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SELF-REGULATION OF NOVICE MIDDLE SCHOOL MATHEMATICS TEACHERS IN THE PREPARATION PROCESS FOR TEACHING

(Research article)

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Abstract

This study analyses the self-regulation (goal setting and planning) of the novice middle school mathematics teachers during the preparation phase of teaching. The study is designed as a case study. The participants are six mathematics teachers with less than five-year teaching experience. The data were collected through interviews, observations and document analysis. In regard to the observations, the teaching of certain topics (e.g., basic elements of prisms) were observed to uncover the classroom behavior of the participants. In the semi-structured interviews carried out after the class observations, the participants were asked some questions about their goals and planning concerning the related teaching activities. The findings of the study indicate that the participants do not exhibit the goal setting and planning activities that are consistent with the conceptual learning covered in the mathematics education program. It is also found that they do not set clear goals and develop detailed planning in regard to teaching activities.

Keywords: self-regulation, planning, goal setting, middle school mathematics teachers

1. Introduction

Early years in the teaching profession are very important for the professional development of new teachers (Fantilli & McDougall, 2009; Hebert & Worthy, 2001; Schmidt, Klusmann, Lüdtke, Moller & Kunter, 2017). The ideas, approaches and practices that teachers develop during this period will guide them in future. Research shows that novice mathematics teachers have difficulties in creating effective teaching plans for the mathematics lessons and in effectively monitoring and evaluating the teaching process (Borko & Livingston, 1989; Fantilli & McDougall, 2009; Hebert & Worthy, 2001; Ricther, Kunter, Lüdtke, Klusmann, Anders & Baumert, 2013; Stahnke & Blömeke, 2021).

In order for the novice mathematics teachers to accomplish these tasks, they should control and regulate certain elements (such as cognitive and affective, etc.) about them. This process, which includes the organizations for teaching activities, is defined as teacher self-regulation. Teacher self-regulation can be defined as teachers' active orientation and maintenance of their metacognition, motivation, and strategies to effectively deliver teaching (Çapa-Aydın, Sungur & Uzuntiryaki, 2009). Teachers who can implement self-regulation concerning teaching process make plans about how to reach the teaching goals they set, try

some strategies to improve the efficiency of the teaching process, observe and evaluate the effects of these strategies and employ their experiences about these strategies in their future decisions and behavior (Yetkin-Özdemir, Gürel, Akdal & Bozkurt, 2020). This study focuses on middle school mathematics teachers' self-regulation concerning the preparations for teaching process. It is important for a teacher to have the necessary self-regulation skills to set goals and prepare a teaching plan in line with these goals, taking into account the place of the study subject in the education program and its relationship with other subjects before the teaching process.

1.1. Theoretical Framework and Literature Review

In this study, Zimmerman's (2000, 2002) three-step (forethought, performance control and self-reflection) cyclical self-regulation model is used to define a self-regulated teaching model (Yetkin-Özdemir et. al., 2020). The forethought phase, which affects the teaching process, is consisted of *goal setting and planning. Goal setting* refers to develop the learning goals for the students which are expected to be gained by them at the end of the teaching process (Çapa-Aydın & Uzuntiryaki-Kondakçı, 2014; Yetkin-Özdemir et. al., 2020). These goals which guide the teaching process may be related to the cognitive, affective and behavioral development of the students (NRC, 2001). Self-regulated teachers set those goals that are clear, realistic and consistent. They can also modify these goals based on the student needs if necessary (Yetkin-Özdemir et. al., 2020). On the other hand, *planning* is the preparatory process for realizing the teaching objectives. In this process, the content of the course and how this content will be delivered are planned (Yetkin-Özdemir et. al., 2020). Self-regulated teachers determine the appropriate teaching methods and materials, taking into account the structure of the subject to be taught and the prior knowledge of the students (Çapa-Aydın & Uzuntiryaki-Kondakçı, 2014; Yetkin-Özdemir et. al., 2020). They regularly check the compatibility of the subject matter with the teaching objectives. In addition, self-regulatory teachers make plans about student related issues, time to be allocated to teaching activities, evaluation criteria for their goals etc. in detail and strategically (Yetkin-Özdemir et. al., 2020).

Although goal setting is included in the first stage of the self-regulation models, most studies suggest that teachers do not start their preparation process with goal setting (Bozkurt, 2015; Clark, 1978; Hall & Smith, 2006; Davidson, 2016; McCutcheon, 1980; Roche, Clarke, Clarke & Sullivian, 2014; Sullivan, Clarke, Clarke, Farrell & Gerrard, 2013; Taylor, 1970). Instead, teachers focus mostly on the activities related to the specification of the content during preparation (Hall & Smith, 2006; Morine, 1975; Roche et. al., 2014; Yinger, 1980; Zahorik, 1975). It is observed that after teachers determine the content, they focus on the teaching strategies and activities that they would use in the lesson and the learning situations to ensure the interest and participation of the students (Koni & Krull, 2018; Peterson, Marx & Clark, 1978). Then they deal with the goal setting and the specification of the evaluation methods (Koni & Krull, 2018; Taylor, 1970). It is reported that while setting goals, teachers often do not take into consideration the students' characteristics and needs (Morine, 1975; Mutton, Hagger & Burn, 2011; Roche et. al., 2014). Moreover, the goals identified mostly focus on the content (Roche et. al., 2014; Yinger, 1980). It is also added that the goals on the behavioral development of students are rarely developed by teachers (Morine, 1975; Yinger, 1980; Zahorik, 1975).

Research suggests that teachers do not allocate a specific time for the planning activities which are not of the written type, but of mental type (Grundén, 2020; Koni & Krull, 2018; McCutcheon, 1980; Morine, 1975; Peterson et. al., 1978; Yinger, 1979). When teachers make written lesson plans, it is seen that these plans contain superficially the topics, concepts and

skills to be presented in the lesson and are very weak in terms of details such as alternative activities, examples and potential questions (McCutcheon, 1980; Morine, 1975; Roche et. al., 2014; Sullivan et. al., 2013; Yinger, 1980). It is reported that teachers mostly carry out activity-oriented planning, and the most important information sources they employ in this process are textbooks and teacher guidebooks (Borko & Livingston, 1989; Clark, 1978; Grundén, 2020; McCutcheon, 1980; Sullivan et. al., 2013; Yinger, 1979).

It is argued that experienced teachers mostly avoid written planning during the preparation processes and can produce more superficial but longer-term plans (for example, unit plans and term plans) compared to teachers who have just started teaching (Borko & Livingston, 1989; Brown, 1993; Hall & Smith, 2006; Housner & Griffey, 1985; Koni & Krull, 2018; Mutton, Hagger & Burn, 2011; Sardo, 1982). It is observed that experienced teachers prefer to carry out mental planning and develop more effective mental plans than novice teachers (Borko & Livingston, 1989; Hall & Smith, 2006; Koni & Krull, 2018). In addition, it is reported that experienced teachers can better predict the potential situations they may encounter in the lesson, make more effective plans to deal with such situations and are more successful in choosing and preparing appropriate teaching materials compared to inexperienced teachers (Borko & Livingston, 1989; Housner & Griffey, 1985; Koni & Krull, 2018; Miles & Knipe, 2018; Okigbo & Okeke, 2011; Sardo, 1982). In summary, the studies cited above indicate that experienced teachers are able to make more student-focused plans in the preparation processes that are more compatible with student interests and needs in contrast to inexperienced teachers.

Studies on the teachers' preparation processes have been mostly carried out on the samples of mixed teacher groups. The studies cited above collected the data using survey questionnaires and provided some general information about the preparation processes implemented by teachers (Davidson, 2016; Roche et. al., 2014; Sullivan et. al., 2013). Therefore, there is a need for studies that examine teachers' pre-lesson preparation activities in depth in relation to the teaching process. In particular, there is not enough information about the self-regulation processes of novice mathematics teachers. It can be argued that studies examining this process in the context of mathematics lessons are important. Considering this situation, in this study, it is aimed to examine the self-regulation activities (goal setting and planning) of newly recruited middle school mathematics teachers (teaching the 5th-8th grades) in the preparation process for teaching. The findings contribute to the field by providing a better definition of the preparation processes of teachers, especially by providing concrete suggestions about pre-service teacher education and practices to be developed to support novice mathematics teachers.

2. Method

2.1. Design of the Study

The self-regulation processes of teachers involve different types of knowledge and skills. These processes are complex in that they require controlling and regulating individual elements (cognition, motivation, behavior) according to the context (students' readiness levels, motivations, misconceptions about the subject, etc.). In order to understand this complex process in detail, it is necessary to examine the preparation activities of teachers with a detailed and holistic approach, taking into account the characteristics of the context (for example, the physical conditions of the schools and classrooms they work in). For this reason, a case study design is employed in this study. A case study is a qualitative research design in which researchers examine one or more limited systems (cases) through in-depth

data collection based on multiple data sources (observations, interviews, audio-visual materials, documents, reports, etc.) and report case descriptions and case-based themes. This design is suitable for gaining an in-depth understanding of clearly identifiable situations and for comparing multiple situations (Creswell, 2007). In this study, goal setting and planning activities of six newly recruited middle school mathematics teachers are examined in depth in relation to their teaching processes and a comparison between them is carried out. Through these comparative analyses, the self-regulation processes of the novice mathematics teachers are defined.

2.2. Participants and Setting

In this study, the participants are six middle school mathematics teachers who were working in the provinces of Burdur, Kayseri and Uşak and who had less than five years of teaching experience. Among the potential participants, those who reported the use of the self-regulation were determined. After the preliminary interviews with these potential participants, six participants, two from each province mentioned above, were selected. Their willingness to participate in the study was also taken into account in the selection of the participants. In addition, the participants were selected from those who could freely share their ideas and were not bothered by being observed in the classroom environment.

Of the participants Serkan and Ender are the most experienced teachers with five-year of teaching experience. Ender teaches at a school which serves for 300 students from different socio-economic status. A total of three mathematics teachers work with a teaching experience ranging from 5 to 18 years. Ender has the lowest level of teaching experience among these teachers. Serkan works at a school which serves for children from higher socioeconomic status. There are 800 students and seven mathematics teachers work. Serkan has the lowest working year among these teachers. Nihal has the lowest level of teaching experience that has just started her teaching career. There are 600 students and four mathematics teachers work in her school. Nihal has master's degree in primary school mathematics education. Özlem has two-year of teaching experience. There are 160 students and three mathematics teacher work. Özlem has the lowest level of teaching experience among teachers in her school. Hale has four-year of teaching experience. There are 300 students at the school. A total of five mathematics teachers work with a teaching experience ranging from 2 to 9 years. Ayla has two-year of teaching experience and works at a village school. She is the only math teacher in the school and started her teaching career in this school. She is continuing master's degree in mathematics education. All participants are the graduates of the public teacher training programs with a specialty on elementary mathematics education.

2.3. Data Collection Process

Before the data collection process, a pilot study was conducted choosing one teacher from three different provinces (Kayseri, Uşak ve Burdur). Based on the findings from the pilot study the data collection tools were modified. The data collection process was completed within two semesters. In each semester the data were collected from three teachers, each from different provinces. Research data were collected by different researchers in each province. Three researchers carried out the data collection process. The data of the study were collected through semi-structures interviews, classroom observations and document analysis. Before the data collection process, an ethical evaluation of the study was ensured, and a necessary ethics certificate was obtained (Hacettepe University Ethical Council’s permission dated 27.09.2012 and number B.30.2.HAC.0.70.01.00/431-3629). In addition, an official permission was taken from the ministry of national education due to the fact that the study was carried out at public schools (dated 25.12.2012 and numbered 10230228/44/42696).

Pre-interviews. In the pre-interviews, the goals were to become familiar with the participants and their preparation routines and to create a trustful environment. Thus, information was obtained about which resources they used while preparing for their lessons, how they determined and used these resources, and how these routines changed in different contexts (such as grade level, and subject-related differences). For this purpose, the participants were asked some questions like the following: "What do you consider when determining the activities, materials, problems and questions that you will use in the lesson?"

Class observations. In order for teachers and students to get used to the camera, each classroom was observed for 5-6 lesson hours and these lessons were recorded with video. After this preparation process, the actual data collection process was started. After the preliminary interviews, the mathematics lessons (nearly ten hours) delivered by the participants were observed. The subjects and durations of the observed lessons are shown in Table 1. In the course observations, an unstructured observation form was used in which the teaching activities carried out by the teachers during the teaching process were specified. During or after observations, the notes were kept by the researchers in order to record the important events that the recording devices could not detect. With the observation data obtained through note-taking and video recording, the teaching activities of the participants in the classroom were described.

Table 1. *Information on classroom observations*

Participants	Classroom observations		Classroom interviews
	Course subject	Course hour	
Nihal	Polygons – Grade 5	2	Interview I
	Circumference of quadrilaterals – Grade 5	4	Interview II
	Area of quadrilaterals – Grade 5	4	Interview III
Özlem	Surface area of prisms – Grade 8	2	Interview I
	Surface area of cones and pyramids - Grade 8	2	Interview II
	Volumes of prisms – Grade 8	4	Interview III
	Pie graphs – Grade 7	2	Interview IV
Ayla	Circles – Grade 7	2	Interview I
	Prisms – Grade 6	4	Interview II
	Angles of circles – Grade 7	2	Interview III
	Surface area of cones - Grade 8	2	Interview IV
Serkan	Probability – Grade 8	4	Interview I
	Multiplication and division with fractions – Grade 6	3	Interview II

	Decimals – Grade 6	2	Interview III
Hale	Multiplication and division with fractions – Grade 6	4	Interview I
	Basic geometric concepts – Grade 5	6	Interview II
Ender	Linear relationships – Grade 7	3	Interview I
	Basic geometric concepts – Grade 5	5	Interview II
	Proportion– Grade 7	4	Interview III

Interviews after class observations. During the pilot study, it was observed that the teachers carried out their preparation for the lesson just before the beginning of the lessons. For this reason, there was no opportunity to discuss the preparatory activities before the lesson. Therefore, it was decided to conduct interviews after the courses, not before. The interviews were held with the teachers after each topic they taught. Information on the interviews is given in Table 1. In these semi-structured interviews held after the class observations, the items were asked to determine the preparatory activities of the participants for the identified teaching activities. The questions included in the interview forms were developed on the basis of the teaching activities revealed in the course observations. For instance, the teachers were asked about their goals for a problem they included in the lesson and the planning activities they had done for this problem ("What were the things you wanted to teach students in this two-hour lesson you taught?", "I noticed that when drawing open shapes of prisms, you usually uses standard/typical expansions. Was there any particular reason for this?"). The duration of these interviews ranges between 40 and 80 minutes.

Final interviews. During these interviews, the items were asked to the participants about the topics that were not clearly described based on the data from the observations or the data obtained from the previous interviews.

During the observation and interview processes, an open-ended observation form (Course Observation Form) and three semi-structured interview forms (Pre-Interview Form, Post-Course Interview Form, and Final Interview Form) prepared by the authors were employed. In the development of these tools, draft forms were created based on the findings of the related studies (Çapa-Aydin & Uzuntiryaki-Kondakçı, 2014; Ross & Bruce, 2007; Weiner, 2010; Zimmerman, 2000). The effect of the draft forms was tested in a pilot study carried out with one teacher from each province, and necessary corrections were made on the forms. During the implementation process, the After Course Interview Forms were restructured after the completion of each course observation process, taking into account the teaching situations observed in the relevant courses. All observations and interviews were recorded using video and audio recording devices.

Document analysis. In this study, the aim of document analysis is to reach the data that would reveal the teachers' preparations towards the teaching activities more clearly in addition to observation and interview data. To this end, those documents (for example, course outlines and teaching materials) reflecting the preparation processes for the teaching activities carried out by the teachers were collected and examined.

2.4. Data Analysis

The obtained data were analyzed by descriptive and content analysis methods. The data analysis is based on the theoretical framework developed by Zimmerman (1998, 2000, 2002), namely self-regulation model. The self-regulation model was used to describe teachers' self-regulated activities in the mathematics teaching. These activities were analyzed based on the sub-dimensions of the forethought process of the self-regulation model (namely, goal setting and planning).

First the recording of class observations and interviews was transcribed. Then, the analysis framework was developed based on the self-regulation model (Zimmerman, 1998, 2000, 2002) and the analysis of pilot data. The framework involves the codes and themes used to describe teachers' goal setting and planning activities (Table 2). Within-case analyses were conducted for each teacher followed by across-case analysis. In this study, the findings of the across-case analysis are reported.

Table 2. *Framework of the data analysis*

Themes	Explanations and sub-codes
Setting goals	It is the process of specifying goals.
Student-oriented	It refers to setting goals to improve student qualities. Cognitive: It refers to setting goals to improve students' cognitive skills. These goals are about the acquisition of mathematical knowledge (concepts, procedures and symbols, etc.) and skills (problem-solving, developing mathematical connections, etc.). Behavioral: It refers to setting goals to improve students' behavioral skills. These goals are about the acquisition of psychomotor skills (for instance, using protractors efficiently, etc.), taking regular notes and asking for help. Affective: It refers to setting goals to improve students' affective skills. These goals are concerned with the acquisition of necessary positive beliefs (self-efficiency, self-confidence, internal motivation, etc.) towards mathematics.
Teaching-oriented	It refers to setting goals that improve teachers' knowledge, behavior and motivation.
Planning	It refers to a process in which teachers carry out preparation to achieve the stated teaching goals.
Planning about the content	It refers to the specification of the content and related concepts, procedures and basic ideas to be taught in the courses.
Planning about the instructional practices	It refers to the teachers' decisions on how to present the content that they chose to teach in the courses. It includes determining the teaching activities to be carried out in the course, the teaching materials to be used (such as examples, questions, problems, models, concrete tools) and teaching methods and techniques (question-answer sessions, discussion, group work, etc.), possible situations that may arise during the course and the reactions of the teachers to these situations. In addition, the time management plans for the teaching process is also included in this process.

Planning about the criteria for success	It refers to the teachers' specification of observable criteria that indicate that they have achieved the stated goals.

Various methods were used in this study to increase the reliability and validity of the findings. During the data collection process, a long-term association was established with the teachers for three months. Researchers worked together in data collection and analysis processes, which were carried out nested. Teachers' confirmations were sought regarding the points of hesitation. In order to increase the consistency in the research, the data collection and analysis process is described in detail. In addition, the findings obtained from observations, interviews and document review were examined comparatively and the consistency of the findings was tested. Researchers worked together in the coding process and made joint decisions. In addition to these, the codes are clearly expressed and supported by direct quotations.

3. Findings

Teachers' self-regulation regarding the preparation for teaching were examined in terms of two processes: (i) goal setting and (ii) planning. The following section presents the findings in regard to these processes.

3.1. Goal Setting

It is found that the participants mostly produced student-oriented goals. Those about teaching activities are found to be relatively less. In addition, these goals are very general. For instance, Serkan stated that he aimed to use discovery learning in his lessons. Özlem and Hale talked about their general goals such as using certain materials, making their lessons more enjoyable and focusing on self-development. Ender, a teacher with five years of teaching experience, stated that he did not have such goals because he did not feel himself inadequate in any course subject. Nihal, who was in her first year in the profession, defined her goal as designing student-oriented, not teaching-oriented lessons.

> "Author: While studying the properties of quadrilaterals, you asked students about the differences between a square and a rectangle, between a parallelogram and a rectangle, and between a parallelogram and a rhombus. What was your purpose here?
> Nihal: I asked them these questions so that the students would not confuse them and would know the difference among these shapes. If I had taught them one by one, they might confuse them. Because especially rhombus and parallelogram look alike. The only difference is that their sides are equal, or they can draw it obliquely, for example, when drawing a square. This one looks like a rhombus. I made it so that they would know the difference." (Grade 5, Polygons and Their Properties)

In the above dialogue, Nihal associated the observed teaching behavior with a student-centered goal. She stated that she did this so that students could understand the differences between concepts more easily. However, she did not mention her own teaching goals that might be associated with this behavior. Ayla was the participant who most clearly defined her teaching-oriented goals. She talked about her goals for realizing teaching behaviors such as giving more voice to her students in her lessons and withdrawing herself in saying/showing the right answer right away. She stated that she aimed her students to find the connections

between mathematical concepts by themselves and for this purpose she tried to control their behavior in the lesson, but she often failed to do so.

> "Ayla: Sometimes I want students to find the result themselves, but they cannot do it. I usually want them to see it, but do I apply it a lot? No, I absolutely cannot. I remind myself not to tell them the related point, but at the end I told them due to their inability to find it themselves." (Grade 7, Angles of Circles)

The teachers especially emphasized cognitive goals in relation to the knowledge and skills they expect their students to acquire. Although the participants mentioned that they aimed to develop students' conceptual understanding and mathematical thinking in their general goal statements, Ayla and Nihal emphasized such goals during the preparation process for the courses and made practices reflecting such goals in the classroom, albeit to a limited extent. For example, Ayla stated that she did not want her students to write down what was written on the board directly in their notebooks in order to improve their mathematical thinking, so she directed them to make their own drawings while working on geometric shapes in the observed lesson. In the lesson, she asked the students to draw different examples of tangents and chords of a circle drawn on the board as examples in their notebooks.

> "Ayla: In the courses I want my students to draw the shapes themselves. I do not want them to copy those shapes that draw on the board. I think it is not very useful. So that I want my students to draw the shapes themselves and to use their creativity. For instance, if they draw a copy of the shape that I draw, I do not accept them. Because I do not want them to think the same way I think." (Grade 7, Positions of Circles and Lines)

The common goals stated in the interviews and observations for all participants are to teach students the correct use of mathematical rules and algorithms or to make them to gain procedural skills. For example, Özlem stated her main goals on prisms as follows.

> "Author: In the two-hour course what were the goals you had for your students?
> Özlem: Developing the formula for surface area. Putting the numbers into proper places [in the formula] and finding the result." (Grade 8, Surface Area of Prisms)

Here Özlem stated her goals as developing the formula for surface area and using the formula to find the surface area of a given shape. In the class she conducted activities for these goals. However, in regard to developing the formula for surface area she was more active than the students. On the other hand, in regard to the other goal [applying the formula to find the surface area] she provided more opportunities for the students to voice their ideas. The classroom observations show that Özlem gives priority to the goal of using the formula correctly, among the two goals she has mentioned above, and that the goal of developing the formula by the students remains in the secondary position. Similarly, Hale and Serkan stated that they aimed for 5th grade students to perform the division and multiplication algorithms in fractions without errors. In the course observations, it was seen that these participants made practices compatible with the goals they stated.

It was observed that the participants almost never mentioned the basic skills (such as problem solving, developing mathematical connections) covered in the education program of the Ministry of National Education (MONE) while talking about their goals. Nihal and Ender talked about their goals to make their students gaining the ability to develop mathematical connections. However, it was observed that the reflection of these goals in classroom practices remained limited. For example, Nihal stated that she aimed for her students to connect mathematics within itself and with daily life, and asked students to find examples from daily life similar to these shapes in the subject of quadrilaterals. In regard to the topic of

measuring an area, she asked the students to estimate the area of the classroom board. Although these activities are concerned with the stated goals, they are limited to presenting or using examples of mathematics in daily life.

It was observed that some of the cognitive goals stated by the teachers were vague and general, and some of them were more specific. Özlem and Ender mostly set vague and general goals. Hale and Serkan, on the other hand, talked about their specific goals for procedural skills and possible student mistakes. For example, one of Hale's goals for multiplication in fractions in Grade 6 was to equip her students with skills for simplifying fractions while carrying out the operations as well as rewriting the result in its simplest form. On the other hand, Ayla and Nihal, who try to take care of their students' goals for conceptual understanding, were able to set clear goals for some subjects, although not always. It was also observed that Ayla focused on the ideas and relationships that form the basis of the learning outcomes given in the education program while expressing her goals, thus creating clear sub-goals. For example, she stated that in the lesson in which she taught the surface area of the cones, she aimed to make students realize the relationship between the diameters of the circle and of the slice of the circle formed by unfolding the cone. Similarly, as seen in the dialogue below, she stated that her main goal regarding the subject of angles in the circle is to enable students to comprehend the relationship between the inscribed angle and the central angle.

> "Ayla: I wanted my students to recognize the relationship between inscribed angle and the central angle. For example, if both [the two angles] see the same arc, how do the [measures of the angles] change?" (Grade 7, Angles in Circles)

The participant produced less goals about improving the students' mathematical learning and related behaviors. Serkan and Hale did not develop any such goal. Ayla, Nihal, Özlem and Ender developed the goals in regard to asking for help, taking notes, the habit of making home assignment and using tools properly to make drawings related to mathematics learning. However, Ender and Ayla are observed to make activities concerning such goals. For instance, Ender stated that he cares about activities that involve measuring or drawing and that he postpones these activities to another lesson in lessons when the students do not bring the necessary tools to the class.

The affective goals developed by the participants are found to be mostly about improving students' interest in mathematics and their self-confidence. Serkan, Hale and Ayla stated such goals in terms of students whereas Ender, Özlem and Nihal produced much more general affective goals. For example, Hale talked about her goals, especially for low-achieving students, and stated that her aim was to make students gain self-confidence in mathematics by asking questions to them which were appropriate to their level. Ender, on the other hand, stated that he aimed to show that mathematics is an enjoyable lesson by associating it with daily life.

> "Ender: Not the coordinate system, but examples from our own life, from theaters. In other words, I tried to show that it is an enjoyable lesson by associating mathematics with our lives, by giving examples to them, so I provided examples like that." (Grade 7, Linear Correlations)

3.2. Planning

It is observed that the course content that the participants specified in the preparation process are generally consistent with their goals. Since the participants mostly set goals focused on the examination success of students, they specified the content by considering the learning outcomes with a focus on rules or algorithms. Therefore, the contents supporting

conceptual understanding in the education program (relationships between concepts, reasons for rules, etc.) are generally ignored or not included enough in the course outlines. For example, Özlem focused on the correct use of the formulas rather than the process of developing understandings of the formula and planned the content of the course as the presentation of the formulas and their use in problems. Similarly, Hale introduced the algorithm in regard to the 6th grade learning outcomes related to multiplication and division with fractions, and then included exercises involving the use of the algorithm. However, her course did not include the content (such as, the use of models, daily life problems, etc.) that could help students in making sense of the algorithm. Similarly, Ender developed a course outline that emphasized the operational rules in solving proportions rather than the mathematical meaning of the direct and inverse proportion while determining the content.

> "Ender: I gave an example of a car traveling at a constant speed of 60 kilometers [/hour] in direct proportion. We have charted and graphed this. I told the rules that we need to follow. For example, in direct proportion the divisions of the quantities are fixed. Since there is multiplication in inverse proportion [refers to the product of the quantities], we give these as an example and we focus on different questions." (Grade 7, Direct and Inverse Proportion)

The significant portion of the planning by the participants in regard to the content is about the *specification of the related prior topics.* For instance, Özlem stated that she specifically plans to include special triangles (3-4-5 and 5-12-13 triangles) in the course in which they study the surface area of prisms. Özlem stated that in this way she aimed to remind her students of the Pythagorean relation. Similarly, she said that she plans to remind the surface areas of the prisms when transitioning to the surface areas of the pyramids, and to remind them how the area of the circle is calculated when switching to the surface area of the cone: "We already worked on these topics together last year. I thought they might remember these topics."

The participants are observed to make plans to teach *mathematical connections* although it was not very common. They used mostly the content which includes some basic examples of the relation between mathematics and daily life. Although they made plans for such examples, these plans were not very detailed showing how they would teach them to the students. In addition, it was observed that the participants often used these examples to draw attention of the students rather than to facilitate students' understanding of concepts related to the subject. For example, Ender's statements below show that he used the story in his lesson to draw attention, but he did not plan how to teach or present the mathematical situations in the story in detail.

> "Ender: Yes, there are events that we experience, and there are some things that we make up in our imagination, that is, we use them in order to attract their attention. For example, … there are these profit-loss problems from previous years. I am creating stories about them. …For example, when I was in Denizli, when I was in Tavas, the most common thing there was grapes in the town… We used to give the example of grapes. We want to sell grapes, …that merchant wants to buy it, they agree on the price." (Grade 7, Linear Correlations)

Unlike other participants, Ayla specified the content to improve the students' *reasoning skills*. For instance, Ayla asked her students to examine the relationship between the arc length and the circumference of the circle forming the base of the cone while finding the angle of the circle segment formed as a result of the unfolding the cone. In her statement below, she stated that she did not expect them to find the angle of the resulting circle segment

in the unfolding of the cone, but she planned to make them think about these shapes through such questions.

> "Ayla: I did not think that the students can find the solution. I did not think the students would use the circumference to find a ratio. It is valuable for me students' thinking about these ideas." (Grade 8, Surface Area of Cones)

Due to several reasons, the participants *limited the course content* during the planning process. For instance, Hale stated that she did not cover the activities to draw parallel line segments in the course which focused on the learning outcome of "Students draw line segments parallel to a segment on squared or dotted paper and interpret whether the drawn segments are parallel or not." She reported the reason for this exclusion as her previous teaching of these topics in the courses which focused on the learning outcome of "Students explain line, line segment, ray and show with symbols." Although these learning outcomes are related to each other, they contain distinct knowledge and skills that help students in understanding the concept of parallelism. Students can determine whether or not the line segments are parallel through the previous acquisition; but, if they focus on the other related topic, they may acquire a skill of drawing parallel linear segments. Therefore, not including this current learning outcome in the course outline, considering that it is similar to the previous learning outcome, may limit students' ability to draw parallel lines.

Nihal stated that since the topics related to the measurement estimation and drawing quadrilaterals were not covered in the examination items, she did not include these subjects in the course. On the other hand, it was observed that Serkan's aims of covering the educational program and the examination items are not consistent. As a result, he limited the course content. For example, he included the invert-and-multiply algorithm in the division of fractions, but did not include finding the common denominator algorithm due to the fact that he thought it is more time consuming and confusing.

> "Serkan: I did not consider to teach this topic [refers to the common denominator algorithm]. Yes, there is a method of finding the common denominators, but for some examples, this method is very confusing and unproductive. So I did not deal with these topics." (Grade 6, Multiplication and Division in Fractions)

The participants reported that they did not cover some methods given in textbooks due to the fact that these might be difficult for students to understand. For instance, Nihal used the method of dividing a shape into squares or rectangles in the problems related to the calculating the areas of compound shapes. However, although it is included in the textbook, she did not include the method of completing a shape into a square or rectangle. She argued that this was more difficult than the other.

On the other hand, although at a limited level, it is observed that some teachers went beyond the learning outcomes of the relevant grade level and *expanded the course content*. For instance, while Nihal was dealing with the subject of angles in quadrilaterals, she also included the angles formed by parallel lines with an intersect, which is a subject that is not included in the 5th grade level mathematics courses. Hale, on the other hand, included the subject of the translation of a point belonging to the higher grade level, instead of the subject of the location of a point relative to a point, which is the subject of the 5th grade. Nihal and Hale stated that they practiced in this way to prepare students for upper-class subjects. It was observed that Ender also made minor expansions by including some concepts that he thought were related (point concept, ratio concept, right angle and straight angle, measuring with a protractor) although they were not included in the topics for the grade level.

> "Ender: In textbooks there is no topic of points. When defining a line, we say that the set of points on a straight segment is called a line. Then what is a point? When it is not presented to the students, they cannot understand it completely. So I started with the concept of points. Because it is closely related to this topic." (Grade 5, Basic Geometric Concepts)

There were times that teachers gave more priority to cover the curriculum. In such cases, even if the teachers think that it is not important, they included that learning outcome. For example, Nihal stated that she included the subject of area estimation, which she thought that it was not important, because it was included in the curriculum. Similarly, Serkan stated that he included activities involving using models in multiplication and division with fractions because they are included in the curriculum and also, are asked in the exams. However, the teachers' insufficient knowledge and experience regarding the use of the subject/material limited the content of the course. For example, in the example given above, Serkan did not establish a relationship between the use of the model and the common denominator algorithm and considered them independently from each other. Similarly, Nihal briefly and superficially touched on the topics of area estimation.

Teachers' planning about the instructional practices basically consisted of determining the definitions, rules and explanations that they would present and identifying the sample questions and problems. Most of the teachers mentioned the importance of presenting important mathematical information and rules to the students in a simple and easy way. They stated that they tried to find the simplest definition or explanation by looking at the sources while preparing for the lesson. While choosing the teaching materials (e.g., exercises, problems, concrete materials) to be used in the courses, their suitability for the students' level and the criteria of being relevant for the examinations were given importance. For example, Serkan stated that since he prioritized the success-oriented purpose in the examinations, he analyzed the questions used in the general examinations and determined the questions that he would include in the course. None of the teachers stated that they considered their suitability with the important mathematical ideas, knowledge or skills aimed at the learning outcome when choosing the course materials. Ensuring diversity in the types of questions in the selection of exercises or problems has emerged as the main criterion. For example, Özlem stated in the following statement that she aimed to present the different types of questions and did not include activities that might hinder her goal.

> "Author: I observe that you generally follow the coursebook, but you did not cover all sections. How do you make such decisions, before the courses or during the courses?
> Özlem: I sometimes do not use activity sections in the book. Because I do not have so much time. In fact, two hours are not sufficient to present the formula and to implement the related activities. It also seems like if I present the activities in the book I will prevent them from seeing different types of questions." (Grade 8, Surface Area of Pyramids)

Teachers' plans for the course flow are very general and superficial such as "first explain and then define" or "solving the problem first by teacher, then by together with students" or "ordering questions from difficult to simple." It is observed that the participants did not make detailed plans during the preparation process for the courses about how they would switch between topics or concepts, how they would guide their students during the solution of the questions and what tips they could give to the students. For example, Hale reported that she planned to ask the questions she used in the lesson in which order according to the scope of the subject whereas she created the number values in the questions during the lesson.

> "Author: Did you prepare the questions before the course?
>
> Hale: …For instance, here there is a simplification (6/4 x 2/6), but in others such as (1/3 x 2/8) (5/8 x 3/4) there is no simplification. Numbers are totally random, but the order of the problems was identified before the course." (Grade 6, Multiplication and Division by Fractions)

While planning the courses the participants considered the potential difficulties that students may come across. However, they did not make any plan about their responses to such situations. They later reported that in such cases they directly presented an explanation or the correct solution. It was more clearly observed in the planning by Hale. Before the courses, she determined the most common mistakes made by the students. However, she did not make any preparation for students to make sense of the concepts in order to eliminate these incorrect answers. She explained these mistakes to the students in the lesson and showed the correct one.

The teachers' predictions about the potential difficulties are also effective in planning the flow of their courses. For example, in the following statement, Serkan stated that he thought that students might make mistakes, and that he made changes while addressing the learning outcome in regard to the multiplication and division with fractions. In the educational program, first, the outcomes involving the product or division of a natural number and a fraction are included, and then the outcomes related to the product or division of two fractions were presented. This sequence presents an approach in which students can first associate multiplication and division in fractions with multiplication and division in natural numbers. However, Serkan first included the two-fraction multiplication/division algorithm in the course and discussed the outcome associated with the multiplication or division of a natural number and a fraction through this algorithm, using the idea that the denominator of natural numbers is 1. This change in the course flow by Serkan limited learning by associating multiplication and division operations in fractions with multiplication and division operations in natural numbers. As can be seen in the following statement, this change to regulate the flow aims to follow the algorithm without error rather than to make sense of the process.

> "Author: When you are dealing with multiplication with fractions, you generally focus on first the multiplication among fractions and then the multiplication with numbers and fractions. Was there any particular reason for this choice?
>
> Serkan: There is, because when multiplying the number by the fraction, the students forget the 1 in the denominator. No matter how much you give it. Go ask today, half will multiply that number with both the numerator and the denominator. That is our only goal, but they are still going to mess it up unfortunately." (Grade 6, Multiplication and Division in Fractions)

The teachers stated that they mostly pay attention to comply with the annual lesson plan in terms of time planning. However, none of the teachers made a detailed time planning for the different stages of the lesson. Ayla and Serkan stated that students spend more time on subjects that they had difficulty in understanding. In addition, Serkan stated that in order to avoid wasting time, he put several students on the board at once and had them solve questions.

It is also found that the teachers do not develop clear criteria for success when planning their courses. The criteria they implicitly specified are covering the curriculum and student achievement-mostly process-oriented. For example, Özlem stated that her lesson was successful when her students could apply the surface area formulas of geometric objects

without errors. Similarly, Hale stated that she thinks her lesson was successful when her students were able to simplify fractions correctly.

4. Discussion and Conclusion

One of the important findings of the study is that the preparation activities for the courses did not go beyond determining the content and delivering of the course in general terms. In the course preparation process, the teachers often did not set clear goals and did not implement detailed plans. The related studies also reported that teachers exhibit inadequate preparatory activities. It is reported that they did not start their preparation with the goal setting (Bozkurt, 2015; Davidson, 2016; Hall & Smith, 2006; Roche et. al., 2014; Sulliven et. al., 2013), did not conduct a detailed goal setting activity (Hall & Smith, 2006; McCutcheon, 1980; Peterson & Clark, 1978; Yinger, 1980; Westerman, 1991) and focused on the content specification during the preparation process (Bozkurt, 2015; Peterson & Clark, 1978; Roche et. al., 2014; Yinger, 1980).

The goals developed by the teachers who participated in the study did not mostly go beyond the verbal expression of the learning outcomes to be covered in the courses. They did not set specific goals for gaining important mathematical ideas underlying these learning outcomes. It is observed that the teachers, who mostly deal with the learning outcomes in terms of rules and algorithms, can develop more specific goals in this respect. Two teachers with the least experience of teaching (Nihal and Ayla) emphasized the objectives of conceptual understanding emphasized in the educational program. Similarly, two teachers (Nihal and Ender) limitedly mentioned their goals for developing mathematical connections, which is one of the basic skills in the educational program. Ayla who mentioned the development of reasoning skills as one of her goals. The teachers also gave more limited place to behavior-based goals related to mathematics lessons, such as asking for help, taking notes, acquiring the habit of doing homework, and using tools properly to make drawings related to mathematics learning. In the related studies, it is reported that teachers' goal setting focused on improving students' behavioral qualities is at a very limited level (Morine, 1975; Yinger, 1980; Zahorik, 1975).

The teachers took into account the possible difficulties and misunderstandings of the students while determining their goals. In particular, the teachers who are more senior than others used this information when setting their goals. However, due to several reasons such as the lack of information about the causes and solutions of such problematics cases or their ineffective use of methods, they could not put forward clear instructional goals to prevent them. It is also observed that the teachers cannot set clear goals to change or improve their teaching behaviors in order to produce solutions for the teaching problems they encounter (student difficulties, challenging concepts etc.). The fact that they do not have detailed information about their strengths and weaknesses as a mathematics teacher has emerged as an effective factor in their inability to set such goals. In this respect, it is seen that the teaching-oriented goals of Ayla, who monitors her teaching performance the most, are more specific than the goals of other teachers.

If lesson plans are prepared correctly and appropriately, these can be necessary guides especially for teachers who are in the first years of the teaching profession. The teachers who participated in this study mostly made plans in line with their goals. However, they did not make a detailed and written plan for each lesson, and used the textbooks for other parts. It is observed that most of the time they prepared for the courses by making a plan in their minds. While planning the content of the course, they mostly did not go beyond the educational program. Although they stated that they thought it was not important, they included some learning outcomes to their lesson due to the fact that these outcomes are covered in the

educational program. They rarely limit or expand the learning outcomes for the relevant grade level. Due to the lack of knowledge in the educational program, the low expectations for their students or preparing the students for the next grade level, they have made a minor expansion or reduction in the learning outcomes. The preparations for the course did not go beyond determining the teaching materials (description, explanation, example, problem, etc.) to be used in the course and their order.

In related studies, it is reported that teachers generally do not allocate a special time for planning studies, do not make written-planning and most of their planning is done mentally (Grundén, 2020; Koni & Krull, 2018; McCutcheon, 1980; Morine, 1975; Peterson et. al., 1978; Yinger, 1979). It is also argued that the written lesson plans of the teachers are mostly formed by listing the subjects, concepts and skills to be presented in the courses, and these written plans are quite weak in terms of including the detailed topics such as alternative activities, examples and possible questions (McCutcheon, 1980; Morine, 1975; Roche vd., 2014; Sullivan vd., 2013; Yinger, 1980). The studies indicate that novice teachers are more diligent in preparing written lesson plans than senior teachers, and that they can produce more detailed lesson plans in terms of time planning and solving questions and problems. (Borko & Livingston, 1989; Hall & Smith, 2006; Koni & Krull, 2018). However, the planning behaviors of the teachers participating in this study are not similar to those of the novice teacher planning behaviors described in the literature. Possible reasons for this finding may be related to the fact that the approach of the education program is not sufficiently understood and adopted. It is also possible that the teachers do not believe in the necessity of preparing a lesson plan, and that they do not have the necessary knowledge and skills to prepare a detailed lesson plan. The participants see mathematics teaching as limited to the presentation of mathematical information and solving sample questions. Therefore, the process of planning the lessons did not go beyond the determination of mathematical definitions, rules or algorithms related to the subject to be covered and the selection of problems. For this purpose, the use of textbooks or reference books was considered sufficient. In short, the teachers did not feel the need to prepare a detailed lesson plan.

The teachers frequently used their knowledge about students during the planning process. However, they did not plan their reactions (give feedback, hints, etc.) to the possible difficulties in detail that students might encounter. The method used for such situations is mostly direct explanation and showing the correct solution. It is observed that the teachers do not make detailed decisions about how to switch between topics or concepts, how to guide their students during the solution of the questions in the lesson, what kind of clues they can give the students, and how much time they would devote to which activity. Similar findings are also reported in the previous studies (Borko & Livingston, 1989; Housner & Griffey, 1985; Koni & Krull, 2018; Miles & Knipe, 2018; Okigbo & Okeke, 2011). One of the reasons for this is that novice teachers cannot approach their teaching tasks from the students' point of view and cannot foresee the possible paths that students can follow in the learning process (Westerman, 1991). Another reason why teachers give a uniform response to possible student difficulties and do not include different methods and techniques in their planning for this purpose may be their limited knowledge (Livingston & Borko, 1989).

As a result, the goals that the teachers set during the preparation process for mathematics courses are mostly about "what to teach to the students" rather than "how to teach". The objectives about how their students learn mathematics or how they teach mathematics themselves are quite general and limited. The teachers only considered the compatibility of the goals they set with the educational program in terms of content. They could not develop clear goals about conceptual learning, mathematical communication or mathematical justification compatible with the approach given in the education program. Therefore, they

could not make detailed and strategic plans compatible with the objectives of the education program. However, this does not mean that the teachers do not set goals or make plans. Teachers have clear goals for the implementation of rules and algorithms, and they make relatively detailed plans in line with these goals. However, these goals, which were prioritized by the teachers, led to decisions and implementations that are not fully consistent with the education program such as supporting conceptual understanding, reasoning and developing mathematical connections in the planning process.

5. Recommendations

Competencies such as conceptual learning, procedural fluency, problem solving, explaining mathematical thoughts, reasoning and making connections are among the general objectives of the Mathematics Curriculum (MEB, 2005, 2013, 2018), which was put into practice in 2005 within the scope of education reform in our country and updated in 2013 and 2018. The fact that the participants did not understand or adopt these general objectives sufficiently may be an important factor in their failure to set goals compatible with the education program. The adoption and implementation of educational reforms by teachers is a process in which many variables (teacher's belief and knowledge, structure of the evaluation system) play a role, requiring time, space and cooperation of stakeholders (academic, school management, family, student, etc.) (Schifter & Fosnot, 1993). In our country, pre-service teachers take lessons about past and current Mathematics education programs (MONE, 2005, 2013, 2018) during their undergraduate education. However, understanding and adopting an education program require the in-depth thinking about the reasons for the approaches underlying that education program and discussing and evaluating them using the knowledge and beliefs in this direction (Borko et. al., 1992; Schifter & Fosnot, 1993). Therefore, through in-service and pre-service education activities such understandings should be encouraged. Particularly, novice teachers need some activities (workshops, seminars, cooperative professional development programs) where they can evaluate the compatibility of their teaching goals with the learning and teaching approach of the educational programs.

Another reason why the participants could not set clear and realistic goals in line with the education program is that they are not competent in setting goals. Even if teachers set goals that are compatible with the education program, such as enabling students to associate mathematics with daily life, their goal statements are often general and vague. The fact that they could not set clear goals caused them to not be able to develop evaluation criteria (indicators) for these goals. The fact that the skills of teachers to create clear teaching goals and evaluation criteria for success are not at the desired levels may be related to the fact that they did not have such experiences during their undergraduate education. In the courses included in teacher education programs, pre-service teachers should make practices in regard to the goal setting and the development of evaluation criteria. For example, they need to work on what skills (for example, choosing a cheaper product) involve associating a certain mathematical concept (for example, proportion) with daily life, and they should be able to put forward appropriate evaluation criteria (for example, comparing products by calculating unit prices). Goal setting and the development of evaluation criteria (learning practices) focusing on the field (such as mathematics education) can enable pre-service teachers to gain experience. There is a need for practices (such as workshops, seminars, cooperative professional development programs) where new teachers can also gain such experiences. For example, workshops can be organized that include practices such as setting goals and creating evaluation criteria for the basic skills emphasized in the curriculum. In this way,

teachers who are in the first years of the teaching profession can offer an opportunity to develop their professional identity based on their own experiences.

In order for teachers to gain a habit of preparing lesson plans and using these plans, they must first understand its necessity. When teachers realize that they need to design activities that will reveal students' prior knowledge in the mathematics teaching process, and that they need to create opportunities that will enable students to think about the concept and make connections with their prior knowledge, they can better understand the importance of preparing a lesson plan. For this purpose, there is a need for practice-oriented, collaborative professional development studies in which teachers jointly prepare course outlines and observe and evaluate the effectiveness of these plans. For example, the Lesson Study is an effective approach that can help teachers organize their lesson preparation activities (Fernandez & Yoshida, 2004; Lewis & Tsuchida, 1997; Richardson, 2004). In this model, a group of teachers works together to set a common teaching goal and plan series of lessons to achieve this goal. Then, they perform observation and evaluation activities in real classroom environments. In this way, teachers can better understand the complex structure of the teaching process and have an opportunity to think in detail about the decisions they make regarding teaching activities. In this study, all of the participants took time to remind the preliminary information about the learning outcome to be covered at the beginning of the lesson or the relationship of the subject with daily life. However, in this process, the teachers themselves rather than the students were active and they did not create learning environments that would support the construction of the new concept/subject on this prior knowledge by focusing on the existing knowledge of the students. If teachers had the opportunity to think about the purpose of these reminder activities, they might be able to structure these activities more effectively. Practices related to lesson study research can offer teachers the opportunity to reflect and discuss each activity that makes up the course (such as introduction to the course, structured activity, practice, reaching generalization), and offer opportunities to improve their planning skills, especially for teachers who are in the first years of the profession (Fernandez & Yoshida, 2004; Stepanek, Appel, Leong, Mangan & Mitchell, 2007).

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References

Borko, H., Eisenhart, M., Brown, C. A., Underhill, R. G., Jones, D., & Agard, P. C. (1992). "Learning to teach hard mathematics: Do novice teachers and their instructors give up too easily?", *Journal for Research in Mathematics Education, 23*(3), 194-222.

Borko, H., & Livingston, C. (1989). Cognition and improvisation: Differences in mathematics instruction by expert and novice teachers. *American Educational Research Journal, 26*(4), 473-498.

Bozkurt, E. (2015). *Ders araştırması modeli bağlamında ortaokul matematik öğretmenlerinin öğretim faaliyetlerine yönelik grup temelli öz-düzenlemelerinin incelenmesi [Investigation of middle-school mathematics teachers' group-based self-regulation of instructional activities in the context of the lesson study model]* [Unpublished doctoral thesis, The University of Hacettepe]. Ankara, Turkey.

Brown, D. S. (1993). Descriptions of two novice secondary teachers' planning, *Curriculum Inquiry, 23*(1), 63-84.

Clark, C. (1978). "Teacher planning study, described", *Communication Quarterly, 1*(1), 4.

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed.). Sage.

Çapa-Aydın, Y., Sungur, S., & Uzuntiryaki, E. (2009). Teacher self-regulation: Examining a multidimensional construct. *Educational Psychology, 29*(3), 345-356.

Çapa-Aydın, Y., & Uzuntiryaki-Kondakçı, E. (2014). Öğretmen özdüzenlemesi [Teacher self-regulation]. In G. Sakız (Ed.), *Öz-düzenleme: Öğrenmeden öğretime öz-düzenleme davranışlarının gelişimi, stratejiler ve öneriler [Self-regulation: The development, strategies, and recommendations of self-regulating behaviors in learning and teaching]* (pp. 218-230). Nobel.

Davidson, A. (2016). The Priorities and Challenges of Primary Teachers' Knowledge in Their Mathematics Planning. *Mathematics Education Research Group of Australasia*.

Fantilli, R. D., & McDougall, D. E. (2009). A study of novice teachers: Challenges and supports in the first years. *Teaching and Teacher Education, 25*(6), 814-825.

Fernandez, C., & Yoshida, M. (2004). *Lesson Study: A Japanese approach to improving mathematics teaching and learning*. New Jersey: Lawrence Erlbaum Associates.

Grundén, H. (2020). Planning in mathematics teaching–a varied, emotional process influenced by others. *LUMAT: International Journal on Math, Science and Technology Education, 8*(1), 67-88.

Hall, T. J., & Smith, M. A. 2006. Teacher planning, instruction and reflection: What we know about teacher cognitive processes. *Quest, 58*(4), 424-442.

Housner, L. D., & Griffey, D. C. (1985). Teacher cognition: Differences in planning and interactive decision making between experienced and inexperienced teachers, *Research Quarterly for Exercise and Sport, 56*(1), 45-53.

Hebert, E., & Worthy, T. (2001). Does the first year of teaching have to be a bad one? A case study of success. *Teaching and Teacher Education, 17*(8), 897-911.

McCutcheon, G. (1980). How do elementary school teachers plan? The nature of planning and influences on it. *The Elementary School Journal, 81*(1), 4-23.

Koni, I., & Krull, E. (2018). Differences in novice and experienced teachers' perceptions of planning activities in terms of primary instructional tasks. *Teacher Development*, *22*(4), 464-480.

Lewis, C., & Tsuchida, I. (1997). Planned educational change in Japan: The case of elementary science instruction. *Journal of Educational Policy, 12*(5), 313-331.

Livingston, C., & Borko, H. (1989). Expert-novice differences in teaching: A cognitive analysis and implications for teacher education, *Journal of Teacher Education, 40*(4), 36-42.

Miles, R., & Knipe, S. (2018). 'I sorta felt like I was out in the middle of the ocean': Novice teachers' transition to the classroom. *Australian Journal of Teacher Education, 43*(6), 105-121.

Milli Eğitim Bakanlığı (MEB) (2005). *İlköğretim okulu matematik dersi (6-8. sınıflar) öğretim programı*. Ankara: Talim Terbiye Kurulu Başkanlığı.

Milli Eğitim Bakanlığı (MEB) (2013). *Ortaokul (5, 6, 7 ve 8. sınıflar) matematik dersi öğretim programı.* Ankara: Talim Terbiye Kurulu Başkanlığı.

Morine, G. (1975). *A study of teacher planning (BTES Technical Report 75-11-6)*. San Francisco, California: Far West Laboratory.

Mutton, T., Hagger, H., & Burn, K. (2011). Learning to plan, planning to learn: the developing expertise of beginning teachers. *Teachers and Teaching, 17*(4), 399-416.

National Research Council (2001). Adding it up: Helping children learn mathematics. J. Kilpatrick, J. Swafford, and B. Findell (Eds.). *Mathematics Learning Study Committee, Center for Education, Division of Behavioral and Social Sciences and Education.* Washington, DC: National Academy Press.

Okigbo, E. C., & Okeke, S. O. (2011). Perceived difficulty in integrating educational objectives within the mathematics classroom: a comparison of beginner and experienced teachers. *Educational Research and Reviews, 6*(3), 292-298.

Peterson, P. L., & Clark, C. M. 1978. Teachers' reports of their cognitive processes during teaching. *American Educational Research Journal, 15*, 555-565.

Peterson, P. L., Marx, R. W., & Clark, C. M. (1978). Teacher planning, teacher behavior, and student achievement. *American Educational Research Journal, 15*(3), 417-432.

Richardson, J. (2004). "Lesson Study: Teachers learn how to improve instruction", Tools for Schools, 7(4), 1-6.

Richter, D., Kunter, M., Lüdtke, O., Klusmann, U., Anders, Y., & Baumert, J. (2013). How different mentoring approaches affect beginning teachers' development in the first years of practice. *Teaching and Teacher Education, 36*, 166-177.

Roche, A., Clarke, D. M., Clarke, D. J., & Sullivan, P. (2014). Primary teachers' written unit plans in mathematics and their perceptions of essential elements of these. *Mathematics Education Research Journal, 26*(4), 853-870.

Ross, J. A., & Bruce, C. D. (2007). Teacher self-assessment: A mechanism for facilitating professional growth. *Teaching and Teacher Education, 23*(2), 146-159.

Sardo, D. 1982. *Teacher planning styles in the middle school.* Paper presented at the Eastern Educational Research Association, Ellenville, NY.

Schifter, D., & Fosnot, C. T. 1993. *Reconstructing mathematics education: Stories of teachers meeting the challenge of reform.* New York: Teachers College Press.

Schmidt, J., Klusmann, U., Lüdtke, O., Möller, J., & Kunter, M. (2017). What makes good and bad days for beginning teachers? A diary study on daily uplifts and hassles. *Contemporary Educational Psychology*, *48*, 85-97.

Stahnke, R., & Blömeke, S. (2021). Novice and expert teachers' situation-specific skills regarding classroom management: What do they perceive, interpret and suggest?. *Teaching and Teacher Education, 98,* 103243.

Stepanek, J., Appel, G., Leong, M., Mangan, M. T., & Mitchell, M. (2007). *Leading Lesson Study: A practical guide for teachers and facilitators.* Corwin Press Thousand Oaks, CA.

Sullivan, P., Clarke, D. J., Clarke, D. M., Farrell, L., & Gerrard, J. (2013). Processes and priorities in planning mathematics teaching. *Mathematics Education Research Journal, 25*(4), 457-480.

Taylor, P. H. (1970). *How teachers plan their courses: Studies in curriculum planning.* New York: National Foundation for Educational Research.

Weiner, B. (2010). The development of an attribution-based theory of motivation: A history of ideas. *Educational Psychologist, 45*(1), 28-36.

Westerman, D. A. (1991). .Expert and novice teacher decision making. *Journal of Teacher Education, 42*(4), 292-305.

Yetkin-Özdemir, İ. E., Gürel, R., Akdal, P., & Bozkurt, E. (2020). Öğretmenlerde özdüzenleme: Matematik dersi örneği [Teacher self-regulation: A case of math lesson]. In G. Sakız (Ed.), *Öz-düzenleme: Öğrenmeden öğretime öz-düzenleme davranışlarının gelişimi, stratejiler ve öneriler [Self-regulation: The development, strategies, and recommendations of self-regulating behaviors in learning and teaching]* (pp. 233-247). Nobel.

Yinger, R. (1979). Routines in teacher planning. *Theory into Practice, 18*(3), 163-169.

Yinger, R. J. (1980). A study of teacher planning. *The Elementary School Journal*, *80*(3), 107-127.

Zahorik, J. A. (1975). Teachers' planning models. *Educational Leadership, 33*(2), 134-139.

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 13-39). Academic Press.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice, 41*(2), 64-70.