>
> **P25:** At the first stage, it helps me to see how the students associate the new knowledge with the existing one. Then, it assists me [in the decision of] what I can add on associated knowledge in the next topic.

Similarly, P4 stated that she would observe the students while they were sharing their groups' answers with the class at the end part of the lesson.

> **R:** How do you understand whether students achieved objectives or not during the lesson?
>
> **P4:** I would observe the students with respect to which student say what, what do they think in general?

In sum, even though none of the twenty-seven participants mentioned using questioning method to check on students' knowledge in the task implementation, seven participants stated that they planned to apply this method to understand whether the students achieved the objectives or not during the interview. Moreover, some participants underlined that affective evidences can also be used to learn about students' learning. It seemed that these participants mostly preferred asking questions for understanding students' learning.

4.3 "Providing Feedback that Moves Learners Forward" (Wiliam & Thompson, 2008, p.63)

In the last section, the subdomain of formative assessment framework "providing feedback that moves learners forward" (Wiliam & Thompson, 2008, p.63) will be addressed by considering the participants' thoughts about the assessment part of the

lesson plan. The participants' purposes in preparing this part will be examined under the categories of "feedback for teacher" and "feedback for students" (Sadler, 1989) followed by their intended further actions while reporting the findings of the interview analysis. Furthermore, their judgements about and the information that they gather through the questions in the assessment part will be reported.

4.3.1 Feedback for Teacher and Students

All participants commented on their purposes in preparing the assessment part and further actions that they intended to actualize based on the questions related to these issues during the interview. All participants emphasized on the feedback which they (as a teacher) would obtain through the assessment part while only one participant mentioned the fact that this part also would provide feedback to the students about their learning.

All interview participants underlined the similar purposes in preparing the assessment part all of which related to the teacher actions. They mainly stated that they would implement this part in order to provide feedback about students' level of knowledge and their competence in teaching. P4 emphasized on both aspects as in the following conversation:

> **R:** What is your purpose in preparing the assessment part of the lesson plan?
>
> **P4:** In order to learn about whether I could teach the concept or not. Did I have students achieve the objectives? There can be some points that the students did not get. I prepare [the assessment part] in order to determine these points [as well].

P13 also underlined the necessity of providing feedback about students' learning as follows:

> I think the [assessment] part is necessary in order to provide feedback about what the students have learnt or have not learnt because let's say we finished the class, the topic did not to come to a conclusion. I think using exit card is very beneficial in order to understand whether the students have learnt the concept or not.

One of the participants, P27, explained her point of view on assessment part of the lesson plan as well as her purpose in preparing it in the following conversation.

> **R:** Do you always include the assessment part in a lesson plan?
>
> **P27:** Well, I do not. Generally, we (her classmates and herself) play a trick. For instance, last year, while we were preparing lesson plans in the method courses, generally we wrote [in the assessment part] that "observe whether the students have learnt the concept or not." Preparing the assessment part and implementing it are somewhat done ultimately. To tell the truth, I do not pay attention to how I assess the students while preparing this part.
>
> **R:** What is your purpose in preparing the assessment part of the lesson plan? Well, you said you did not prepare this part but you wrote about the observation of the students. What is your purpose in writing about the observation of the students in the assessment part?
>
> **P27:** There are objectives and we try to achieve those objectives. [I prepare it] in order to learn about "Did I achieve the objectives or not?" For instance, are the students willing to do the activity? Or do they get bored while doing it? Actually, in order to have information about my instruction, I can observe the student as well.

Additionally, P23, one of the interview participants emphasized that the assessment part provided feedback not only to the teacher but also to the students about their learning. He also underlined that he did not know how to implement the exit card which was one of the ways of assessing students' understanding. The conversation between the researcher and P23 was as follows:

> **P23:** I would give the exit card. When they finished, they would go out. However, I do not know how to implement it. For instance, I do not know whether they come to me and show their answers. Do I need to tell them "yes, you can go out"? I know [how to implement it] theoretically.
>
> **R:** What is your purpose in preparing the assessment part of the lesson plan?
>
> **P23:** Well, definitely I will not grade students' work. Here, grading is so ridicules. I check whether they understood the concept or not. I think that it should provide me feedback.

R: Why did not you grade their works?

P23: We implement it in last five minutes [of the lesson]. The students have learnt the concept in that lesson. Their knowledge is so fresh. I think there is no need to grade the exit card if the students have a perception that the assessment part serves for testing themselves. The teacher will use it to learn about what the students understand (and) also the students will realize whether they understand the concept or not through the assessment part.

Not only P23, but also the remaining ten participants preferred not to grade students' answers to the questions in the assessment part since they would construct this part either to check students' understanding or to have the students understand the concept better. To illustrate, according to P21, the purpose in preparing the assessment part was not grading. He explained his reasoning in the following way:

R: Do you grade the assessment part? How do you evaluate it?

P21: I do not grade it.

R: Why not?

P21: Because our aim should only be teaching the concept and having students comprehend it.

All interview participants also mentioned for what purpose they would use the information they gathered through the assessment part. They mainly expressed that information they obtained by means of the assessment part affected their further instructional plans. On the other hand, none of the participants mentioned students' possible further actions in order to enhance their own learning.

The feedback gathered from the assessment part mainly impacted the participants' plans related to the following instruction. P23 explained how the feedback he obtained through the assessment part would affect the next classroom activities as follows:

I prepare the homework or the next class' assignments by considering the students' answers to the questions in the assessment part. If most of the students answer them correctly, I assume that these students certainly understand the concept. I ask more difficult questions in the next class. If most of the students

> give incorrect answers to the questions, in the following class, I extent the time in which I repeat the previous concept.

P15 also emphasized on the effect of the feedback she obtained through the assessment part on her further instruction plans. However, she thought that the curriculum might prevent her implementing these plans.

> I would decide what to do according to the answers of the majority of the class. If the students made major errors, I would think that I was responsible for their mistakes. Maybe, I would repeat the lesson or I would probably teach another lesson in which I could make emphasize on the points that the students misunderstood. I do not think that I will move to another topic (without improving students' learning). However, I do not know whether I have time to do it when I would be a teacher because there is a curriculum [need to follow]. These plans are only utopia.

To sum up, all participants agreed on that the assessment part provided feedback. However, they mainly emphasized on the feedback which they (as a teacher) would obtain through the assessment part. Only one participant mentioned that this part also provided feedback to the students about their learning. It seemed that these participants ignored that the students also could make benefit of the feedback they gathered through the assessment part in order to improve their learning.

Additionally, all participants stated that they would not grade the assessment part since they constructed it to check students' understanding or to have the students understand the concept well. Regarding to the further actions, these participants planned to use the feedback that they acquired by means of the questions in the assessment part in order to make some instructional adjustments according to the students' needs. They preferred to make some changes in the next class' activities or to directly repeat the lesson again. However, some of the participants claimed that they probably would not have time to repeat the lesson since they needed to follow the national curriculum. It seemed that these participants used the assessment part of the given lesson plan formatively since they did not prefer to grade the questions in this part and they planned to adjust the next class' instruction with respect to the feedback they provided through the assessment part.

4.3.2 Participants' Thoughts and Suggestions about the Assessment Part of the Lesson Plan

In the task implementation, sixteen among twenty-seven participants made a wide range of comments about the strengths of the assessment part while twenty participants expressed the weaknesses of this part by mainly emphasizing on the insufficient number and the variety of the questions. These participants also were not favor of providing single type of questions in the assessment part. Hence, they proposed some suggestions to improve the indicated weaknesses.

The participants who specified the strengths of the assessment part, drew attention to the different aspects. Five of these participants underlined that the questions in the assessment part were related to the lesson content. To illustrate, P5 expressed that *"[the assessment part] is not strayed from the point and the questions are not confusing."* Moreover, P12 thought that *"it is a good activity [since] the students can implement what they learnt to the assessment part."* Two participants claimed that the assessment part was strong since *"it is efficient in assessing whether the students understand the second objective"* (P8) and *"the indicated questions can measure easily whether the students understand the relationship between two equivalent fractions."* (P15). P11 and P27 remarked on different aspect of the questions. They expressed that this part was useful since there were questions related to both enlargement and simplification of the fractions and *"they included both true and false answers"* (P27). There was not any coherence between other participants' expressions. For instance, P9 stated that she liked the questions in the assessment part since *"they have uncontroversial and single answer"* whereas according to P23, *"the questions do not have specific answer and they prompt students to think."* Additionally, P18 expressed the reason for why she thought the assessment part was strong as *"if it is planned to be implemented as the exit card at the end of the lesson, it is good in terms of its shortness."*

Regarding to the weakness of the assessment part, six participants highlighted the insufficient number and diversity of the questions. They also made some suggestions

in order to improve these aspects of the assessment part. To illustrate, P2 emphasized on the necessity of adding different types of the questions as *"not only true-false questions, but also questions with different variability such as matching questions and easy problems should be included [in the assessment part]."* Similarly, P21 mentioned increasing the variability of the question as *"there is only one type of question. There should be (questions) which are supported by the shapes. Not only true-false questions, but also some interpretation questions and the questions that the students can write equivalence of the indicated fractions should be added."* P11 also emphasized on the insufficient number of the questions and expressed that *"four questions in the assessment part were not enough."* She suggested to add some matching questions and *"fractions that the students can show them with models."*

In addition, five participants thought that this part of the lesson plan was weak since it included questions that the students had fifty per cent chance to answer them correctly. P16 explained her reasoning as *"the questions do not prompt students to think. I do not think that the (questions) which the students have fifty percent chance to answer them correctly can be beneficial."* Similarly, P12 claimed that students could guess and have a chance to find the correct answer as either true or false. In order to reduce the chance factor, she proposed that *"the students should explain the reasoning behind their answers."* Moreover, P19 set a condition to use true-false questions as *"true-false questions would be beneficial under the condition of providing their explanations."* She also suggested to *"add some open ended questions in order to see how much the students understand the concept in an easy and reliable way."* The remaining participants proposed different kinds of recommendations. To exemplify, P24 suggested adding verbal questions by considering that *"the assessment part can be more comprehensive if the verbal questions are included"* while P26 recommended to insert *"questions with shapes in which the students can shade."* Furthermore, P5 was in favor of including daily life questions and she explained her reasoning as *"there could have been different types of (questions) which increase the creativity [of the students]. That is, there should be questions which aim to have students discover the [concept]. Different, I mean real-life questions would be added."*

During the interview, participants mostly underlined the weaknesses of the assessment part of the lesson plan and they made suggestions in order to improve these weaknesses similar to the ones in the task implementation. Only four interview participants mentioned the aspects they thought as the strength of the assessment part. Two of these participants stated that they would keep the option c since it could assist to detect some misconceptions or errors. P22 expressed his opinion about the option c as follows:

> I like this example very much. *(He referred to the option c).* This had been multiplied by four, and that one had been multiplied by three. *(He referred the numerator and the denominator of the fraction).* How did I define [the equivalent fractions]? Well, the fractions which are the multiple of each other are equivalent fractions. Ok. However, [there is the question of] how many times one is the other, how so? For instance, [numerator of the existing fraction] is multiplied by four and [denominator of the existing fraction] is multiplied by three. This is consistent with my definition. However, this one is actually multiplied by $\frac{4}{3}$. Should I say [to the students] that the [equivalent fractions are] the fractions with whole number multiple … I mean this makes me think. Hence, the option c can cause the misconception and it is also a good example to detect the misconception.

Another participant, P17, emphasized that she liked the questions in the assessment part since they included numbers which were not much used:

> **R:** You had written about the strength of the assessment part in the task implementation that it was good to see different and unfamiliar examples.
>
> **P17:** Yes, like 37 or so. Here for instance, $\frac{3}{4}$ or $\frac{5}{10}$ …I do not know… $\frac{5}{15}$ …easy numbers with 0 or 5 [had not been used]. […]. $\frac{46}{14}$ again different numbers. Using these kinds of number is good.

While P17 thought that using this kind of numbers was the strength of the assessment part, P22 emphasized that using these numbers was challenging and the waste of time.

> I think this is so weird. *(He referred option c).* It is waste of time. Ok, 37 is the half of 74, but the students cannot realized it easily. Can the student answer it correctly with the excitement of that moment?

Additionally, four among eleven interview participants expressed that they could not realize whether the students would understand the concept or not by means of the questions in the assessment part. One of these participants, P18, explained her reasoning as follows:

> I think, whether the students understand the concept or not is not assessed exactly here because there is fifty per cent chance. If I write all of them true, I will answer one or two of them correctly.

In order to overcome this weakness of the questions, she proposed to add another kind of question as follows:

> If I were….I would give them $\frac{3}{4}$ and want them write an equivalent fraction to this one rather than asking true-false [questions]. Even, I can ask the same questions with the one that I asked in the beginning part of the lesson. I change its numbers. "If such a number of pieces of cake were eaten, how many pieces were eaten?" and "Is there another fraction which represents the (same) amount?"

Another participant, P21 stated that he cannot understand whether the students gave correct responses intentionally or by chance through the question in the assessment part. Moreover, he suggested making some additions to the assessment part so that students could understand the equivalent fractions concept better as in the following conversation:

> **R:** If you had prepared the assessment part of the lesson plan, how would you design it?
>
> **P21:** I would keep these ones but (they are) all numerical expressions. There is not any drawing [question]. I would add that kind of questions as well. In this way, the equivalent fraction [concept] is settled down better in students' minds. With these questions, students can only simplify and enlarge the fractions. Why $\frac{3}{4}$ is equal to $\frac{6}{8}$ cannot be seen by the students. [Working with] only drawings is not also (efficient) since they come across these types of questions very frequently. *(He referred true-false questions).* Both types [of questions] should be learnt.

In addition to all, P24 recommended to add some problems. She explain the reasons behind her addition as follows:

> Here, you only execute the operations. *(She referred the assessment part).*They are a kind of drill. Only students need to multiply or divide the numbers. This direct students memorize [the rules]. For instance, there should be problems that prompt students to think. […] For instance, I gave $\frac{3}{2}$ of 12 apples to Ayşe. The student says "I have 12 apples" and draw them. S/he also draws $\frac{3}{2}$ of it and says "I gave these [apples to Ayşe]". Then, s/he can find the remaining. It is more challenging.

To sum, in both task implementation and the interview, participants emphasized on the similar issues with different frequencies. In the task implementation, more than half of the participants commented on the strength of the assessment part. They mainly underlined the consistency of the questions in the assessment part with the lesson content and the objectives. They also thought this part was useful since it included questions related to both enlargement and simplification of the fractions. On the other hand, during the interview, less number of participants mentioned the strength of the assessment part by commenting on only the specific options. Regarding to the weaknesses of assessment part, in both task implementations and interview, participants highlighted insufficient number and diversity of the questions. Moreover, they expressed that they could not realize whether the students would understand the concept or not by means of the questions in the assessment part since their structure gave the students fifty per cent chance to answer them correctly. Participants also made similar suggestions so that indicated weaknesses can be improved. They mainly proposed either to add open ended questions or questions with drawings. It seemed that these participants could notice improper aspect of the questions related to the quality. However, they did not mention the inclusion of the rubric for fair scoring which was another reason of the improperness of the given task.

4.4 Summary of the Findings

The findings of the data analysis for "clarifying and sharing learning intentions and criteria for success" (Wiliam & Thompson, 2008, p.63) revealed that the consistency between activity and the learning goal was the most frequently mentioned feature that should be considered in lesson planning. The participants underlined this feature as the weaknesses of the lesson plan both in the task and during the interview by emphasizing the nonexistence of the activity related to the third objective. The participants also emphasized on the necessity of including more examples in the lesson plan considering different aspects such as to motivate students, to have them understand the concept better and questions' difficulty levels. However, in general, they focused more on the number of the questions, rather than their quality. Only a few participants could detect the inconsistency between questions in the assessment part and the objectives which was the third most frequently mentioned feature that should be considered in lesson planning. They drew attention to the nonexistence of the questions related to the first and second objectives. Yet, most of the participants could not notice the inconsistency between those which was one of the reasons of calling the task improper. On the other hand, all interview participants agreed on including end of the lesson review to the lesson plan since they considered it necessary in lesson planning. Beside all, very few participants mentioned the generality and immeasurability of the first objective; however, they could not explain the reasoning under their assertion why the objectives should be observable and measureable. Giving direction to the students was the least mentioned feature that should be considered in lesson planning. Some participants indicated that the students needed to understand what they were supposed to do. Hence, they underlined the necessity of giving directions to the students; however, a few of them thought that directions in the lesson plan were insufficient for the teacher and they preferred to give directions to the teacher rather than the students.

Data gathered from the participants related to the subdomain "engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding" (Wiliam & Thompson, 2008, p.63) indicated that the participants mostly tended to ask questions for recalling the previous knowledge of the students or

drawing their attentions to the current topic. They were also prone to use questioning rather than observation method for both clarifying and challenging the misconceptions. However, they mostly asked questions while learning about students' misconceptions rather than challenging them. In addition, some participants emphasized on creating discussion environment and they suggested asking question in the middle and end parts of the lesson plan in order to provide that environment. The participants underlined that having students discover the concept was very crucial in teaching and they preferred to create question-answer session in order to have students discover the pattern in equivalent fractions rather than explaining it themselves. They also mentioned using questioning in order to understand whether the students have achieved the objectives or not. In addition to the questioning, they asserted that students' behaviors can also be used to learn about students' learning. Even if the observation is one of the effective ways to check on students' understanding, the participants were not liable to implement it.

Data analysis of the subdomain "providing feedback that moves learners forward" (Wiliam & Thompson, 2008, p.63) showed that all participants had a consensus that the assessment part provided feedback for the teacher. They planned to implement this part in order to gather feedback about only the students' level of knowledge and their own competence in teaching. That meant, the participants overlooked the fact that the assessment part also provided feedback to the students about their learning progress. Besides, all participants underlined that they would not grade the assessment part since they prepared it to understand whether the students could achieve the objectives or not. That is, they prepared it in order to obtain feedback about students' progress, not to grade their works. This idea was coherent with the participants' further actions. They intended to use the feedback they acquired by means of the questions in the assessment part in order to make some instructional adjustments according to the students' needs. They mainly planned to make some changes in the next class's activities or they directly preferred to repeat the lesson again. However, these participants had a concern for not being able to teach the all contents in the curriculum within the stated time schedule. The assessment part of the lesson plan served for formative purpose since

the participants did not grade students' answers and planned to adjust the next class's instruction with respect to the feedback they provided through the assessment part in accordance with the students' needs.

Additionally, the participants had similar thoughts and suggestions about the questions in the assessment part of the lesson plan. Most of the participants thought that the assessment part was weak since it included insufficient number of questions with no variability. They believed in that they (as a teacher) could not realize whether the students have understood the concept or not through these questions since their structure gave the students fifty percent chance to answer them correctly. In order to eliminate this weakness of the assessment part, they mainly recommended to add either open-ended questions or questions with drawings. On the other hand, the participants did not mention the inclusion of the rubric for fair scoring which was another reason of the improperness of the given task.

Participants also did not refer any feature with regard to the categories which are "activating students as instructional resources for one another" and "activating students as the owners of their own learning" (Wiliam & Thompson, 2008, p.63). Hence, no finding presented in this chapter related to these categories.

CHAPTER V

DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

The purpose of this study was to reveal senior preservice middle school mathematics teachers' formative assessment approaches they planned to implement in a real classroom setting. The findings of the current study will be discussed in accordance with the purpose of the study.

Each section in this chapter is associated with the subdomain of formative assessment framework (Wiliam & Thompson, 2008) addressed in the findings section in order. In the first section participants' strategies for having students comprehend what the objectives mean will be discussed. Next, the usage of questioning and classroom observation as formative assessment strategies will be discussed with an emphasis on their frequencies. Then, participants' thoughts and suggestions about the assessment part of the lesson plan followed by their purposes in preparing it will be discussed, and their intended further actions will be interpreted by means of the formative usage of the assessment part of the lesson plan. Finally, some implications and recommendations for further studies will be addressed. However, before moving the discussion related to the subdomains of the formative assessment framework (Wiliam & Thompson, 2008) addressed in the findings section, discussion with regard to the two not mentioned subdomains will be presented.

Findings revealed that although preservice teachers were not directed to any formative assessment strategy, their expressions were grouped under the three subdomains of the formative assessment framework (Wiliam & Thompson, 2008). Any feature associated with the remaining two subdomains "activating students as the owners of their own learning" and "activating students as instructional resources for one another" (Wiliam

& Thompson, 2008, p.63) was not mentioned either in the task implementation or during the interview. Not addressing these subdomains might be due to the preservice teachers' thoughts that students cannot possibly assess their peers' and their own performances objectively (Wiliam, 2007). Another reason of not mentioning these subdomains might be attributed to the fact that preservice teachers perceived assessment as only their responsibility since they thought that only teachers would have necessary skills and expertise in order to assess students' learning (Sadler, 1989).

5.1 "Clarifying and Sharing Learning Intentions and Criteria for Success" (Wiliam & Thompson, 2008, p.63)

Findings indicated that preservice teachers in the study had several weaknesses in one of the formative assessment strategies, "clarifying and sharing learning intentions and criteria for success" (Wiliam & Thompson, 2008, p.63) investigated in the study. Preservice teachers did not specify any success criteria or rubric for the assessment part of the lesson plan to prevent unfair scoring. Similar findings were obtained from the research which reported preservice teachers' evaluations of students' learning, as provided in their plans (Campbell & Evans, 2001). Omitting the success criteria or rubric might be due to the nature of the questions in the assessment part of the lesson plan. Since there were true-false questions in the assessment part, preservice teachers might have thought that they did not need to include any rubric for scoring. Another reason for non-inclusion of the rubric might be preservice teachers' thoughts about the usage of the assessment part. As they emphasized that this part was only for checking students' level of learning, they might not have preferred to score students' work and not to include a rubric for fair scoring.

When clarifying learning intentions was taken into consideration, almost half of the participants were able to detect the inconsistency between classroom activity/questions and the lesson objectives which was one of the reasons for calling the given task as improper. Even though it was the most frequently mentioned aspect that the participants considered in lesson planning, the number of the participants who emphasized this issue was very limited in some respects. Although ensuring the

consistency between the learning targets and classroom activities is one of the basic concerns that should be taken into account in lesson planning (Moss & Brookhart, 2009), and necessity of consistency between those has been dwelled on in many mathematics teaching courses (such as Measurement and Assessment, Methods of Teaching Mathematics I, II) throughout participants' training, such limited number of participants who emphasized on this feature was surprising. Additionally, although these participants stated the inconsistency between classroom activity/questions and the objectives as the weaknesses of the lesson plan, most of them did not suggest any particular example in order to eliminate this feature. This might be due to the fact that the participants needed some materials in order to propose specific examples in that instant. Moreover, the participants might be disposed to not specifying all intended assessment actions in the lesson plans; in fact, each step of the assessment needs to be decided and planned continuously and more specifically (Cauley & McMillan, 2010; Heritage, 2007). Instructional activities that correspond with the lesson objectives also need to be constructed beforehand (Heritage, 2007). Therefore, participants might not decide to provide suggestions because they did not have tendency to specify all intended actions, sufficient time and/or resources.

In addition to the necessity of alignment between classroom activities and the objectives, the participants specified including more examples in the lesson plans considering different aspects. However, participants who referred to adding examples in the lesson plan focused more on the number of the questions, rather than their quality or difficulty levels. The disposition to increase the number of the questions might be attributed to the fact that there has been a general tendency among the teachers to introduce students with different questions as much as possible in order to prepare the students for high-stakes national examinations (Amador & Lamberg, 2013; Haser, 2006). Especially senior preservice teachers might have the same tendency since they have observed and internalized inservice teachers' teaching practices throughout the two semesters in practice related courses.

Participants mentioned not only the alignment between classroom activity/questions and lesson objectives, but also consistency between plan's assessment and learning

targets. Although a few participant realized that the questions in the assessment part of the lesson plan did not assist the teacher to understand whether the students achieved the first and second objectives, most of the participants were unable to detect the inconsistency between plan's assessment and the lesson objectives which was one of the reasons for calling the given task as improper. The participants' failure in detecting the inconsistency between plan's assessment and the lesson objectives was congruent with the research findings gathered through the examinations of the lesson plans in terms of degree of match between objectives and the assessment part of the lesson plan (Ambrosio et al., 2001; Campbell & Evans, 2001; Ruys, Van Keer, & Aelterman, 2012). Although ensuring consistency between the plan's assessment and objectives is another fundamental issue to concern in lesson planning (Ambrosio et al., 2001; John, 2006; Moss & Brookhart, 2009; Theoharis & Causton-Theoharis, 2011), and requirement of consistency between those has been emphasized on in many mathematics teaching courses throughout teacher training, very few number of participants who underlined this feature was also unanticipated.

Although the participants were unable to detect the improper nature of the lesson plan, they could specify the strength of the end part of the lesson plan. They all emphasized that the lesson plan had an essential element, which was the end of the lesson review. This high frequency of mentioning the end of the lesson review was also reported in a previous study which investigated the teachers' planned formative assessment practices (Black et al., 2003). The great amount of emphasis on this feature might have resulted from the fact that the researcher directed a specific question to the participants in order to understand their thoughts related to the end part of the lesson plan. This might prompt the participants to think about the properties of the end part of the lesson plan. Another explanation of the greater stress on the end of lesson review might be due to the nature of the methods of teaching courses. In these courses, preservice teachers were expected to prepare lesson plans and implement them to their classmates. After the implementation, preservice teachers discussed the properties of beginning, middle, and end part of their peers' lesson plans. This might have fostered preservice teachers to develop the perception of what was valuable in lesson planning.

When the lesson objectives were taken into consideration, the findings revealed that a vast majority of the participants were unable to detect the generality and immeasurability of the first objective which was one of the reasons for calling the given task as improper. This finding, again, was unexpected since throughout their education, preservice teachers were exposed to the knowledge that the lesson objectives were supposed to be measureable (Goldston, Day, Sundberg, & Dantzler, 2009) and observable (Campbell & Evans, 2000; John, 2007) in many mathematics teaching courses. In addition, the participants who could realize the inappropriateness of the objective were not able to explain their reasoning and some of them addressed the instructors as the source of their ideas. Not being able to explain the reasoning behind the improperness of the first objective might have resulted from the fact that the participants have not internalized why the objectives were supposed to be measureable and observable in the course of their university education despite the strong emphasis on these characteristics.

The frequency of mentioning the insertion of the directions in the lesson plan either for the students or the teacher showed variation in the task implementation and the interview. In the task implementation, participants thought that the lesson plan was sufficient for the teacher and they did not value the explanations with regard to the students' perspective. During the interview, however, they emphasized more on giving directions to the students. This variation might be due to the fact that the participants were required to undertake inservice mathematics teacher role to implement this plan in the task implementation. During the interview, they were asked what they would do if they were the teacher rather in general terms. This might be a limitation which stemmed from the task implementation that the task implementation might seem rather formal for the participants. Nevertheless, they were expected to value the lesson plan with regard to the students' perspective since in the given lesson plan, there were expressions that guided the teacher in order to keep students on the lesson objectives. In addition, the reason of not valuing the lesson plan expressions with regard to the students' perspective might be that the participants thought that the teacher would make necessary explanations verbally rather than including them in the lesson plan. In

fact, there were instances where participants expressed that the teacher did not indicate certain issues on the lesson plan, but would probably state those issues in the class. Therefore, participants might have the assumption that even if there were not instructions for students in the plan, the teacher would surely indicate them during the implementation.

5.2 "Engineering Effective Classroom Discussions and Other Learning Tasks that Elicit Evidence of Student Understanding" (Wiliam & Thompson, 2008, p.63)

Regarding to the formative assessment framework and determined codes, preservice teachers seemed to make little or no benefit of some usage of questioning and observation which could be utilized to enhance students' learning process. However, they are the most used methods of collecting information on students' progress (Antoniou & James, 2014).

Little number of participants mentioned asking questions in the task implementation while during the interview, majority of the participants emphasized it. This little emphasis on questioning in the task implementation might have resulted from the fact that the participants might be inclined to not specify particular questions in the lesson plan. The reason might be that participants thought that there would be no need to write the questions as the teacher would keep in mind what to ask in the classroom, similar to not writing directions. However, when the questions were written before the instruction began, teachers could have an opportunity to explore particular strategies for arousing students' attention to the key mathematical concepts (Black et al., 2003; Boaler & Staples, 2008) and they could support students to provide deep explanations related to the content (Pashler et al., 2007).

During the interview, preservice teachers favored asking questions for reminding students of previous lesson and drawing students' attention to the current topic especially at the beginning of the lesson. This finding might be in line with a previous research finding which indicated that questions were mainly used by the teachers to relate the previous lesson with the current topic at the beginning of the instruction

(Antoniou & James, 2014). In addition, it was consistent with the one of the IES recommendations (2007) related to the asking "pre-questions" in order to activate students' previous knowledge and focus their attention on the activities. The emphasis on using questioning for reminding students of their prior knowledge might be due to the structure of the methods of teaching mathematics courses. The nature of these courses might encourage the preservice teachers to elaborate the beginning part of the given lesson plan since the properties of each part of a lesson plan was issue of concern in these courses.

When students' misconceptions were taken into consideration, more than half of the participants suggested asking questions either to learn about students' misconceptions or to challenge them during the interview. Similar finding related to the frequent usage of questions to challenge misconceptions was also reported in a previous research (Black et al., 2003). On the other hand, some participants favored directing students toward the correct answers by means of their explanations without allowing them to explore it. This might have resulted from the fact that these participants were disposed to teacher-centered instruction since they did not feel confident in using questioning method to learn and challenge the misconceptions. Another reason of not allowing the students to explore the concept might be due to the preservice teachers' concerns about the time constraint issue. Teachers tend to answer students' needs superficially and they glance quickly over the various tasks without giving importance to examining students' level of knowledge since they are concerned about timing issue (Antoniou & James, 2014). This finding might also be valid for the usage of questioning in promoting the discussion environment and in having students discover the concept. The less frequency of mentioning those usage of questioning also be resulted from the time constraints issues.

Although none of the participants mentioned the usage of questioning in examining students' learning in the task implementation, all interview participants employed questioning as a way of checking whether the students have understood the concept or achieved the lesson objectives. Similar findings were obtained from the previous research in which the teachers' usage of questioning to check on students'

understanding (Antoniou & James, 2014; Leahy et al., 2005) and to learn whether they attained the lesson objectives, were emphasized (Antoniou & James, 2014). Besides, some participants underlined that affective evidences can also be used to examine students' learning. They claimed that whether the students have understood the topic could be detected from their eyes. Similar finding related to the usage of the informal ways which could be used to receive signal from the students about their level of knowledge was also reported in the study conducted by Antoniou and James (2014). A vast amount of emphasis on this feature might have resulted from the fact that the researcher directed a specific question to the participants in order to reveal how they would gather evidence about whether the students achieved objectives or not during the lesson. This might direct the preservice teachers to think about the ways of gathering rather quick information about students' understanding.

In spite of the fact that observation was one of the fundamental ways of formative assessment in which the teacher could obtain evidences about students' learning progress (Cauley & McMillan, 2010; Torrance & Pryor, 2001), preservice teachers did not explicitly reflect on what they would do while students were working in their groups and how they would observe students' group processes in an attempt to formative assessment. This was in line with the previous research findings which reported that the teachers mainly focused on the learning product especially at the end of the lesson and monitoring students' learning processes was predominantly absent in their plans (Ruys, Van Keer, & Aelterman, 2012). This finding might be resulted from the fact that the participants were not required to mention their own behaviors while students were working in their groups since they thought that they prepared the lesson plan for rather content and timing purposes. Besides, they might have focused on tangible actions such as asking question and review of the lesson during lesson planning rather than informal way of assessing students' learning, such as observation (Cauley & McMillan, 2010). Another reason of little or no emphasis on the usage of observation in lesson planning might be due to the fact that preservice teachers have monitored inservice teachers' lesson preparation and implementation throughout the

two semesters in practice related courses. They might have been affected by their mentor teachers' practices of not including observation in their lesson plans.

Additionally, only one of the participants underlined using checklist as one of the methods of recording students' progress and in observation of the students' works. Although several observation recording formats and techniques of obtaining observation data were emphasized in measurement and assessment, and mathematics teaching courses, the number of participants who underlined this observation method was surprising. This finding was consistent with the research results which indicated that the preservice teachers were not disposed to use some alternative assessment techniques such as checklists and attitude scales (Ören, Ormancı & Evrekli, 2014) most probably due to the crowed classes, the time constraints, and difficulty in preparation and implementation of these methods (Gelbal & Kelecioğlu, 2007). Indicated reasons of not employing the methods of obtaining observation data might also be valid for the current study findings.

5.3 "Providing Feedback that Moves Learners Forward" (Wiliam & Thompson, 2008, p.63)

Findings revealed that all preservice teachers underlined very similar purposes in preparing the assessment part, all of which related to the teacher actions. They mainly emphasized that they would implement this part in order to provide feedback about students' level of knowledge and their competence in teaching. However, only one participant mentioned that this part also would provide feedback to the students about their learning. Participants ignored the fact that the students also could benefit from the feedback they obtained by means of the assessment part of the lesson plan in order to monitor their progress and improve their learning. The disposition towards teacher-centered assessment was congruent with the research findings which indicated that formative assessment was considered as the action which assisted the teacher in order to establish the problematic areas that needed more emphasis and practice. That is, the assessment was perceived as a teacher-centered process, with the only condition to provide feedback was being the teacher (Antoniou & James, 2014). The finding of the

current study might have resulted from the fact that the preservice teachers thought that the students were not capable of establishing their needs and deciding on necessary actions to meet their needs. That is, they might not internalize the assessment part as a tool which assisted students self-assess and enhanced their own performance.

When grading of the assessment part was taken into consideration, the findings indicated that all participants were against assigning grades to the students with regard to their performance in the assessment part of the lesson plan. Their aim in the construction of the assessment part was to check students' learning or to have the students understood the concept well. This finding was in line with the idea that the main purpose of the formative assessment was to help facilitating and improving students' learning rather than simply assigning a grade (Marshall & Drummond, 2006). When it is considered that the formative assessment serves its purpose when the teacher avoids grading students' performance (Butler, 1987; Cauley & McMillan, 2010; Hattie &Timperley, 2007; Elawar & Corno, 1985; Stiggins, J. Chappuis, Chappuis, & Arte, 2004), preservice teachers gave appropriate decision about not grading the assessment part of the lesson plan.

Preservice teachers not only commented on providing feedback through the assessment part, but they also expressed for what purpose they would use the feedback gathered from the assessment part. All participants expressed that the feedback obtained by means of the assessment part helped them form their further instructional plans according to the students' needs. This finding indicated that the assessment part of the lesson plan served for formative purpose since the participants adjusted the next class's instruction, and planned further instructional steps (Black et al., 2003; Earl, 2003; O'Connor, 2002) with respect to the feedback they were provided through the assessment part in accordance with the students' needs. In general, the participants preferred to repeat the previous lesson or teach another lesson by altering the existing activity in case students gave wrong answers to the questions in the assessment part. These types of adjustments in the instruction were congruent with those reported in the previous study (Antoniou & James, 2014). On the other hand, some participants stated that the necessity of following the national curriculum might not allow them

implementing these extra plans prepared according to students' needs by considering time constraints issue. Similar findings related to the lack of time in order to cover the all subject matter in the school year curriculum was also reported in the previous study (Antoniou & James, 2014). Additionally, although all participants expressed that the feedback obtained through the assessment part assisted them arrange their further instructional plans, they did not mention students' possible further actions in order to enhance their own learning. Not emphasizing on students' possible further actions might be due to the preservice teachers' tendency towards teacher-centered assessment. Since they disregarded the fact that the students also could provide feedback by means of the assessment part so as to monitor their progress and improve their learning, they might not consider students' further actions.

Regarding to the participants' thoughts about the questions in the assessment part of the lesson plan, a vast majority of the preservice teachers were able to detect improperness of the assessment part caused by the structure of the questions in both task implementation and the interviews. They mainly emphasized that they could not understand whether the students had learned the concept or not by means of the questions in the assessment part since the assessment structure gave the students fifty per cent chance to answer them correctly. In order to eliminate this weakness of the assessment part, they generally suggested adding open ended questions or questions with drawings. Both determining the improperness and suggesting adding more open ended questions and questions with figures might resulted from the fact that these preservice teachers were aware of the necessity of alignment between objectives and the questions in the assessment part. They might suggest adding these types of questions in order to eliminate the inconsistency between the objectives and questions in the assessment part. In addition to recommending adding different types of questions, preservice teachers also suggested increasing the number of the questions in the assessment part of the lesson plan. This disposition to increase the number of the questions might be attributed to the demand to introduce the students with wide variety of questions in order to prepare the students for high-stake national examinations (Amador & Lamberg, 2013; Haser, 2006).

5.4 Implications

The findings of the current study provide researchers and teacher educators with information related to the preservice mathematics teachers' formative assessment approaches they planned to implement in a real classroom environment. Hence, some implications for mainly teacher educators and recommendations for further research will be presented in this section.

Findings of the current study revealed that none of the preservice mathematics teachers mentioned any feature associated with two subdomains which are "activating students as the owners of their own learning" and "activating students as instructional resources for one another" (Wiliam & Thompson, 2008, p.63) either in the task implementation or during the interview. That is, they did not prefer to employ any formative assessment strategy related to peer- or self- assessment. In order to motivate preservice teachers to use these kinds of assessment strategies, it should be emphasized especially in measurement and assessment course that students are also responsible for their own learning; hence, they need to be incorporated in assessment process. Moreover, some practices related to planning and implementing peer- and self-assessment might be included to the content of the course in order to canalize preservice teachers into utilizing these strategies.

Findings also indicated that preservice mathematics teachers have several weaknesses in each of the formative assessment strategies addressed in the study. First, they were unable to determine the improperness of some basic concerns that should be taken into account in lesson planning such as setting the observable and measureable objectives, ensuring the consistency between both objectives - classroom activities, and objectives - plan's assessment. Hence, it is highly probable that the preservice teachers did not internalize these basic concerns as the prerequisite components for a lesson plan and so they were not attentive while analyzing these components of the lesson plan. In order to handle the weakness in determining the improper aspects of the lesson plan, the stated components should be emphasized in method courses while analyzing the weekly prepared lesson plans of the preservice teachers. In this way, preservice

teachers can internalize the formative assessment as one of the integral components of the instruction and the lesson plan.

Preservice teachers were also disposed to not specifying intended formative assessment actions in a lesson plan such as giving directions and asking questions to the students and observing them while they were working in their groups. The content of Measurement and Assessment course includes a chapter regarding to the informal observations and questions which means that the preservice teachers are supposed to know how to use these strategies in their teaching practices. However, most of the preservice teachers did not integrate these strategies to the given lesson plan in the study although each step of the assessment needs to be decided and planned continuously and more specifically (Cauley & McMillan, 2010; Heritage, 2007). Hence, in measurement and assessment course, necessity of planning these assessment strategies should be emphasized and some practices related to how preservice teachers can plan and enact these strategies might be included to the content of the course.

In addition, preservice teachers favored directing students toward the correct answers by means of their explanations without allowing them to explore the content of the lesson. As it was discussed in the previous chapter, the reason of not enabling the students to explore the content might be that these participants were disposed to teacher-centered instruction since they did not feel confident in using questioning method to learn and challenge the misconception. In order to direct preservice teachers towards using questioning method, more practice should be given a place in Measurement and Assessment course and methods of teaching courses to improve questioning skills of the preservice teachers. By this way, they can feel more confident in using this method and they might have more tendency to implement student-centered instruction.

Preservice teachers not only underlined the tangible actions such as asking questions and review of the lesson in order to check students' level of knowledge, but they also mentioned usability of affective evidences for examining students' learning. However, they omitted the necessity of attributing these evidences to the concrete ones which

were gathered through some assessment tools such as checklists, attitude scales and observation protocols. Hence, in measurement and assessment course and methods of teaching courses, the necessity of employing these assessment tools should be stressed on more. Besides, preservice teachers should be given more opportunities to implement these assessment tools so that they can internalize the usage of them. This can direct preservice teachers to employ these kinds of assessment tools more frequently in their practices.

Findings of the current study also revealed that preservice teachers were successful in determining the improperness of the questions in the assessment part of the lesson plan. Since there is a great emphasis on particularly the assessment tools in Measurement and Assessment course, this finding was inevitable. Due to the fact that the measurement and assessment course stresses on mainly the assessment tools rather than focusing on the whole picture of the lesson plan with regard to the utilization of the formative assessment strategies, preservice teachers might have had difficulty in examining and integrating the intended formative assessment strategies in the lesson plan. In order to eliminate this situation, Measurement and Assessment course can be offered with the methods of teaching courses or lesson contents of these courses can be associated with each other. By this way, preservice teachers can have an opportunity to integrate what they have learnt in Measurement and Assessment course into the lesson plans they prepared in the methods of teaching course. Hence, they can have a chance to look at the whole picture of the lesson plans in terms of employing the formative assessment practices.

5.5 Recommendations for Further Research

There are also some recommendations based on the findings of the current research for the further studies. First, conducting a research in order to examine the quality of formative assessment strategies which preservice teachers plan to employ seems necessary in order to gain information about preservice teachers' competence in employing formative assessment strategies. Furthermore, findings of such a study

might assist preservice teachers in improving their ability to plan and implement a range of high quality formative assessment strategies.

In order to see how preservice teachers' formative assessment approaches differentiated across the years they enrolled in elementary mathematics education program, a longitudinal study might be conducted. More specifically, a longitudinal study which begins with the second year preservice teachers and observing the same preservice teachers' development of formative assessment strategies throughout their university education might provide essential information related to the effect of measurement and assessment course, the methods of teaching and teaching practices courses on preservice teachers' understanding of formative assessment. Moreover, this study might be extended to preservice teachers' first year experience in teaching in order to see discrepancy between planned and enacted formative assessment strategies of preservice (in this case inservice) teachers and to reveal the effect of one year experience on their formative assessment strategies.

Even the quality of lesson plans changes, it is known that preparing them is at least a significant first step for a successful lesson, although it cannot be foreseen that preservice or inservice teachers who integrated formative assessment strategies in a lesson plan effectively will succeed in more competent implementation than those who could not integrate their plans in a desired way. Further study is therefore, required in order to investigate the relationship between effectively generated lesson plans and teaching performance of preservice or inservice teachers with respect to the use of formative assessment strategies. Additionally, the impact of other factors such as grade level of the students, teaching methods and environments, and lesson content on this relationship can be investigated in this context. The evidence provided through such a research might be considered in designing many mathematics teaching and assessment courses.

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APPENDICES

APPENDIX A: MEASUREMENT AND ASSESSMENT COURSE SYLLABUS (SPRING 2012-2013)

Catalog Description

Focuses on construction and use of classroom tests to assess student learning in relation to instructional objectives, test interpretation, basic psychometric statistics and reporting.

Course Objectives and Goals

You are expected to achieve the following goals:

- understand basic concepts related to assessment and measurement.
- understand role of measurement and assessment in the instructional process
- identify instructional objectives as intended learning outcomes
- understand the issues that make a well-designed instrument for classroom evaluation.
- develop various assessment materials for the classroom use.

Specifically, we will focus on establishing a framework for assessing students, types of instructional decisions, validity and reliability issues, developing, administering, and scoring written tests and alternative assessments, and using assessment for instructional decisions.

Textbook

Oosterhof, A. (2003). *Developing and Using Classroom Assessment (3rd ed.)*. Upper Saddle River: Pearson Education Inc.
I will also assign additional readings.

Final Project

It is a**n individual project** in which you will develop an achievement test in a content area in the upper elementary grades mathematics curriculum. You are required to actually administer the test to several people and conduct set of analyses using the collected data. Different sections of the project will be turned in throughout the semester, as the material is covered in the class.

The following sections should be completed for the final project:

- Name of the Unit, Grade level, Content, Objectives - Table of specifications - Test preparation - A frequency distribution for total scores on the test - The mean, median, and mode of the scores on the test, and comment on the general shape of the distribution	- The standard deviation of the scores on the test - Item analysis - Reliability evidence - Validity evidence - Conclusion (A written reflection on how you followed the process of item development and what the results tell) - A copy of the test

Tentative Schedule

Weeks	**Topic**
Week 1	**Introduction, overview.** Chp1 – Introduction
Week 2	Chp2 – Determining How your Assessments Will be Interpreted and Used Chp3 – Measurable Objectives and Goals
Week 3	Chp4 – Gathering Evidence of Validity
Week 4	Chp5 – Generalizing Observed Performance to Unobserved Performance
Week 5	Chp6 – Completion and Short-Answer Items Chp7 – Essay Items
Week 6	Chp8 – Multiple-Choice Items Chp9 – Alternate-Choice Items
Week 7	Chp11 – Informal Observations and Question
Week 8	**MIDTERM I**
Week 9	Chp12 – Considerations When Using Performance Assessment Chp13 – Creating Performance Assessments
Week 10	Chp14 – Portfolios Chp15 – Reporting Student Performance
Week 11	**MIDTERM II**
Week 12	Chp16 – Norm-Referenced Test Scores Chp17 – Standards-Based Test Scores
Week 13	Elementary Statistics
Week 14	Evaluation of TIMSS and PISA results

APPENDIX B: METHODS OF TEACHING MATHEMATICS I COURSE SYLLABUS (FALL 2013-2014)

Course Description: This course focuses on the basic concepts of school mathematics and how they are taught. More specifically ELE 341 includes a study of techniques, materials, strategies, and current research used in the teaching of mathematical concepts to elementary and middle grade students. Students will study contemporary approaches in teaching mathematics and recent curriculum changes. They will develop an awareness of the professional resources, materials, technology, and information available for teachers; prepare unit and lesson plans with related assessment procedures on a variety of topics.

Course Objectives:

- Understand the basic concepts related to school mathematics.
- Understand the basic concepts and recognize connections among mathematical ideas in elementary mathematics curriculum.
- Prepare and present plans for mathematics instruction that utilize different teaching methods.
- Use a variety of resources for mathematics teachers as (web sites, publications, etc.)
- Understand the misconceptions related to school mathematics.
- Recognize connections among mathematical ideas and other disciplines.
- Use representations to organize, record, and communicate mathematical ideas.
- Apply variety of appropriate strategies to solve problems.
- Analyze mathematical thinking of other classmates.
- Be self-confident in teaching mathematics.
- Have positive attitude toward teaching mathematics.
- Be motivated to teach mathematics.

Main Book:

Van De Walle, J. A., Karp, K. S., & Bay-Williams J. M. (2012). Elementary and middle school mathematics: Teaching developmentally (8th Ed.). Boston, MA: Pearson Education, Inc.

Tentative Schedule

Weeks	Topic
Week 1	Introduction to the Course and the lab materials
Week 2	Chp.1 Teaching Mathematics in the 21st Century Chp.2 Exploring What It Means to Do Mathematics Elementary Mathematics Curriculum
Week 3	
Week 4	NO CLASS
Week 5	Elementary Mathematics Curriculum
Week 6	Elementary Mathematics Curriculum Chp.3 Teaching Through Problem Solving
Week 7	Chp.3 Teaching Through Problem Solving Chp.4 Planning in the Problem-Based Classroom Chp.5 Building Assessment into Instruction
Week 8	
Week 9	Chp.7 Technology and School Mathematics
Week 10	MIDTERM
Week 11	Chp.8 Developing Early Number Concepts and Number Sense
Week 12	Chp.9 Developing Meanings for the Operations
Week 13	Chp.10 Helping Children Master the Basic Facts
Week 14	Chp.11 Developing Whole Number and Place Value Concepts
Week 15	Chp.12 Developing Strategies for Addition and Subtraction Computation
Week 16	Chp.13 Developing Strategies for Multiplication and Division Computation

Group Activities/Presentations: You are supposed to prepare activities related to the topic and discuss during the class hour based on our previous class. You should work in groups while preparing activities.

Project: During the semester you will be asked to prepare a project.

Portfolio: You are supposed to put all the class works in a folder that you will produce during the course.

Additional Sources:

Altun, M. (2005). İlköğretim İkinci Kademede (6,7 ve 8. sınıflarda) Matematik Öğretimi. Aktüel Yayınları, Bursa.

Developing Mathematical Reasoning in Grades -12. National Council of Teachers of Mathematics, Reston, Virginia (1999).

Hatfield, M. M., Edwards, N. T., Bitter, G. G., Morrow, J. (2005). Mathematics Methods for Elementary and Middle School Teachers. Wiley Jossey-Bass Education.

İlköğretimde Karşılaşılan Matematiksel Zorluklar ve Çözüm Önerileri, Pegem Akademi, Ankara (2009)

Teaching Mathematics through Problem Solving (Grades 6-12). National Council of Teachers of Mathematics (2003).

Van De Walle, J. A., Karp, K.S., Bay-Williams, J.M. (2012). İlkokul ve Ortaokul Matematiği Gelişimsel Yaklaşımla Öğretim (7. basımdan çeviri). [Elementary and Middle School Mathematics Teaching Developmentally]. (Durmuş, S. (Çeviri Editörü)).

Journals:

- The Mathematics Educator
- International Journal of Mathematics Education in Science and Technology
- Journal of Computers in Mathematics and Science Teaching
- Journal for Research in Mathematics Education
- Journal of Mathematical Behavior
- Journal of Mathematics Teacher Education
- Mathematics Teacher
- School Science and Mathematics

APPENDIX C: METHODS OF TEACHING MATHEMATICS II COURSE SYLLABUS (SPRING 2013-2014)

Course Description

ELE 342 is aimed at helping pre-service mathematics teachers develop skills in methods of teaching mathematics to grade 5-8 students. It focuses on the issues around what can be done to help young learners understand math concepts. There will be an emphasis on critical discussion and applications of strategies to teach specific mathematics concepts.

Course Objectives

Students completing this course will have a critical understanding of teaching and learning processes in Numbers/Algebra/Geometry/Measurement/Probability and Data Analysis learning areas.

- Construct the concepts and connections among mathematical ideas in related mathematics learning areas effectively.
- Analyze students' misconceptions related to mathematics learning areas.
- Use representations to organize, record, and communicate mathematical ideas.
- Design and implement plans and activities for mathematics instruction with different teaching strategies specific to mathematics including problem solving approaches.
- Design and employ materials and resources for effective teaching of school mathematics.
- Participating in productive classroom discourse including teaching activities and mathematical ideas.
- Express interest, self-confidence, and motivation in teaching mathematics.

Main Book

Van De Walle, J. A., Karp, K. S., & Bay-Williams J. M. (2012). Elementary and middle school mathematics: Teaching developmentally (8th Ed.). Boston, MA: Pearson Education, Inc.

Other Sources

METU Library has several resources on teaching elementary mathematics. Please check them before the internet resources.

Altun, M. (2005). *İlköğretim İkinci Kademede (6, 7 ve 8. sınıflarda) Matematik Öğretimi*. Aktüel Yayınları, Bursa.

Bingölbali, E. & Özmantar, M.F. (Eds.) (2012). *İlköğretimde Karşılaşılan Matematiksel Zorluklar ve Çözüm Önerileri*. Pegem Akademi: Ankara.

Haylock, D. (2005) *Mathematics explained for primary teachers*. London: Paul Chapman.

Milli Eğitim Bakanlığı (MEB). (2012). Matematik *Öğretmen Klavuz Kitabı (İlköğretim 6. Sınıf)*. MEB: İstanbul.

Milli Eğitim Bakanlığı (MEB). (2012). *Matematik Öğretmen Klavuz Kitabı (İlköğretim 7. Sınıf)*. MEB: İstanbul.

Milli Eğitim Bakanlığı (MEB). (2012). *Matematik Öğretmen Klavuz Kitabı (İlköğretim 8. Sınıf)*. MEB: İstanbul.

Olkun, S. & Toluk Uçar, Z. (2012). *İlköğretimde Etkinlik Temelli Matematik Öğretimi*. Ankara: Norrsken.

Umay, A. (2007). *Eski Arkadaşımız Okul Matematiğinin Yeni Yüzü.* Ankara.

Tentative Schedule

Weeks	***Topic***
Week 1	**Chapter 24-** Developing Concepts of Exponents, Integer, and Real Numbers
Week 2	**Chapter 15-** Algebraic Thinking: Generalizations, Patterns, and Function
Week 3	**Chapter 16-** Developing Fraction Concepts
Week 4	**Chapter 17-** Computation with Fractions
Week 5	**Chapter 18-** Decimal and Percent Concepts and Decimal Computation
Week 6	**Chapter 19-** Proportional Reasoning
Week 7	**Midterm**
Week 8	**Chapter 20-** Developing Measurement Concepts
Week 9	**Chapter 21-** Geometric Thinking and Geometric Concepts
Week 10	**Chapter 21-** Geometric Thinking and Geometric Concepts
Week 11	
Week 12	**Chapter 22-** Concepts of Data Analysis
Week 13	**Chapter 23-** Exploring Concepts of Probability
Week 14	

Group Activities
Every week you are supposed to prepare and discuss activities related to the topic of previous class. You should work in groups while preparing activities.

Portfolio
You are supposed to put **all** the class works in a folder that you produced during the course. You will put existing **improved versions** of your work and your friends' selected work. You are required to organize all the work you have in your portfolio and write a one-page reflection on why you organized the portfolio in this way, why you included the work other than your work, and how you are planning to use them in the future.

APPENDIX D: SCHOOL EXPERIENCE COURSE SYLLABUS (FALL 2014-2015)

COURSE DESCRIPTION

Classroom observation including organization and management of school, daily activities in the school, group activities, a day of a teacher, a day of a student, school-family cooperation, observation of major and non-major courses, school and related problems, various teaching learning activities, examination of materials and written sources.

FIELD EXPERIENCE

RESPONSIBILITIES & EXPECTATIONS OF STUDENTS

- Complete appropriate number of days/hours as designated by the instructors.
- Model professional behavior/dispositions for the educational community.
- Complete all field and seminar assignments, self-evaluations, or site evaluations when required.
- Notify the course instructors of any and all absences, as well as dates to be rescheduled as soon as possible.
- Understand and observe rules and policies of each school site and classroom.
- Take all complaints to the course instructors.

TIPS FOR A SUCCESSFUL FIELD EXPERIENCE

- ✓ Become familiar with your students' curriculum and your cooperating teacher's schedule.
- ✓ Assist the teacher with classroom activities and duties. This is a great way of helping your supervising teacher. Work with your Supervising Teacher to teach one of his/her lessons, consider taping this lesson for critiquing by yourself and/or the university instructor.
- ✓ Write a thank you note to your supervising teacher.
- ✓ Attend and participate in planning sessions.
- ✓ Attend and participate in at least one in-service.
- ✓ Review the school and classroom rules of your respective teachers.
- ✓ Always carry emergency contact information. Provide this to your cooperating teacher on the first day.
- ✓ Provide your cooperating teacher with your telephone number and/or electronic mail address in case he/she needs to contact you. Obtain his/her preferred contact information in case you need to reach him/her before the next scheduled field visit.

ASSIGNMENTS (**A detailed rubric for evaluating your assignments will be shared during the semester.**)

Observation/Investigation Reports

You will be required to write two observation/investigation reports during the semester. These reports should be at most five-page long. They should be reflecting your true observations. You should not only describe what you have been observing, but also elaborate, critique, and reflect on the observation. The two observation reports and their requirements are as follows:

1. Observe the teaching of a mathematics concept and report what the learning difficulties are with specific examples from the teacher's and students' behaviors. What are the students' difficulties, what do they struggle to learn? How much do you think is related to the concept/students' background knowledge/students' studying skills/teacher?

You will be observing your teacher most of the time. Focus on how your teacher teaches a specific mathematics concept and how students learn it. Try to understand your teacher's way of teaching the concept. Which methods, if any, does your teacher use? Do you think his/her way of teaching is effective in students' learning? How are the students trying to learn the concept? Are all classroom activities (such as questioning, learning activities, solving exercises/problems on the board, quizzes, etc.) and out-of-class tasks (such as doing homework, completing worksheets, preparing posters, etc.) effective in students' learning? Why/why not? If you think that the students are not learning effectively, then how do you think a teacher can help them to learn?

2. Describe culture of the school and of the class you observe the most.

We want a description of the characteristics of the students, the teacher, the physical environment of the class and the school. How do the teacher and students communicate? How do students communicate each other? How do you think the classroom environment is different than what you have expected? How does the school culture look like? How do the administrators communicate the teacher and the students? How do the administrators and the teachers communicate the parents? Feel free to ask your teacher and the school administrators about these issues. Through these and other questions you have in your mind, we are hoping that you will have an understanding of the elements of the class and school culture. Try to find out how these elements might have impacted teachers' teaching and students' learning.

Learning Center Activity: You are expected to prepare and implement a learning center in your practice school. This learning center will include 4-5 activities about specific curricular subjects.

End of Semester Reflection Paper: You will be asked to write a reflection paper on your school experience and what have you learned from this experience. This paper should include the responses to the following questions in the form of your reflections: What have you observed and experienced as expected and unexpected about the school context, students, and teachers? What might be the reason for unexpected issues? What was the most surprising issue for you during the semester? What were the difficulties you faced in your school, in the classroom, and in your own preparation? What do you think a student teacher (like you) needs to know in order to handle this course? What was the most educative experience for you? What was missing in this course which would help you in your school experience? What do you think you have learned in your cooperating school from the students, teachers, and the school context? What did you learn in our class hours?

Teaching Portfolio: You will prepare a teaching portfolio to reflect your ideas for your future teaching throughout the semester. The intention is to help you with your first year in your teaching.

For all your assignments, the following general issues will be considered for grading purposes:

Has the student done what was asked for and specified in the description of the assignment?
Are the ideas discussed relevant for mathematics teaching and learning?
Do they include important issues and discussions considered in the field of mathematics education?
Is the work clearly presented and properly written? Are the ideas well developed? Are they coherently woven together and presented in an orderly fashion?
Does the work demonstrate that the student spent time and thought in completing the assignment? Is the work thoughtful, insightful?
Has the student made connections to pertinent readings discussed in class and to the literature on the subject under study?

APPENDIX E: PRACTICE TEACHING IN ELEMENTARY EDUCATON COURSE SYLLABUS (SPRING 2014-2015)

Course Aim:

Field experience and teaching practice including class observation, adaptation to classroom condition, planning and preparation for teaching. Guided mathematics teaching practice in elementary schools.

Course Objectives:
Practice teaching is a means of providing opportunities for student teachers, under typical conditions in selected cooperating schools, to obtain experience in observing and participating actively in all the diverse educational activities in the school.

At the end of the course students should be able to:

- Demonstrate knowledge regarding different techniques of teaching mathematics.
- Develop and implement mathematics lessons for the elementary school students and be familiar with classroom management techniques.
- Select and use appropriate instructional strategies and equipment.
- Design and implement activities which promote the development of concepts and problem solving skills in mathematics, as well as promote positive attitude toward mathematics.
- Understand how elementary school students learn mathematics.
- Be aware of specific mathematics topics taught in each of the grades 6-8 and know where to gather resources to aid in the teaching of those topics.
- Be familiar with how to assess progress of elementary school students who are learning mathematics and be able to adjust instruction for students with special needs.
- Use different technological tools to develop elementary school students' understanding of mathematics concepts.

Required Texts:
Öğretmenlik Mesleği Genel Yeterlikleri: http://otmg.meb.gov.tr/YetGenel.html
Milli Eğitim Bakanlığı, (2007). İlköğretim 7. Sınıf Matematik Dersi Öğretmen Kılavuz Kitabı. Ankara: MEB, Devlet Kitapları

School Teachings: Each student is required to teach at least two hour in the cooperating school. We are going to observe and score one of them. Your master teacher in the school will observe and score the other. Schedule your teaching with me and your master teacher. Prepare a lesson plan and submit it after your teaching experience.

Campus Teaching: One oral presentation (30 min) is required. Presentation dates will be assigned. You will prepare and turn in your lesson plan at the time of your presentations.

Lesson Plans: You will prepare two lesson plans to teach a topic assigned to you and make oral presentations, one in school that we observed and the other at campus. At the time of your presentation you will turn in your lesson plan.

Micro-teaching: You are to videotape yourself while you're teaching in your group outside your campus teaching.

Self-Critique Paper (campus): You are to videotape yourself during your campus teaching and write a one-page analysis of each. This analysis should be a critical view of your teaching, highlighting both strengths and weaknesses you detect, along with ideas for improvements.

Self-Critique Paper (school): Write a similar self-critique paper for your campus teaching (no video recording is required).

Self-Improvement Paper: I expect you to identify an aspect of your teaching behaviors that you want to improve. Write an analysis of the existing situation with this aspect of your teaching behaviors. Explain your plan about your self-improvement on this issue. Your self-improvement paper should include a clear *description* of the issue that you identified. Then write a plan of self-improvement for this issue in detail.

Participation: During semester we expect each of you to write anonymous feedback about teaching of your friends. You will turn in these written feedback notes to the course assistant at the end of each teaching session.

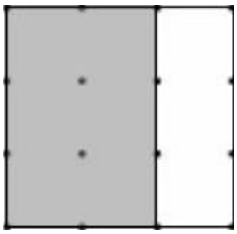
School attendance: Successful completion of ELE 420 includes completing a minimum of 6 hours of classroom observation/ participation per week. Teaching at school is obligatory and will not be tolerated and will result in failure of the course.

APPENDIX F: INCOMPLETE AND IMPROPER LESSON PLAN TASK

Title/Topic:	Equivalent-Fraction Concept		
Grade Level:	6^{th}	Duration:	45 minutes
Resources/Materials:	Dot paper, ruler, pencil, rubber		
Objectives:	➢ Students should be able to develop a conceptual understanding of equivalent fractions. ➢ Students should be able to explore the same quantity can have different fractional names. ➢ Students should be able to look for patterns in equivalent fraction.		
Prerequisite Knowledge:	Fraction concept		
Teaching Method(s):	Questioning, Discussion, Discovery, Cooperative learning		

- *Beginning*
  - ➢ Begin with simpler version of the task.

    On the board, draw a 3 by 3 rectangle and shade in $\frac{2}{3}$ of it as shown here



Repeat a few times the statement: "Two students look at the picture and each saw different fractions" in order to ensure that students understand what it means.

- Have students discuss on different explanations for how these two students saw different fractions although they saw the same drawing.
- When students agree on why these two students saw different fractions, draw the corresponding unit fractions on the board to strengthen their understanding.
- Before starting the activity form 4 groups of 3 students.
- Distribute activity sheet and dot grid paper to the groups.

- *Middle*
  - Have students complete the activity in 15 minutes.
- *End*
  - For each drawing on the activity sheet, make a list of groups' answers.
  - Let students share their ideas.
  - At the end of the discussion, summarize the main idea and make students aware of even if the fractions are different; they are representing the same drawing.

Assessments:

For each equivalence please write T in the given blank if it is correct; write F if it is false.

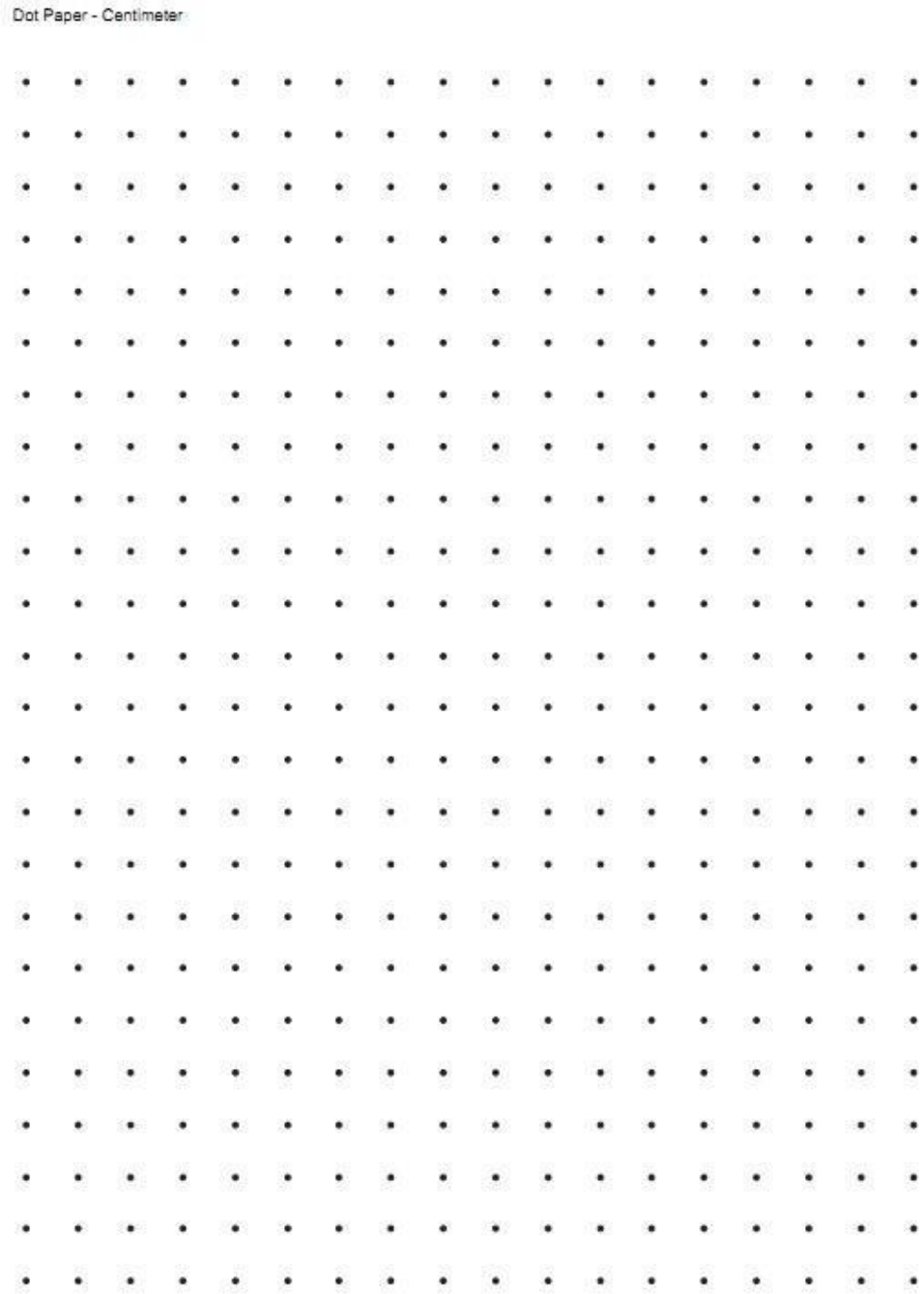
A) $\frac{3}{4} = \frac{6}{8}$ (__)

B) $\frac{46}{14} = \frac{23}{6}$ (__)

C) $\frac{5}{12} = \frac{20}{36}$ (__)

D) $\frac{37}{74} = \frac{1}{2}$ (__)

DOT GRID PAPER



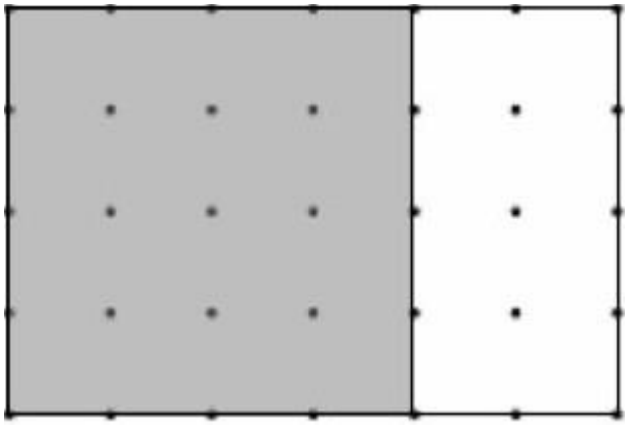
“EŞ ANLAMLI” (SYNONYMS) FRACTIONS

Name:

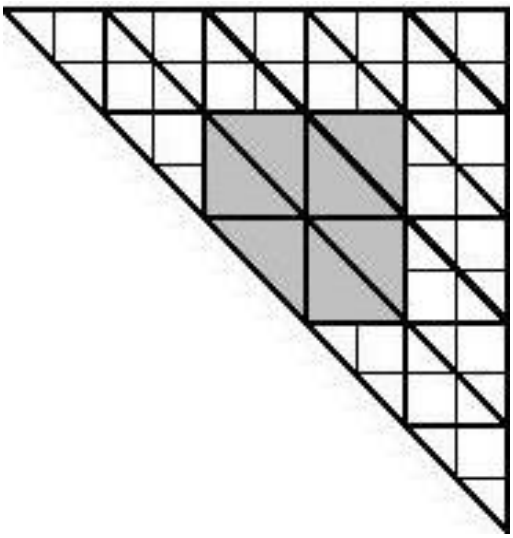
Surname:

1. Find as many fraction names as possible for each shaded region and draw and label the unit fractions of the fraction name you found on the dot grid paper.

a)



b)



Dear preservice teacher,

The purpose of this study is to determine the points preservice middle school mathematics teachers consider important while evaluating a lesson plan. Firstly, please read the below scenario and then answer the questions after examining the given lesson plan. Your answers will not be graded under the extent of any course and they will be kept confidential. Your data will be coded so that there will be no direct connection to your name. Only study investigator and her advisor will have access to the data.

Your participation in this research is completely voluntary and you may choose not to participate without any penalty.

Thank you for your contribution to the study.

Name:

Surname:

Grade Level:

Must courses you have taken in Elementary Mathematics Education Program (courses with ELE code):

Suppose you are a mathematics teacher of 7^{th} grade students in a middle school. One day, one of your colleague told you that he could not attend to the class which would be held on the same day since he had an important appointment and asked you implement the lesson plan he had prepared for 6^{th} grade students. Even if you do not teach 6^{th} grade students this year, you have some idea about how to introduce the fraction concept. You accept his request and he sent you the lesson plan he had prepared before.

Please overview the lesson plan before you implement it and answer the following questions. Please write every detail which come to your mind. If you wish, you can edit the given lesson plan. If you prefer editing on the lesson plan, please indicate the number of the question you suggest changes about.

1. What is your general view about the given lesson plan? Do you enact this lesson plan in this form?

2. What are the strengths of the lesson plan? Please examine it within the scope of below headings:
   Lesson design:

   Mathematical concepts:

   Objectives:

   Assessment:

3. What are the weaknesses of the lesson plan? Please examine it within the scope of below headings:
   Lesson design:

   Mathematical concepts:

   Objectives:

   Assessment:

4. How would you improve this lesson plan with regard to the weaknesses you found within the scope of below headings?

Lesson design:

Mathematical concepts:

Objectives:

Assessment:

Anything you want to add:

APPENDIX G: SEMI-STRUCTURED INTERVIEW PROTOCOL

Now we are going to talk about the task that I previously applied to you.

1. What are the points that you pay attention while preparing a lesson plan?

2. If you had prepared the given lesson plan,
   a. How would you design the beginning part of the lesson plan?
      - In this section, different questions may be asked according to participants' answers. (E.g. if the participant says that "I begin the lesson by asking questions", follow-up questions such as "What kind of questions are you planning to ask? What is your intention of asking those questions? What kind of answers are you expecting to get? What are you going to do if you cannot get the answer you expected?" will be posed to participants).
      - If participant does not have an answer, what s/he said in previous application will be reminded to her/him by saying "You said … previously"
   b. How would you design the middle part of the lesson plan?
      - In this section, different questions may be asked according to participants' answers. (E.g. if the participant says that "I observe students' group work", follow-up questions such as "What is your intention of observing students' group work? For what purposes do you plan to use the result you get?" will be posed to participants).
   c. How would you design the end part of the lesson plan?
      - In this section, different questions may be asked according to participants' answers. (E.g. if participant says that "I ask questions to students", follow-up questions such as "What kind of questions are you planning to ask? What is your intention of asking those questions?

What kind of answers are you expecting to get? What are you going to do if you cannot get the answer you expected?" will be posed to participants).

d. How would you design the assessment part of the lesson plan?
   - In this section, different questions may be asked according to participants' answers. (E.g. if the participant wants to change the question used in the assessment part, follow up questions such as "Why do you want to change the question? What kind of a question would you write instead of that one? Why do you want to write such a question?" will be posed to participants).

3. What is your purpose in preparing the assessment part of the lesson plan? For what purposes will you use the information you gather from this part?

4. How do you understand whether students achieved objectives or not during the lesson?

APPENDIX H: PERMISSION OBTAINED FROM METU APPLIED ETHICS RESEARCH CENTER

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
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04.03.2015

Gönderilen : Doç. Dr. Çiğdem Haser
İlköğretim Bölümü

Gönderen : Prof. Dr. Canan Sümer
IAK Başkan Vekili

İlgi : Etik Onayı

Danışmanlığını yapmış olduğunuz İlköğretim Bölümü öğrencisi Gözde Kaplan'ın "Matematik Öğretmeni Adaylarının Biçimlendirici Değerlendirme Yaklaşımlarının İncelenmesi" isimli araştırması "İnsan Araştırmaları Komitesi" tarafından uygun görülerek gerekli onay verilmiştir.

Bilgilerinize saygılarımla sunarım.

Etik Komite Onayı

Uygundur

04/03/2015

Prof.Dr. Canan Sümer
Uygulamalı Etik Araştırma Merkezi
(UEAM) Başkan Vekili
ODTÜ 06531 ANKARA

APPENDIX I: TURKISH SUMMARY

ORTAOKUL MATEMATİK ÖĞRETMENİ ADAYLARININ BİÇİMLENDİRİCİ DEĞERLENDİRME YAKLAŞIMLARININ DERS PLANLAMASI YOLUYLA İNCELENMESİ

GİRİŞ

"Değişen dünyamızda, matematiği anlayan ve matematik yapanlar, geleceğini şekillendirmede daha fazla seçeneğe sahip olmaktadır" (Milli Eğitim Bakanlığı (MEB), 2009, s.7). Milli Eğitim Bakanlığı'nın da belirttiği üzere her insan, hayatta başarılı olmak ve geleceğini şekillendirmek için matematiği anlayabilmeli ve yeterli matematiksel beceriye sahip olmalıdır. Her ne kadar bu beceri küçük yaşlarda edinilmeye başlansa da, kişilerin bu beceriyi kazanmasında okullardaki matematik eğitiminin rolü büyüktür. Öğrencilerin matematiksel yeterliğe ulaşabilmesi için okullardaki matematik eğitimi, daha etkili ve öğrenciyi üretken olmaya iten bir yapıya sahip olmalıdır. Bunun için öğrencilerin önceki bilgilerinin ve ne bilmeleri gerektiğinin belirlenmesi gerekmektedir (NTCM, 2000). Bunu yapmanın bir çok yolu vardır; bu yollarından biri de öğrencilerin değerlendirilmesidir.

Değerlendirme, öğrencilerin konu ile ilgili bilgisi, bu bilgiyi kullanım yeterlikleri ve matematiğe karşı eğilimleri hakkında bilgi edinmek için çeşitli delillerden yorumlar çıkarmaktır (NCTM, 1995). Ayrıca öğrencilerin başarılarını ve katettiği gelişmeleri; öğrenme sürecinin ve ortaya çıkan ürünün ölçülmesiyle ortaya koyan bir terimdir (Doğan, Atmaca ve Yolcu, 2010). Geçmişte değerlendirme sadece öğrencilere not vermek olarak görülürken, yapılandırmacı yaklaşımın benimsenmesiyle değerlendirme, öğrencilerin öğrenme düzeylerini arttırmada ve etkili bir öğretim ortamının sağlanmasında kullanılmaya başlanmıştır (Segers, 2003). Değerlendirmenin öğrencilerin gelişimlerindeki önemli etkisi göz önüne alınmalı ve öğretmen adaylarına değerlendirmenin, öğrencilerin öğrenim düzeylerine olan etkileri anlatılmalıdır

(Graeber, 1999). Bunun yanında öğretmen adaylarına, öğrencilerdeki bu gelişimleri nasıl gözlemleyecekleri hakkında bilgi verilmelidir.

Değerlendirme, amacına göre tamamlayıcı/düzey belirleyici, değerlendirici ve biçimlendirici olmak üzere üç kategoriye ayrılmıştır. Tamamlayıcı/düzey belirleyici değerlendirme, öğrencilerin potensiyelinin belirlenmesinde kullanılır (Wiliam, 2007). Diğer bir değişle, öğrenciler tarafından elde edilen başarının seviyesini belirlemede etkilidir. Değerlendirici ise kurumların ve eğitim programlarının niteliğinin incelenmesinde (Wiliam, 2007) ve niteliğin arttırılması için gerekli eylemlerin belirlenmesinde bir gösterge olarak kullanılır (Perie, Marion ve Gong, 2007). Biçimlendirici değerlendirme, öğretmen ve öğrencilere kendi öğretim ve performansları ile ilgili bilgi sağlar (Sadler, 1989). Bu bilgi, öğrencilerin ihtiyaçlarını karşılamak için öğretim yöntemlerinde gerekli değişikliklerin yapılmasında kullanılabilir (Black ve Wiliam, 1998b; Wiliam, 2007).

Biçimlendirici değerlendirmenin, öğrencilerin performanslarını arttırmada ve öğrenmelerini şekillendirmede rolü büyüktür (Wiliam, 2007). Bu süreçte öğrenciler, sınıf içi etkinliklerine aktif bir şekilde katılım sağlarlar ve kendi öğrenmelerinden sorumlu tutulurlar (Heritage, 2007). Öğrencileri kendi öğrenmelerinden sorumlu tutmak için öğretmenin yapması gerekenler vardır; Ramaprasad'a (1983) göre ilk olarak öğrencilerin o anki öğrenme düzeyleri ortaya konulmalı ve sonrasında nasıl bir gelişme katettikleri hakkında öğrenciler bilgilendirilmelidir (akt. Black ve Wiliam, 2009). Bu yüzden değerlendirmenin her bir basamağı önceden planlanmalıdır (Heritage, 2007). Öğretmenler öğrencilerin bilgi düzeylerini ortaya çıkarmak için sınıf içinde ne gibi değerlendirme yöntemi uygulayacaklarına, dersin öncesinde karar vermeli ve planlamalıdırlar. Her ne kadar öğretmenlerin biçimlendirici değerlendirme yaklaşımlarıyla ilgili çalışmalar ilgili alanyazında bulunsa da, bu yaklaşımların nasıl geliştiği ve bir plana nasıl entegre edildiğini inceleyen çalışmaların sayısı oldukça azdır (Ayala vd., 2008). Bu yüzden, bu çalışma, son sınıf matematik öğretmeni adaylarının gerçek bir sınıf ortamında uygulamayı planladıkları biçimlendirme değerlendirme yaklaşımlarını araştırmayı amaçlamıştır. Öğretmen adaylarının

biçimlendirici değerlendirme yaklaşımları, Tablo 1'de görülen Wiliam ve Thompson'ın (2008) biçimlendirici değerlendirme modeline göre incelenmiştir.

Modele göre biçimlendirici değerlendirme beş temel strateji ve bir ana fikirden oluşmaktadır. Bu stratejiler şu şekilde sıralanmıştır: (i) Öğrenme amaçları ve başarı kriterlerinin açıklanması ve paylaşılması; (ii) Öğrenilen bilgiyi ortaya çıkarmak için etkili sınıf içi etkinlik ve tartışma ortamı yaratmak; (iii) Öğrencilerin öğrenmelerini ileri götüren dönüt vermek; (iv) Öğrencilerin birbirleri için öğrenme kaynağı olmasını sağlamak; ve (v) Öğrencilerin kendi öğrenmelerinin kaynağı olmasını sağlamak.

Tablo 1

Biçimlendirici Değerlendirme Stratejilerinin Öğretim Süreçleriyle İlişkisi (Wiliam ve Thompson, 2008, s.63)

	Öğrencinin Varılması İstenilen Yer	Öğrencinin Şu An Bulunduğu Yer	Varılmak İstenilen Yere Nasıl Ulaşılır
Öğretmen	Öğrenme amaçlarının ve başarı kriterlerinin açıklanması ve paylaşılması	Öğrenilen bilgiyi ortaya çıkarmak için etkili sınıf içi etkinlik ve tartışma ortamı yaratmak	Öğrencilerin öğrenmelerini ileri götüren dönüt vermek
Akran	Öğrenme amaçlarının ve başarı kriterlerinin anlaşılması ve paylaşılması	Öğrencilerin birbirleri için öğrenme kaynağı olmasını sağlamak	
Öğrenci	Öğrenme amaçlarının ve başarı kriterlerinin anlaşılması	Öğrencilerin kendi öğrenmelerinin kaynağı olmasını sağlamak	

Ana fikre göre, öğrencilerin öğrenme süreçlerinin çıktıları, öğrencilerin ihtiyaçları doğrultusunda, öğretimde gerekli değişikliklerin yapılması için kullanılabilir (Wiliam ve Thompson, 2008). Beş temel stratejide de öğrenciler kendi öğrenmelerinden

sorumludur. Bu bağlamda, öğretmenin rolü sadece öğrenmeye yön vermektir. Bu nedenle öğretmen, etkili bir öğrenme ortamı yaratmakla yükümlü olarak görülebilir. Öğretmenler bu ortamı öğrenme etkinlikleri ve tartışma ortamları oluşturarak, anlamlı sorular sorarak, ve öğrenme sürecini gözlemleyerek yaratabilirler (O'Connor, 2002). Öğrencinin öğrenme sürecine aktif katılımı, düşündürücü etkinliklerle ve bu etkinliklere dönüt vermekle sağlanır. Bu türden dönüt, öğrencinin başarısıyla doğrudan ilişkilidir ve öğrencinin gelişmesine yardımcı olur (Black ve Wiliam, 1989a). Ayrıca dönüt, öğrencilerin gelişimi hakkında çıkarımda bulunulmasını sağlar. Bu çıkarımlara göre öğretmenler, öğrencilerin şu anki öğrenme durumlarına dair bilgi sahibi olurlar ve öğretim uygulamalarını, öğrencilerin öğrenmelerini ilerletmek için düzenlerler (Laud ve Patel, 2013).

Öğretmenler genellikle sınıfta yapmak istedikleri hakkında öğrencileri bilgilendirmedikleri için öğrencilerin kendilerinden ne istenildiği hakkında bir fikirleri yoktur. Bu durumun önlenmesi için öğrenme amaçlarının ve başarı kriterlerinin açıklanması ve paylaşılması çok önemlidir (Wiliam, 2007). Bunun yanında, öğrencilerin birbirleri ve kendileri için öğrenme kaynağı olmalarının sağlanması tüm değerlendirme yaklaşımları için hayati öneme sahiptir (Berry, 2008). Öz değerlendirme ve akran değerlendirmesi öğrencilerin kendi gelişimlerine dönüt vermelerini sağlar. Bu değerlendirme türleri yoluyla öğrenciler, kendi öğrenmelerini kontrol etme becerilerini arttırırlar ve problemlere alternatif bakış açıları ve stratejiler geliştirirler (Nicol ve Macfarlane-Dick, 2006). Bununla birlikte, akranlarının çalışmalarına yorum yaparak yargılama becerisi geliştirirler, ayrıca kendilerini ve akranlarını değerlendirmelerinin bir sonucu olarak, gelecekle ilgili daha doğru kararlar verebilirler (Berry, 2005).

Çalışmanın Amacı

Bu çalışmanın amacı, üniversite son sınıf ortaokul matematik öğretmeni adaylarının, gerçek bir sınıf ortamında uygulamayı planladıkları biçimlendirici değerlendirme yaklaşımlarının belirlenmesidir. Bu yaklaşımlar Wiliam ve Thompson'ın (2008)

biçimlendirici değerlendirme modeline göre incelenmiştir. Özelleşmiş olarak araştırmaya yön veren araştırma sorusu aşağıda belirtilmiştir.

> Son sınıf ortaokul matematik öğretmeni adaylarının bir ders planına entegre ettikleri biçimlendirici değerlendirme yaklaşımları nelerdir?

Çalışmanın Önemi

Biçimlendirici değerlendirme sürecinin en önemli öğelerinden biri olarak öğretmenler, biçimlendirici değerlendirme yöntemlerini nasıl etkili bir şekilde kullanacaklarını bilmeli ve öğrencilerin ihtiyaçlarına göre öğretim yöntemlerinde değişikliğe gidebilmelidirler. Kaya (2009) öğretmen adaylarının da değerlendirme uygulamaları hakkında biliçlendirilmesi gerektiğini vurgulamış ve üniversitelerdeki ölçme ve değerlendirme derslerinin azlığına dikkat çekmiştir. Öğretmen adaylarının biçimlendirici değerlendirme stratejileri hakkında yeterli bilgi dolanımıyla mezun olup olmadıkları bilinmediği için bu çalışmanın bulguları, diğer çalışmalarla karşılaştırılabilir. Böylece öğretmen yetiştirme programlarına, verdikleri ölçme ve değerlendirme eğitiminin kalitesi hakkında dönüt verebilir ve bu bulgular doğrultusunda öğretmen adaylarının aldıkları zorunlu eğitim derslerinin içeriklerinde eğer gerekli görülürse değişiklikler yapılabilir.

Değerlendirme yöntemlerinde yapılan reform sonucunda öğretmenlerden, portföy, kavram haritaları, gözlem, öz değerlendirme ve proje gibi alternatif değerlendirme yöntemlerini, öğrencilerin öğrenim ve bilgi düzeylerini ölçmede kullanmaları beklenmektedir (Lee, Park, ve Choi, 2011; MEB, 2009). Bu reform araştırmacıları, öğretmenlerin alternatif değerlendirme yöntemleri hakkındaki algı ve inanışlarını anlamak (Lee, Park ve Choi, 2011; Restorff, Sharpe, Abery, Rodriguez ve Kim, 2012), bu yöntemlerin etkili bir şekilde kullanılıp kullanılmadığını öğrenmek ve öğretmenlerin değerlendirme tercihlerini incelemek (Buldur, 2009; Çetin, 2011; Miller ve Smith, 2001; Orhan, 2007; Watt, 2005), ve bu yöntemlerin kullanılmasındaki engeller (Erdal, 2007; Gelbal ve Kelecioğlu, 2007; Watt, 2005) üzerine çalışmalar yapmaya sevketmiştir. Fakat, Türk alanyazında, özellikle matematik eğitimi alanında, öğretmen adaylarının biçimlendirici değerlendirme uygulamalarını inceleyen kısıtlı

sayıda çalışma mevcuttur (Köğçe, 2012). Bu yüzden, Türk eğitim sistemi bağlamında, ortaokul matematik öğretmeni adaylarının kullanmayı planladıkları biçimlendirici değerlendirme uygulamaları üzerine bir araştırma, biçimlendirici değerlendirmenin önemli olmasına rağmen ihmal edilen yönlerini ortaya çıkarmada etkili olacaktır.

İlgili alanyazında, Wiliam ve Thompson'un (2008) biçimlendirici değerlendirme modeli temel alınarak yapılan çalışmalara pek rastlanılmamaktadır (Marshall ve Drummond, 2006). Bu yüzden, öğretmen adaylarının bir ders planına entegre ettiği biçimlendirici değerlendirme yaklaşımlarının belirlenmesi için belirtilen modelin kullanılması, modelin kullanışlığı hakkında da bilgi vereceğinden önemlidir.

YÖNTEM

Araştırma Deseni

Araştırmada üniversite son sınıf ortaokul matematik öğretmeni adaylarının, gerçek bir sınıf ortamında uygulamayı planladıkları biçimlendirici değerlendirme yaklaşımları hakkında detaylı bilgiye sahip olmak için temel nitel araştırma yöntemi (Merriam, 2009) kullanılmıştır.

Araştırmanın Bağlamı

Bu araştırma İlköğretim Matematik Öğretmenliği (İMÖ) programında eğitim gören son sınıf matematik öğretmenleriyle gerçekleştirilmiştir. Araştırmanın gerçekleştirildiği İMÖ programı, eğitim dili İngilizce olan bir devlet üniversitesinin sunduğu dört yıllık bir programdır. Bu program, 5-8 sınıf öğrencilerine matematik eğitimi verecek nitelikte matematik öğretmenleri yetiştirmeyi amaçlamaktadır.

İMÖ programının ilk iki senesinde temel matematik, fen ve eğitim dersleri bulunmaktadır. Üçüncü ve dördüncü senelerinde ise öğrencilere yoğun olarak matematik öğretimi dersleri verilmektedir. Katılımcıların seçiminde kriter olarak alınan Ölçme ve Değerlendirme dersi ikinci senenin Bahar döneminde sunulurken Matematik Öğretim Yöntemleri I ve Matematik Öğretim Yöntemleri II dersleri programın üçüncü senesinde yer almaktadır. Ayrıca Okul Deneyimi ve Öğretmenlik

Uygulaması dersleri, sırasıyla dördüncü senenin Güz ve Bahar dönemlerinde verilmektedir.

Ölçme ve Değerlendirme dersinde, sınıf içi ölçme ve değerlendirme araçlarının geliştirilmesi, test sonuçlarının yorumlanması ve öğrencilerin temel istatistik bilgisi üzerinde durulmaktadır. Ayrıca sınıf içi ölçme ve değerlendirme yöntemlerinin yanı sıra, alternatif değerlendirme yöntemlerine de değinilmektedir. Matematik öğretim yöntemleri derslerinde ise öğrencilere genel olarak öğretim yöntemleri ve materyalleri sunulmaktadır. Bunun yanında öğrenciler, farklı değerlendirme araçları ve sınıf içi değerlendirmede gözlemin nasıl kullanılacağı hakkında bilgilendirilmektedir.

Öğretmen adayları Okul Deneyimi dersinde toplamda 40 ders saati, Öğretmenlik Uygulaması dersinde ise 60 ders saati boyunca özel ya da devlet orta okullarda çalışan danışman öğretmenlerini gözlemekle yükümlüdürler. Okul Deneyimi dersinde, öğretmen adaylarından danışman öğretmenlerinin öğretimlerini rapor etmeleri ve en çok gözledikleri sınıfın kültürünü anlatan bir rapor yazmaları istenmektedir. Ayrıca bu ders kapsamında öğretmen adaylarının, çeşitli etkinliklerden oluşan bir öğrenme merkezi hazırlamaları gerekmektedir. Öğretmenlik Uygulaması dersinde ise gözlem yapmanın yanı sıra öğretmen adaylarından en az iki ders saati gerçek sınıf ortamında ve bir ders saat sınıf arkadaşlarına ders anlatmaları ve bu anlatımları için ders planı hazırlamaları beklenmektedir. Ayrıca öğretmen adaylarından sınıf arkadaşlarına anlattıkları dersin dışında, kendi grup arkadaşlarına seçtikleri bir konuyu anlatmaları ve bunu kaydetmeleri istenmektedir (micro-teaching).

Katılımcılar

Merriam'a göre (2009) seçkisiz ve seçkisiz olmayan olmak üzere iki temel örnekleme yöntemi vardır. Nitel araştırmaların temel amacı bulguları daha büyük örneklemlere genellemek olmadığı için seçkisiz olmayan örnekleme yöntemleri-amaçsal örnekleme (Patton, 2002) nitel araştırmalar için en uygun örnekleme yöntemidir.

Çalışmaya Ankara'da bir devlet üniversitesinde İMÖ programına kayıtlı olan 27 son sınıf ortaokul matematik öğretmeni adayı katılmıştır. Katılımcılar zaman ve iş gücü

kaybını önlemek amacıyla araştırmacının araştırma görevlisi olduğu üniversiteden seçilmiştir. Ayrıca, katılımcıların Öğretmenlik Uygulaması dersini alıyor olmaları ve Matematik öğretim yöntemleri I, II ve Ölçme ve Değerlendirme derslerini başarı ile tamamlamış olmaları, seçimlerinde kriter olarak belirlenmiştir. Araştırmanın ilk veri toplama aracı olan Tamamlanmamış ve Hatalı Ders Planı Testi (LPT) araştırmaya katılan 27 öğretmen adayına uygulanmıştır. Katılımcıların teste verdikleri yanıtlar, Wiliam ve Thompson'ın (2008) geliştirdiği modele göre analiz edilmiş 11 öğretmen adayı aşağıda belirtilen kriterler doğrultusunda görüşme yapmak üzere seçilmiştir.

1. Hiç bir biçimlendirici değerlendirme stratejisine değinmeyen katılımcılar, bu stratejilere değinmemelerinin nedenlerini araştırmak üzere seçilmişlerdir. (S=3)
2. Yanıtları biçimlendirici değerlendirme stratejilerinden birini işaret eden katılımcılar, yanıtlarının biçimlendirici değerlendirme amacıyla verilip verilmediğini araştırmak üzere seçilmişlerdir. (S=4)
3. En az bir biçimlendirici değerlendirme stratejisine değinmiş katılımcılar, bu stratejileri nasıl uygulayacakları hakkında detaylı bilgi almak için seçilmişlerdir. (S=4)

Veri Toplama Araçları

Araştırma sorusuna yanıt aramak için, araştırmacı tarafından geliştirilen iki farklı veri toplama aracı, katılımcılara sırasıyla uygulanmıştır.

Tamamlanmamış ve Hatalı Ders Planı Testi (LPT)

İlk veri toplama aracı olan LPT, öğretmen adaylarının biçimlendirici değerlendirme stratejileri hakkında bilgi edinmek amacıyla, araştırmacı tarafından geliştirilmiştir. Bu teste, birim kesirleri konu alan bir ders planı, katılımcıların kendilerini ortaokulda çalışan bir matematik öğretmeninin yerine koymaları gereken bir durum ve ders planıyla ilgili dört tane açık uçlu soru bulunmaktadır.

Ders planı giriş, gelişme, sonuç ve değerlendirme kısımlarından oluşmaktadır. Bir de planın başında konu, sınıf seviyesi, süre, kazanımlar ve kullanılacak öğretim

yöntemleri hakkında bilgilendirici bir kısım bulunmaktadır. Ders planının hatalı olarak adlandırılması, ders planında bilinçli olarak yapılan hatalardan kaynaklanmaktadır. Örneğin dersin ilk kazanımı ölçülemez ve gözlemlenemezdir. Ayrıca değerlendirme kısmında verilen sorular, dersin kazanımlarıyla ve yapısıyla uyumlu değildir. Bunun yanında öğrencilere planın değerlendirme kısmı için puanlandırma anahtarı verilmemiştir. Katılımcılardan bu hataları testin uygulanması sırasında fark etmeleri beklenmiştir. Ders planının tamamlanmamış olmasının sebebi ise tüm biçimlendirici değenlendirme stratejilerinden arındırılmış olmasıdır. Katılımcıların uygulama esnasında bu eksiklikleri fark edip biçimlendirici değerlendirme stratejilerinden bazılarını ders planına entegre etmesi beklenmiştir.

Uzman görüşleri alınıp yapı geçerliği sağlandıktan sonra, testin pilot çalışması yapılmıştır. Pilot çalışma sonrasında gerekli düzenlemeler yapılıp test uygulanmaya hazır hale getirilmiştir.

Yarı Yapılandırılmış Görüşme Protokolü

Katılımcıların teste verdikleri yanıtları detaylı bir şekilde incelemek amacıyla, ikinci veri toplama aracı olan yarı yapılandırılmış görüşme protokolü geliştirilmiştir. Uzman görüşleri alınıp yapı geçerliği sağlandıktan sonra yapılan görüşmelerle, protokolün pilot çalışması tamamlanmıştır. Pilot çalışma sonrasında gerekli düzenlemeler yapılıp görüşme protokolü uygulanmaya hazır hale getirilmiştir.

Veri Toplama Süreci

Gerekli etik izinler alındıktan sonra 2014-2015 öğretim yılının ilk döneminde pilot çalışmalar tamamlanmış ve asıl araştırmanın verileri 2014-2015 öğretim yılının ikinci döneminde toplanmıştır. Dönemin başında ilk veri toplama aracı olan LPT, 27 öğretmen adaylarına uygulanmış, bir aylık veri analizi sürecinin ardından 11 öğretmen adayı seçilerek bireysel görüşmeler yapılmıştır.

Veri Analizi

Her iki veri toplama aracıyla toplanan verilerin analizinde, içerik analizi yöntemi kullanılmıştır. İlk olarak katılımcıların sorulara verdikleri yanıtlar Wiliam ve Thompson'ın (2008) geliştirdiği biçimlendirici değerlendirme modelinin alt alanlarına göre kategorize edilmiştir. Sonrasında bu kategoriler, ilgili alanyazından elde edilen kodlara göre daha küçük alt kategorilere ayrılmıştır. Katagorilendirmenin sonunda katılımcıların son iki alt alanla ilgili bir yorumda bulunmadıkları görülmüş, ilk üç alt alana verdikleri yanıtlar ise test ve görüşme için ayrı ayrı gruplandırılmıştır. Bu sürecin sonunda veriler araştırmacı tarafından tekrar kodlanıp eğitim alanında çalışmalar yürüten diğer bir araştırmacıyla tartışılmıştır. Böylelikle araştırmacının analiz ettiği verilerin aynı alanda uzman diğer bir araştırmacı tarafından değerlendirilmesi sağlanmıştır. Bu süreçte farklı kodlar ortaya çıkmış, bazı kodlar çıkarılmış, bazıları da tek bir kod altında toplanmıştır.

BULGULAR VE TARTIŞMA

Uygulanan test ve görüşmelerde öğretmen adayları, hiç bir biçimlendirici değerlendirme stratejisine yönlendirilmeseler de, verdikleri yanıtlar ilk üç alt alan altında toplanmış, katılımcılar "öğrencilerin birbirleri için öğrenme kaynağı olmasını sağlamak" ve "öğrencilerin kendi öğrenmelerinin kaynağı olmasını sağlamak" (Wiliam ve Thompson, 2008, p.63) alt alanları ile ilgili hiç bir yorumda bulunmamışlardır. Bu durum, öğrencilerin arkadaşlarını ve kendilerini değerlendirirken objektif olamayacaklarını düşünmelerinden kaynaklanmış olabilir. Ayrıca öğretmen adayları, değerlendirmenin sadece uzman kişilerce yapıldığını bu yüzden de sadece öğretmenlerin sorumluluğunda olduğunu düşünmüş olabilirler (Sadler, 1989).

"Öğrenme Amaçlarının ve Başarı Kriterlerinin Açıklanması ve Paylaşılması" (Wiliam ve Thompson, 2008, s.63)

Çalışmanın bulgularına göre öğretmen adaylarının hiç biri, ders planının değerlendirme bölümünün adil puanlanması için gerekli olan puanlandırma

anahtarının ders planında yer almaması ile ilgili bir yorumda bulunmamıştır. Ayrıca, bu bölüm için herhangi bir başarı kriterinden söz etmemişlerdir. Bunun sebebi ders planının değerlendirme bölümünde yer alan soruların doğası olabilir. Sorular doğru-yanlış soruları olduğu için öğretmen adayları, puanlandırma anahtarı ekleme gereksinimi duymamış olabilirler. Diğer bir sebep de öğretmen adaylarının ders planının bu kısmını sadece öğrencilerin öğrenme düzeylerini belirlemek amaçlı kullanmak istemeleri olabilir. Öğrencilerin yanıtlarını notlandırmamayı tercih ettikleri için herhangi bir puanlama anahtarı eklemeyi önermemiş olabilirler.

Ders planının hatalı olmasının sebeplerinden olan dersin kazanımlarıyla, derste yapılması planlanan etkinliklerin ve değerlendirme kısmındaki soruların uyumlu olmaması durumlarını bir çok öğretmen adayı fark edememiştir. Katılımcıların, dersin kazanımları ve değerlendirme kısmındaki soruların arasındaki uyumsuzluğu fark edememesi durumu, bir ders planının bu açılardan incelenmesi istenen çalışmalardan elde edilen bulgularla benzerlik göstermektedir (Ambrosio vd., 2001; Campbell ve Evans, 2001; Ruys, Van Keer ve Aelterman, 2012). Matematik Öğretim Yöntemleri derslerinde ve Ölçme ve Değerlendirme dersinde, bu özellikler üzerinde çok durulmasına rağmen, öğretmen adaylarının bu uyumsuzlukları fark edememesi beklenmedik bir durumdur. Bunun yanında, kazanım-etkinlik uyumsuzluğunu fark eden öğretmen adaylarının bir çoğu, bu uyumsuzluğu gidermek için bir öneride bulunmamışlardır. Bunun sebebi, katılımcıların uygulama sırasında özelleşmiş örnekler verebilmek için ders materyaline ya da daha fazla süreye ihtiyaç duyması olabilir, ya da öğretmen adayları, planladıkları her değerlendirme eylemini ders planında belirtmiyor olabilirler.

Kazanım-etkinlik, kazanım-değerlendirme soruları uyumsuzluklarını fark edememelerinin yanı sıra öğretmen adayları, ders planının hatalı olmasının sebeplerinden biri olan dersin ilk kazanımının genel ve ölçülemez olduğunu belirleyememişlerdir. Kazanımların ölçülebilir ve gözlenebilir olması gerektiği, katılımcıların eğitimleri boyunca aldıkları bir çok derste vurgulanmasına rağmen bu durumu belirleyememeleri şaşırtıcıdır. Bu hatanın farkına varan öğretmen adayları ise cevaplarının altında yatan sebepleri açıklayamamışlardır. Bu durum, öğretmen

adaylarının kazanımların gözlenebilir ve ölçülebilir olması gerektiğini özümseyememelerinden kaynaklanmış olabilir.

Bazı öğretmen adayları ders planına daha fazla örnek eklemek istediklerini belirtmişler ancak bu adaylar, soruların niteliğinden çok sayılarının arttırılması gerektiği üzerinde durmuşlardır. Bu durum öğretmenlerin, öğrencileri merkezi sınavlara hazırlamak için olabildiğince fazla örnek çözme eğiliminden kaynaklanmış olabilir (Amador ve Lamberg, 2013; Haser, 2006). Son sınıf öğretmen adayları, okul deneyimi derslerinde öğretmenleri gözlemledikleri için öğretmenlerin bu eğilimini benimseyip ders planına daha fazla soru eklemek istemiş olabilirler.

Öğretmen adaylarının neredeyse tümü, dersin sonunda konunun özetlenmesi gerektiğini vurgulamış, ders planının sonuç kısmında özetleme yapıldığı için bu kısmı güçlü bulduklarını belirtmişlerdir. Neredeyse tüm adayların bu konuda doğru yorum yapması, araştırmacının dersin sonuç kısmı ile ilgili sorduğu sorudan kaynaklanmış olabilir. Bu soru öğretmen adaylarının, dersin bu kısmını derinlemesine incelemelerine sebep olmuş olabilir. Ayrıca matematik öğretim yöntemleri derslerinde öğretmen adaylarının hazırladıkları planların sınıf içi uygulamasından sonra tartışılması, ders planında dikkat edilmesi gereken durumlar konusunda öğretmen adaylarının bilinçlenmesini sağlamış olabilir.

Bazı öğretmen adayları, ders planındaki yönergelerin öğretmen için az olduğunu belirtmişlerdir. Yönergelerin öğrenci açısından değerlendirilmemesi, katılımcıların derste yapmaları gereken açıklamaları ders planına eklemek yerine, sözlü olarak ders esnasında ifade etmeyi tercih etmelerinden kaynaklanıyor olabilir. Yani, ders planında öğrenciler için herhangi bir yönerge olmasa da öğretmen adayları, gerekli açıklamaları uygulama esnasında yapabileceklerini düşünmüş olabilirler.

“Öğrenilen Bilgiyi Ortaya Çıkarmak için Etkili Sınıf İçi Etkinlik ve Tartışma Ortamı Yaratmak” (Wiliam ve Thompson, 2008, s.63)

Biçimlendirici değerlendirme modeli ve belirlenen kodlar göz önüne alındığında, öğretmen adaylarının öğrencilerin gelişimleri hakkında bilgi sahibi olmak için en çok

kullanılan sorgulama ve gözlem yapma yöntemlerinden (Antoniou ve James, 2014) öğrencileri değerlendirmede ya az faydalandıkları ya da hiç faydalanmadıkları görülmektedir.

Çalışmanın bulguları, öğretmen adaylarının sorgulama yöntemine en çok başvurdukları alanın, öğrencilere bir önceki derste yapılanları hatırlatmak ve onların derse olan ilgilerini arttırmak olduğunu ortaya koymuştur. Bu bulgu, Antoniou ve James'in (2014) çalışmasından elde ettikleri sonuçlarla benzerlik göstermektedir. Öğretmen adaylarının sorgulama yöntemini, öğrencilere önceki bilgilerini hatırlatmak için kullanmalarının sebebi, matematik öğretim yöntemleri derslerinin yapısından kaynaklanıyor olabilir. Bu derslerde, ders planının giriş, gelişme ve sonuç bölümlerinin özelliklerine dikkat çeken uygulamalar yapıldığı için öğretmen adayları, planın giriş kısmını detaylandırmak istemiş olabilirler.

Gözlem, öğretmenlerin, öğrencilerin gelişimleri hakkında bilgi sahibi olmak için kullanıldıkları en temel biçimlendirici değerlendirme yöntemlerinden biridir (Cauley ve McMillan, 2010; Torrance ve Pryor, 2001). Fakat öğretmen adayları, öğrencilerin grup çalışma süreçlerini nasıl gözlemleyeceklerini ne test uygulamasında, ne de görüşme esnasında açık bir şekilde ifade etmişlerdir. Bu bulgu öğretmenlerin, öğrencilerinin öğrenme süreçlerini nasıl gözlemleyeceklerini ders planlarında belirtmedikleri bulgusuyla (Ruys, Van Keer ve Aelterman, 2012) benzerlik göstermektedir. Bu durum, katılımcıların hazırladıkları planlarda, kendi davranışlarına yer verme gereksinimi duymamalarından kaynaklanmış olabilir. Bunun yanında öğretmen adayları, ders planlarında daha somut davranışlara (soru sormak ya da dersi özetlemek gibi) yer verme eğiliminde olabilirler. Öğretmen adaylarının gözlem yapacaklarına dair bilgiyi ders planlarında belirtmemelerinin diğer bir nedeni ise, okul deneyimi derslerinde gözlemledikleri öğretmenlerin hazırladıkları planlarda sınıf içi gözleme yer vermemeleri olabilir.

Ölçme ve Değerlendirme, ve Matematik Öğretim Yöntemleri derslerinde bir çok gözlem aracı tanıtılmasına rağmen sadece bir öğretmen adayının kontrol listelerinin öğrencileri gözlemlemek için kullanılabileceğini ifade etmesi, beklenmedik bir

durumdur. Bu bulgu, öğretmen adaylarının kontrol listeleri, tutum ölçeği gibi alternatif değerlendirme yöntemlerini kullanma eğiliminde olmadıkları sonucuyla (Ören, Ormancı ve Evrekli, 2014) uyumludur. Öğretmen adaylarının gözlem araçlarına planlarında yer vermemelerinin sebebi, bu yöntemlerin hazırlanmasının ve uygulanmasının zorluğu, ve zaman yetersizliği (Gelbal ve Kelecioğlu, 2007) olabilir.

"Öğrencilerin Öğrenmelerini İleri Götüren Dönüt Vermek" (Wiliam ve Thompson, 2008, s.63)

Öğretmen adaylarının tümü, ders planının değerlendirme bölümünden elde edecekleri dönütü, öğrencilerin kazanımlara ulaşıp ulaşmadıklarını ve kendilerinin konuyu anlatmada ne kadar yeterli olduklarını anlamak için kullanabileceklerini belirtmişlerdir. Öte yandan sadece bir öğretmen adayı, değerlendirme kısmının öğrencilere de kendi öğrenmeleri hakkında dönüt sağlayabileceğini vurgulamıştır. Yani katılımcıların neredeyse tamamı, ders planının değerlendirme kısmından elde edilecek olan dönütten öğrencilerin de yararlanabileceği gerçeğini görmezden gelmişlerdir. Bu öğretmen merkezli değerlendirme, Antoniou ve James'in (2014) öğretmenlerle yaptıkları çalışmadan elde ettikleri bulgularla örtüşmektedir. Öğretmen adaylarının bu eğilimi, öğrencilerin kendilerinin eksik oldukları alanları tespit etmede ve bu eksikliklerin giderilmesi için yapılması gerekenleri belirlemede yeterli olmadıklarını düşünmelerinden kaynaklanmış olabilir. Yani, ders planının değerlendirme bölümünü, öğrencilerin kendilerini değerlendirebilecekleri (öz değerlendirme) bir araç olarak görmemiş olabilirler.

Yapılan görüşmeler sırasında öğretmen adaylarının hepsi, ders planının değerlendirme kısmını notlandırmayacaklarını vurgulamışlardır. Biçimlendirici değerlendirmenin amacına ulaşması için öğrencilerin performanslarını notlandırmaktan kaçınmak gerektiği bulgusu (Butler, 1987; Cauley ve McMillan, 2010; Hattie ve Timperley, 2007; Elawar ve Corno, 1985; Stiggins, J. Chappuis, Chappuis ve Arte, 2004) göz önüne alınınca, katılımcıların doğru bir karar verdiği söylenebilir. Bunun yanında öğretmen adayları, bu bölümden elde edecekleri dönütün, bir sonraki dersin içeriğinin öğrencilerin ihtiyaçları doğrultusunda değiştirilmesinde etkili olacağını ifade

etmişlerdir. Katılımcıların hem ders planının değerlendirme bölümünü notlandırmaktan kaçınmaları hem de bu bölümden elde edilecek dönütü ilerideki dersleri şekillendirmek için kullanmak istemeleri, bu bölümün biçimlendirici değerlendirme aracı olarak kullanılacağını işaret etmektedir (Black vd., 2003; Earl, 2003; O'Connor, 2002).

Öğretmen adaylarının değerlendirme kısmındaki sorularla ilgili düşünceleri incelendiğinde, bir çoğunun soruların yapısından kaynaklanan zayıflığı fark ettikleri görülmüştür. Katılımcılar, değerlendirme sorularının doğru yanıtlanma olasılığının yüksek olması sebebiyle, öğrencilerin konuyu öğrenip öğrenmediklerini bu sorularla anlayamayacaklarını dile getirmişlerdir. Bu zayıflığı gidermek için ise değerlendirme bölümüne açık uçlu, şekilli sorular ve günlük hayat problemleri eklemek istemişlerdir. Bu tarz sorular eklemek istemelerinin sebebi, kazanım-değerlendirme soruları uyumsuzluğunu gidermek istemeleri olabilir. Bunun yanında öğretmen adayları, değerlendirme kısmındaki soruların sayısının arttırılması gerektiğini ifade etmişlerdir. Bu istek yine öğretmen adaylarının olabildiğince fazla soru çözme eğilimlerinden kaynaklanmış olabilir.

ÖNERİLER

Öğretmen adayları uygulanan test ve görüşmelerde modelde yer alan son iki biçimlendirici değerlendirme stratejisi (akran ve öz değerlendirme) ile ilgili hiç bir yorumda bulunmamışlardır. Bunun önüne geçebilmek için, özellikle ölçme ve değerlendirme derslerinde, değerlendirmenin sadece öğretmenler tarafından yapılmadığı, öğrencilerin de kendi öğrenmelerinden sorumlu tutulması gerektiği bu yüzden de değerlendirmede sürecine onların da dahil edilmesi gerektiği vurgulanmalıdır. Ayrıca öğretmen adaylarının bu stratejileri nasıl planlayacakları ve uygulayacakları ile ilgili çalışmalar, ders içeriğine eklenebilir.

Ders planının hatalı olmasının sebeplerinden olan ilk kazanımın ölçülemez ve gözlenemez oluşu, ve kazanım-etkinlik ve kazanım-değerlendirme soruları uyumsuzlukları, bir çok öğretmen adayı tarafından fark edilmemiştir. Bu durumun önüne geçmek için, matematik öğretim yöntemleri derslerinde öğretmen adaylarının

her hafta hazırladıkları ders planları tartışılırken, ders planının belirtilen açılardan incelenmesi sağlanabilir. Böylelikle öğretmen adayları biçimlendirici değerlendirmeyi, planın ayrılmaz bir parçası olarak görebilirler.

Öğretmen adaylarının; öğrencilerin yapması gerekenler için yönergeler, öğrencilere soracakları sorular ve sınıf içi gözlem gibi biçimlendirici değerlendirme stratejilerini ders planında belirtme eğiliminde olmadıkları gözlenmiştir. Değerlendirmenin her bir basamağının önceden planlanması gerektiği (Cauley ve McMillan, 2010; Heritage, 2007), Ölçme ve Değerlendirme dersinde vurgulanmalıdır. Ayrıca yine öğretmen adaylarının bu stratejileri nasıl planlayacakları ve uygulayacakları ile ilgili çalışmalar, ders içeriğine eklenebilir.

Öğretmen adaylarının bazıları, sınıf içi gözleme yer vereceklerini belirtseler de öğrencilerin öğrenimleri ile ilgili elde edilen bilginin, kontrol listeleri gibi çeşitli gözlem araçlarıyla somutlaştırması gerektiğini belirtmemişlerdir. Bu yüzden, Ölçme ve Değerlendirme, ve Matematik Öğretim Yöntemleri derslerinde bu tür alternatif değerlendirme yöntemlerinin üzerinde daha çok durulmalıdır ve öğretmen adaylarının bu yöntemleri uygulamalarına fırsat tanınmalıdır. Böylelikle öğretmen adayları, kendi uygulamalarında kontrol listeleri, tutum ölçekleri gibi gözlem araçlarını kullanmaya yönelebilirler.

Öğretmen adaylarının çoğu, değerlendirme bölümündeki soruların yapısından kaynaklanan zayıflığı fark etmişlerdir. Özellikle Ölçme ve Değerlendirme dersinde bu konu üzerinde çok durulduğu düşünülürse, bu bulgu kaçınılmazdır. Ölçme ve Değerlendirme dersleri daha çok değerlendirme araçlarını tanıtmaya yer verdiği için öğretmen adayları, bir ders planına, kullanmayı planladıkları biçimlendirici değerlendirme stratejilerini entegre etmekte zorlanmış olabilirler. Bunun önüne geçmek için, Ölçme ve Değerlendirme dersi, matematik öğretimine yönelik derslerle birlikte verilebilir ya da bu derslerin içerikleri birbirleriyle ilişkili hale getirilebilir. Böylelikle öğretmen adayları, Ölçme ve Değerlendirme derslerinde öğrendiklerini, Matematik Öğretim Yöntemleri derslerinde hazırladıkları planlara entegre etme şansı bulabilirler.

Bunlara ek olarak bu araştırmanın bulguları doğrultusunda, ileriki çalışmalar için önerilerde bulunulabilir. Öncelikle, öğretmen adaylarının biçimlendirici değerlendirme stratejilerini kullanmadaki yeterlikleri hakkında bilgi sahibi olmak için, kullanmayı planladıkları değerlendirme stratejilerinin niteliği ile ilgili bir araştırma yapılabilir. Ayrıca, öğretmen adaylarının biçimlendirici değerlendirme yaklaşımlarının, bulundukları sınıf seviyelerine göre nasıl değiştiğini görmek için uzun süreli bir çalışma yürütülebilir. Böyle bir araştırma, Ölçme ve Değerlendirme, Matematik Öğretim Yöntemleri, ve Okul Deneyimi derslerinin öğretmen adaylarının biçimlendirici değerlendirme yaklaşımlarını nasıl etkilediği ile ilgili detaylı bilgi edinmemizi sağlar.

Biçimlendirici değerlendirme stratejilerini, bir ders planına iyi bir şekilde entegre edebilmiş olan öğretmen adayları ya da öğretmenlerin, edemeyenlere göre daha etkili bir öğretim ortamı oluşturup oluşturamayacağı bilinmemektedir. Bu yüzden, öğretmen adaylarının ya da öğretmenlerin biçimlendirici değerlendirme stratejilerinin kullanımı açısından iyi hazırlanmış olan planlarla, ders sırasındaki biçimlendirici değerlendirme stratejilerini kullanımları arasındaki ilişkiyi araştırmak için bir çalışma yürütülebilir.

APPENDIX J: TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☐

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : KAPLAN
Adı : Gözde
Bölümü : İlköğretim Fen ve Matematik Alanları Eğitimi

TEZİN ADI (İngilizce): An Investigation of Preservice Middle School Mathematics Teachers' Formative Assessment Approaches through Lesson Planning

TEZİN TÜRÜ : Yüksek Lisans ☐ Doktora ☐

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz. ☐

TEZİN KÜTÜPHANEYE TESLİM TARİHİ: