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The Effect of Lesson Study on Preservice Teachers' Noticing Skills Towards Misconceptions*

Ders İmecesinin Öğretmen Adaylarının Kavram Yanılgılarına Yönelik Farkındalık Becerilerine Etkisi

Yasemin TÜRK ** **Adnan BAKİ** ***

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ABSTRACT: The aim of the study is to examine how lesson study activities affect primary school preservice teachers' noticing of students' misconceptions. A qualitative research approach was adopted and action research method was used. The study was conducted with 9 primary school preservice teachers. The data were obtained from the observation form, video recordings, reflection reports and field notes in order to reveal how the lesson study model affected the noticing development of preservice teachers. In addition to these, the "video exam" at the end of the Teaching Practicum-II course also constituted one of the data collection tools. Descriptive analysis was used in the study. The data obtained were analyzed by adapting the theoretical framework of "Levels of Noticing of Students' Mathematical Thinking" developed by van Es (2011) as "Levels of Noticing of Students' Misconceptions" in order to reveal preservice teachers' noticing of students' mathematical thinking. As a result of the research, it was concluded that noticing skills of the lesson study group preservice teachers were mostly at the level of reasoning and justifying their reasons (level 3) and offering alternative pedagogical solution suggestions based on comments (level 4). It was concluded that the noticing skills of the comparison group preservice teachers were mostly descriptive (level 1) and at the level of identifying important events but being insufficient to expand their interpretations (level 2).

Keywords: Noticing, lesson study, teacher education, misconception.

ÖZ: Araştırmanın amacı, ders imecesi çalışmalarının, sınıf öğretmeni adaylarının, öğrencilerin kavram yanılgısı ile ilgili farkındalık becerilerini nasıl etkilediğinin incelenmesidir. Çalışmada nitel araştırma yaklaşımı benimsenmiş ve aksiyon araştırması yöntemi kullanılmıştır. Çalışma 9 sınıf öğretmeni adayı yürütülmüştür. Ders imecesi modelinin öğretmen adaylarının farkındalık gelişimini nasıl etkilediğini ortaya koyabilmek için veriler, gözlem formundan, video kayıtlarından, yansıma raporlarından ve alan notlarından elde edilmiştir. Bunlara ek olarak Öğretmenlik Uygulaması-II dersinin sonunda yapılan "video sınavı" da veri toplama araçlardan bir tanesini oluşturmuştur. Çalışmada betimsel analiz yapılmıştır. Elde edilen veriler, öğretmen adaylarının öğrencilerin matematiksel düşünmeleri farkındalık becerisini ortaya koyabilmek için van Es (2011) tarafından geliştirilmiş olan "Öğrencilerin Matematiksel Düşünmelerini Fark Etme Düzeyleri" teorik çerçevesi araştırmacı tarafından "Öğrencilerin Kavram Yanılgısını Fark Etme Düzeyleri" şeklinde uyarlanarak analiz edilmiştir. Oluşturulan bu çerçeve verilerin analizinde kullanılmıştır. Çalışmanın sonucunda ders imecesi grubu öğretmen adaylarının farkındalık becerilerinin ağırlıklı olarak düzey 3 veya düzey 4, karşılaştırma grubu öğretmen adaylarının farkındalık becerilerinin ise ağırlıklı olarak düzey 1 ve düzey 2 olduğu sonucuna varılmıştır.

Anahtar kelimeler: Farkındalık, ders imecesi, öğretmen eğitimi, kavram yanılgısı.

* This study was prepared based on the doctoral thesis, titled "The effect of lesson study on the noticing skills of preservice teachers regarding student learning", which we completed in February 2020.

** *Corresponding Author:* Instructor., Karadeniz Technical University, Trabzon, Türkiye, yaseminturk3010@gmail.com, https://orcid.org/ 0000-0002-2680-3149

*** Prof. Dr., Trabzon University, Trabzon, Türkiye, adnanbaki@gmail.com, https://orcid.org/0000-0002-1331-053X

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The knowledge of "content education", which is included in the general competencies of teaching profession determined in our country (MEB, 2017), appears as "knowledge of teaching the content" among the knowledge that teachers should have in the international literature (Cochran, 1997; Magnusson, Borko, & Krajcik, 1999; Mohr & Townsend, 2002; Sulman, 1986; Van Driel, Verloop, & de Vos, 1998). Content area teaching knowledge includes the knowledge that teachers should have in order to realize effective learning in students (Baki, 2019; Ball, Thames, & Phelps, 2008; Fennema & Franke, 1992; Marks, 1990; Shulman, 1986). Shulman (1986) gave the answers to the questions of what a teacher considers when preparing a lesson, what knowledge he mobilizes in the preparation phase of the lesson, how he determines the most accurate and effective technique that can be used in the implementation of a plan, how he behaves in order to teach a knowledge that he has not encountered in his own learning process, and how he transforms his content knowledge into a form that students can understand with the concept of " teaching knowledge". In the studies, there are professional development models that have been put forward to improve the knowledge of teaching the content. In this way, there are many professional development models that support teacher professional development (Darling-Hammond, 2003; Garet, Porter, Desimone, Birman, & Yoon, 2001; Hawley & Valli, 1999; Kennedy, 1999). One professional development model that supports the development of the teacher's knowledge of teaching the required content area (Fernandez & Yoshida, 2004; Takahashi & Yoshida, 2004) is lesson study. Lesson study is a model for developing teachers' content knowledge and it starts with setting goals for student learning and development (Lewis, Perry, & Murata, 2006). The lesson study model includes successive stages such as setting goals, planning the lesson, implementing the plan, observing the lesson, discussing and evaluating the lesson, reviewing and reorganizing the lesson, re-teaching the lesson and re- evaluating the lesson (Fernadez & Yoshida, 2004; Lewis & Tsuchida, 1998). In this model, in the planning phase, teachers prepare the lesson plan together. In the implementation phase, one teacher in the group implements the plan prepared together and this lesson is recorded. In the observation phase, the other teachers observe the implementing teacher, in the discussion phase, all teachers, first the teacher who taught the lesson, share their observations and suggestions about the lesson, and in the evaluation phase, the lesson is evaluated and the lesson plan prepared together is revised. The new revised plan can be reapplied or not, depending on demand. Studies in the literature suggest that the lesson study model as a professional development model can be used by teachers (Gözel, 2016; Lewis, 2016; Meyer & Wilkerson, 2011; Sudejamnong, Robsouk, Loipha, & Inprasitha, 2014; Verhoef & Tall, 2011); Yoshida & Jackson, 2011) and preservice teachers (Akbaba-Dağ, 2014; Baki, 2012; Bütün, 2012; Corcoran, 2008; Fernandez, 2010; Özdemir-Baki, 2017) positively support the development of mathematics teaching knowledge. One of the concepts that has gained importance in teacher education in recent years and makes it necessary to focus on practices in teaching is the concept of teacher noticing (Philipp, 2014). van Es and Sherin (2002) and Sherin and van Es (2009) defined teacher noticing as a teacher's ability to recognize important situations that occur in complex classroom environments and to interpret these complex situations. van Es (2011) suggests that teachers need to learn this noticing, given the emphasis in current mathematics education reform proposals (Ball & Cohen, 1999; NCTM, 2000) on teachers adopting a

flexible teaching approach that is responsive to student ideas. Some research results have shown that to teach mathematics effectively, teachers need to recognize students' thinking and use it to adjust their lessons to support students' learning (Ainley & Luntley, 2007; Lee, 2018; Lee & Cross Francis, 2018). According to Sherin and van Es (2005), noticing skills should be included in teacher training programs and preservice teachers should be given the opportunity to do practices that can develop these skills. Noticing skill is one of the basic professional skills that preservice teachers should have (Mason 2002; Sherin, Jacobs, & Philipp, 2011). van Es (2011) argues that teachers' noticing expertise "What did teachers notice? How did teachers notice?". The first category focuses on "to whom" (e.g. classroom environment, whole class, groups of students, individual students, individual teachers) and "what issues" (e.g. teaching strategies, students' behavior, students' mathematical thinking, classroom management) teachers attend to. The second category is concerned with how teachers analyze their observations (e.g., describing, interpreting, and evaluating), the depth of their analysis (e.g., giving few details or basing their interpretations on evidence), and making connections to pedagogical knowledge about teaching and learning. van Es (2011) presented a developmental trajectory for these dimensions within both categories, from level 1 to level 4, which reveals the development of noticing. Studies in the literature indicate that preservice teachers' noticing skills are at a low level compared to experienced teachers and that it is necessary to develop noticing skills in preservice teachers and ensure that they start to work (Jacobs, Lamb, & Philipp, 2010; Sherin & van Es., 2005; Star & Strickland, 2008; van Es et al., 2002). When the studies in the literature are examined, it is seen that the studies on lesson study (Budak, Budak, Bozkurt, & Kaygın, 2011; Fernandez, 2005; Meyer, 2005; Özdemir-Baki, 2017; Özen, 2015; Özen & Köse, 2013; Özen & Köse 2014; Verhoef et al, 2011) and teacher noticing studies were conducted with mathematics teachers or preservice mathematics teachers (Erdik, 2014; Güner, 2017; Osmanoğlu, 2010; Osmanoğlu, Işıksal, & Koç, 2012; Tataroğlu-Taşdan, 2018; Temel-Doğan, Özgeldi, 2018). Considering that primary school teachers plan and conduct mathematics lessons until the 4th grade of primary school, it is clear that these studies conducted with primary school mathematics teachers and preservice mathematics teachers should also be conducted with primary school teachers and preservice primary school teachers. It has been a matter of curiosity whether it would be an opportunity for primary teachers to practice with a professional development model that supports the development of knowledge of teaching the content such as lesson study before service, and to gain noticing skills. As a result, it is aimed to investigate how the lesson study model affects the noticing development of primary school preservice teachers regarding misconceptions. In addition, there are different research topics in the literature on teacher noticing that researchers have focused on and one of them is teacher noticing of student learning (Santagata, Zannoni, & Stigler, 2007). In this study, under the title of student learning, the focus was on the preservice teachers' ability to recognize students' misconceptions or prevent them from falling into misconceptions. According to Baki (2006), misconceptions are the behaviors of students as a result of their wrong beliefs and wrong experiences. Since misconception of a concept may lead to misperception of many subsequent concepts and learning difficulties in this regard, it is important for the teacher to be aware of the situations that may cause students to have misconceptions in the process of teaching concepts (Zembat, 2010). Prioritizing students' misconceptions and then planning teaching

activities by taking them into consideration is very important in terms of increasing the quality of teaching (Ayyıldız & Altun, 2013; Gilbert, Osborne, & Fensham, 1982). In this study, what is meant by "taking students' misconceptions into consideration" are as follows; Recognizing the student's systematic mistakes, recognizing the student's comprehension skill and ability, taking into account the student's prior knowledge and readiness level for teaching, giving appropriate feedback to the student in order to prevent the student from falling into misconceptions, showing appropriate behavior or behaviors to prevent the student's misconceptions, determining what or what may cause misconceptions, avoiding overgeneralization or over-specialization, taking into account the pedagogical reasons that may cause misconceptions, in other words, using the correct method technique appropriate to the subject, organizing the content appropriately. When the noticing studies in the literature are examined, it is seen that video is used as a tool to improve teacher noticing (Barnhart et al., 2015; Benedict-Chambers, 2016; Christ et al., 2017; Huang et al., 2012; Kleinknecht et al., 2016; Lee, 2019; Mitchell et al., 2014; Osmanoğlu, 2010; Osmanoğlu, Işıksal, & Koç; 2012; Stockero et al., 2017; van Es et al., 2002; 2006; 2008; Vrikki et al., 2017). However, this study aimed to expand the existing literature not only with the use of video, but also with the use of video in the context of content through lesson study. In addition, there are studies in the literature that examine teachers' noticing development in the lesson study process (Güner, 2017; Güner & Akyüz, 2017; Lee, 2019). However, when these studies were examined, it was seen that the focus was on teachers' noticing of students' mathematical thinking. However, this study aims to examine the misconception noticing process of preservice teachers. It is thought that the study will contribute to the literature in this sense. In this direction, the problem of the study was determined as "How do lesson study studies affect the noticing skills of primary school preservice teachers about students' misconceptions? In the light of all this information, the aim of this study is to reveal how preservice primary school teachers' noticing develops with the lesson study model and the development process that occurs in preservice teachers during the lesson study process. For this purpose, the study investigated in detail the primary school preservice teachers' ability to recognize students' misconceptions. As a result, it is aimed to investigate how the lesson study model affects the noticing development of primary school preservice teachers regarding misconceptions.

Theoretical Framework

Lesson Study

Lesson study is a professional development model originating from Japan, which was put forward to improve the knowledge of teaching the field in the process of knowledge research that the teacher should have (Fernandez et al., 2004; Takahashi et al., 2004). Lesson study; In primary education, it is a process that includes the development of teaching and structuring of knowledge (Cerbin and Kopp, 2006) and the stages of lesson planning, lesson implementation, lesson observation, lesson discussion, lesson evaluation, lesson revision, lesson re-implementation and lesson re-evaluation (Lewis, 2002; Lewis and Tsuchida, 1998).

Noticing

van Es and Sherin (2002) stated that "the teacher's ability to see and interpret important situations that occur in complex classroom environments is the teacher's noticing." van Es (2011) developed a theoretical framework consisting of four levels (Level1 - Level2 -Level3 -Level4) to reveal teachers' noticing development regarding students' mathematical thinking. van Es (2011) developed two categories for noticing: "what do teachers notice" and "how do teachers notice" and evaluated these two categories by dividing them into four dimensions. He divided these categories into dimensions to reveal the nature of the group's noticing. The first category is "what teachers notice" and includes the dimensions "Whose" and "Subject". The "whose" dimension is the teacher to the student, the teacher to himself, or to someone else. It is the dimension that expresses who is focused on. The "subject" dimension focuses on defined topics such as mathematical thinking, pedagogical strategies, classroom management, and environment. The second category of the framework concerns teachers' analysis of what they notice and includes the dimensions "Situation and Specificity". The "specificity" dimension indicates the level of detail in the teacher's discourse and focuses on the teacher talking about his general impressions while expressing his thoughts or expressing his thoughts in detail by justifying them. The "situation" dimension is the teacher's analytical approach in interpreting what he notices (van Es, 2011). It indicates whether the group's inquiry into teaching and learning is qualified or not, and how it interprets and evaluates its observations. The "situation" dimension is divided into three: definition, evaluation and interpretation. "Description" is a restatement of the events that occurred. "Evaluation" refers to the teacher deciding what is good or bad and expressing it or making conscious decisions about how to do it. "Interpreting" refers to the group's efforts to reason about what they observe, to understand the roots of an idea, and to explain what is meant by a particular idiom, drawing, action, or expression, or it includes expressions in which the teacher infers from his observations and tries to explain the reasons why events occur. van Es (2011) has put forward a framework consisting of four levels that will reveal the development of noticing for these four dimensions of both categories. These four levels are; They are presented as level 1, level 2, level 3 and level 4. Level 1 of students' noticing of mathematical thinking; It involves the teacher talking about his general impressions, expressing his observations in a simplistic manner, and not providing evidence or any interpretive explanations. level 2; It involves the teacher continuing to talk about his general impressions but also mentioning specific students and moments to support his statements but failing to elaborate on his comments and observations. level 3; It involves the teacher reasoning about his observations and trying to justify them; level 4 ; It involves the teacher trying to establish a connection between teaching and learning principles, as well as offering alternative pedagogical solutions based on interpretation.

Considering Misconceptions

In this study, what is meant by "taking into account the student's misconceptions" is as follows; Noticing the mistakes made systematically by the student, noticing the student's comprehension skills and abilities, taking into account the student's previous knowledge and readiness level for teaching, giving appropriate feedback to the student in order to prevent the student from falling into misconceptions,

showing appropriate behavior or behaviors to prevent the student from misconceptions, Determining what or what may cause misconceptions, avoiding overgeneralization or overspecification, taking into account the pedagogical reasons that will cause misconceptions, in other words, using the right method and technique appropriate to the subject, arranging the content appropriately, etc.

Method

Approach of the research

In the study, a qualitative research approach was adopted and action research method was used. Qualitative research approach is a research approach in which qualitative data collection techniques such as observation, interview, and document analysis are used and a qualitative process is followed to reveal perceptions and events in a realistic and holistic way in a natural environment (Yıldırım & Şimşek, 2013). One of the reasons why the qualitative research approach is preferred in research is to systematically examine the meanings arising from the experiences of the people to be researched (Ekiz, 2009). For this reason, in this research, a qualitative research approach was adopted as it was aimed to examine the change in the noticing of preservice teachers with their lesson study experience. Action research is defined as a research that aims to determine the necessary measures to improve the situation by making an analytical evaluation of the existing practice, conducted by expert researchers, with the participation of practitioners and parties to the problem (Karasar, 2009). This study was conducted as an action research with the aim of raising noticing among preservice teachers by improving the existing process through lesson study. In accordance with the nature of action research, the practitioner took an active role in this process as both a teacher and a researcher.

Research process

The research was conducted in Teaching Practicum-I and Teaching Practicum-II courses. In the Teaching Practicum-I course, eight lesson study cycles were carried out with 3 primary school preservice teachers. Each of the preservice teachers taught a mathematics lesson for 2 class hours for each cycle, making a total of 8 lesson study cycles. Before each lesson study cycle, the lesson plan was prepared jointly by the 3 preservice teachers and the researcher during the planning phase of the lesson. In the implementation phase of the lesson, one of the preservice teachers implemented the lesson plan prepared together in the classroom. At the end of the lesson, the primary school teacher was also asked to share her observations about the lesson. The lesson observation form was filled in by the preservice teachers participating in the lesson study during the implementation lesson. The items in the observation form focused on preventing students from falling into misconceptions. In the third stage, the discussion of the lesson and reflections stage, the implementation lesson was evaluated by watching the video of the implementation lesson recorded by the researcher, and by considering the observation form, lesson plan and video recordings together. After these meetings, each preservice teacher wrote reflection reports by considering the items related to misconceptions in the observation form. The plan was revised again, but the revised lesson plan was not applied again. The Teaching Practicum-I course, which was conducted with the lesson study group preservice teachers through lesson study cycles,

was conducted with the comparison group preservice teachers by adhering to the content and methodology specified in the undergraduate program. The comparison group preservice teachers also attended one-hour meetings once a week in the researcher's room, during which the lesson plan for Teaching Practicum was reviewed and discussed. In the Teaching Practicum-II course, 3 preservice teachers who had participated in the lesson study in the first semester and 6 preservice teachers who had never participated in a different lesson study were selected as the comparison group and observed each other's lessons in three groups of three for eight lessons consisting of two hours each. Video recordings and observation forms, which were used as part of the lesson study in the process of lesson study in the Teaching Practicum-I course, were used by the researcher as data collection tools in the second semester. The observation forms, reflection reports, video recordings, video exams and the researcher's field notes of the preservice teachers in the Teaching Practicum-II course were analyzed to reveal the noticing development of the preservice teachers.

Study group

The study was conducted with 9 preservice teachers studying in the 4th grade of Karadeniz Technical University Fatih Faculty of Education, Department of Elementary Education, Classroom Teaching Program in the Teaching Practicum-I and Teaching Practicum-II courses. Typical case sampling from purposeful sampling method was used to determine the primary school preservice teachers participating in the study. In order to reveal the noticing of preservice teachers, a typical group of preservice teachers whose academic achievement was neither very high nor very low was determined. Eight lesson study cycles were conducted with 3 preservice teachers in the Teaching Practicum-I course. In the Teaching Practicum-II course, 3 preservice teachers who participated in lesson study were selected as the lesson study group and 6 preservice teachers who had never participated in a different lesson study were selected as the comparison group and they were allowed to observe each other's mathematics lessons in three groups. The Teaching Practicum-I course was carried out with the 6 primary school preservice teachers in the comparison group in accordance with the content and methodology specified in the undergraduate program. In the second semester of the academic year, in the Teaching Practicum-II course, two groups of primary school preservice teachers were compared in order to reveal more clearly whether the lesson study model contributed to the noticing of preservice teachers.

Data collection tool

In order to reveal how the lesson study model affected preservice teachers' noticing development, data were obtained from the observation form developed by the researcher, video recordings, reflection reports and field notes. The reason for using more than one data collection tool in the study was to obtain more in-depth data. Video recordings, observation forms and reflection reports used as part of the lesson study were used as data collection tools in the second semester. In addition to these, the "video exam" at the end of the Teaching Practicum-II course was also one of the data collection tools. The video exam consisted of 3 preservice teachers who participated in the lesson study process and 6 preservice teachers who did not participate in the lesson study process watching a two-hour mathematics lesson of the mentor teacher, which was videotaped, and filling in the observation form simultaneously. A video exam

rubric was created by the researcher for the analysis of the video exam and used in the analysis of the data. Descriptive analysis, one of the qualitative data analysis types, was used in the study.

Data analysis process

The data obtained were analyzed by adapting the theoretical framework of van Es (2011) as "Students' Levels of Recognizing Misconceptions" by the researcher in order to determine preservice teachers' noticing of students' misconceptions. This framework was used to analyze the data. In order to determine the misconception noticing skills of preservice teachers, the levels adapted by the researcher using van Es (2011)'s theoretical framework are as follows: Level 1 (Baseline Noticing): Talks about general impressions about the misconception. They state what they observe with simple expressions. Makes descriptive and general comments. Does not provide evidence to support his/her explanations or gives very few details. Level 2 (Mixed Noticing): Although he/she continues to talk about his/her general impressions about the misconception, he/she also tries to describe important events. He/she mentions specific students and moments to support his/her explanations, but is unable to expand his/her comments and elaborate on his/her observations. Level 3 (Focused Noticing): Reason about what they observe about misconceptions and try to justify the reasons for them. Analyzes important situations observed in the classroom. Uses the details of observations to make inferences about students' misconceptions. His/her explanations based on his/her observations are interpretative and he/she tries to elaborate these explanations. Level 4 (Extended Noticing): Analyzes student comments and explanations in detail to determine whether students have misconceptions. Highlights noteworthy events related to misconceptions. Cites specific events and interactions as evidence. Provides detailed information on the interactions they observe and provides details to support their thinking as a result of their observations. Interpret and articulate what they observe, taking into account the relationship between the student's misconception and the teacher's pedagogy. Makes connections between what they observe and the principles of teaching and learning. Suggests alternative pedagogical solutions based on interpretations. In the Teaching Practicum-I course, preservice teachers in the lesson study group analyzed each other's lessons as part of the lesson study model. In the Teaching Practicum-II course, the Lesson Study group and the comparison group were allowed to analyze each other's lessons in their own groups in order to reveal their noticing, and the researcher analyzed the lessons of both groups. Studies conducted for the validity (Creswell & Miller, 2000) and reliability (Merriam, 1998) of the study; triangulation, long-term application, purposive sampling, detailed description, participants' consent to the data, defining the research method and stages of the research, detailed description of the sample, consistency review.The research is limited to the practices carried out with 9 preservice teachers in the Teaching Practicum-I and Teaching Practicum-II courses in the Department of Primary Education, Karadeniz Technical University. The research is limited to misconceptions from student learning. It is limited to 8 lesson study cycles conducted with primary school preservice teachers in Teaching Practicum-I course.

Ethical Procedures

Ethical committee date: 09.12.2021 and number: E-81614018-000-2100005124.

Findings

The noticing skills of T1, T2, T3, C1, C2, C3, C4 and C6 preservice teachers in the Teaching Practicum-II course are summarized in Table 1, Table 2 and Table 3 below. Group1 consisted of T2 Preservice Teacher, C1 Preservice Teacher, C2 Preservice Teacher, Group2 consisted of T3 Preservice Teacher, C3 Preservice Teacher, C4 Preservice Teacher, Group3 consisted of T1 Preservice Teacher, C5 Preservice Teacher, C6 Preservice Teacher. Table 1 below shows the noticing skills of T2, C1 and C2, preservice teachers in the Teaching Practicum-II course, which were obtained as a result of the analysis of the data obtained from the observation form and reflection reports.

Table 1

Noticing Skills of the Preservice Teachers in Group 1 (T2 Preservice Teacher, C1 Preservice Teacher, C2 Preservice Teacher)

	Misconception noticing levels		
	T2 Preservice Teacher	C1 Preservice Teacher	C2 Preservice Teacher
Lesson 1 Group 1	Level 3	Level 1	Level 2
Lesson 2 Group 1	Level 4	Level 1	Level 1
Lesson 3 Group 1	Level 4	Level 1	Level 2
Lesson 4 Group 1	Level 3	Level 1	Level 2
Lesson 5 Group 1	Level 4	Level 2	Level 2
Lesson 6 Group 1	Level 3	Level 1	Level 1
Lesson 7 Group 1	Level 4	Level 1	Level 1
Lesson 8 Group 1	Level 3	Level 1	Level 1

When Table 1 is examined, it is seen that the noticing skills of the preservice teachers in the lesson study group in group 1 are predominantly level 3 and level 4, while the noticing skills of the comparison group preservice teachers are predominantly level 1 and level 2. From this point of view, it was concluded that the lesson study group preservice teachers gained noticing skills as a result of the development of knowledge of teaching the content with the lesson study model. When the contents of the courses in which the preservice teachers' noticing levels were determined as level 4 were examined, it was concluded that there were topics that overlapped with the topics of the courses carried out in the Teaching Practicum-I course. As a result of this, it is thought that the focus of the lesson study activities caused the preservice teachers to gain competence in these subjects and thus to have high noticing skills.

In Table 2 below, the noticing skills of T3, C3 and C4 preservice teachers in the Teaching Practicum-II course are given as a result of the analysis of the data obtained from the observation form and reflection reports.

Table 2

Noticing Skills of the Preservice Teachers in Group 2 (T3 Preservice Teacher, C3 Preservice Teacher, C4 Preservice Teacher)

	Misconception noticing levels		
	T3 Preservice Teacher	C3 Preservice Teacher	C4 Preservice Teacher
Lesson 1 Group 2	Level 3	Level 1	Level 2
Lesson 2 Group 2	Level 4	Level 1	Level 1
Lesson 3 Group 2	Level 3	Level 1	Level 2
Lesson 4 Group 2	Level 4	Level 2	Level 1
Lesson 5 Group 2	Level 4	Level 2	Level 1
Lesson 6 Group 2	Level 3	Level 1	Level 2
Lesson 7 Group 2	Level 4	Level 1	Level 2
Lesson 8 Group 2	Level 3	Level 1	Level 1

When Table 2 is examined, it is seen that the noticing skills of the lesson study group of pre- service teachers in group 2 are predominantly level 3 and level 4, while the noticing skills of the comparison group preservice teachers are predominantly level 1 and level 2. From this point of view, it was concluded that the lesson study group preservice teachers gained noticing skills as a result of the development of knowledge of teaching the content with the lesson study model. When the contents of the courses in which the preservice teachers' noticing levels were determined as level 4 were examined, it was concluded that there were overlapping subjects with the subjects of the courses carried out in the Teaching Practicum-I course. As a result of this, it is thought that the focus in the lesson study activities caused the preservice teacher to gain competence in these subjects and thus to have high noticing skills.

Table 3 shows the noticing skills of T1, C5 and C6, preservice teachers in the Teaching Practicum-II course, which were obtained as a result of the analysis of the data obtained from the observation form and reflection reports.

Table 3

Noticing Skills of the Preservice Teachers in Group 3 (T1 Preservice Teacher, C5 Preservice Teacher, C6 Preservice Teacher)

	Misconception noticing levels		
	T1 preservice teacher	C5 preservice teacher	C6 preservice teacher
Lesson 1 Group 3	Level 4	Level 1	Level 1
Lesson 2 Group 3	Level 4	Level 2	Level 1
Lesson 3 Group 3	Level 3	Level 1	Level 1
Lesson 4 Group 3	Level 4	Level 2	Level 1
Lesson 5 Group 3	Level 3	Level 1	Level 1

Lesson 6 Group 3	Level 4	Level 2	Level 2
Lesson 7 Group 3	Level 4	Level 1	Level 1
Lesson 8 Group 3	Level 4	Level 1	Level 1

When Table 3 is examined, it is seen that the noticing skills of the lesson study group of pre- service teachers in group 3 are predominantly level 3 and level 4, while the noticing skills of the comparison group preservice teachers are predominantly level 1 and level 2. From this point of view, it was concluded that the lesson study group preservice teachers gained noticing skills as a result of the development of knowledge of teaching the content with the lesson study model. When the contents of the courses in which the preservice teachers' noticing levels were determined as level 4 were examined, it was concluded that there were overlapping subjects with the subjects of the courses carried out in the Teaching Practicum-I course. As a result of this, it is thought that the focus of the lesson study activities caused the preservice teachers to gain competence in these subjects and thus to have high noticing skills.

Noticing Skills of the Lesson Study Group and Comparison Group Preservice Teachers at the End of the Video Exam (Last Lesson)

At the end of the whole process, a math lesson of the mentor teacher was video recorded. Then, 9 preservice teachers were asked to watch this video-recorded lesson and they were asked to fill in the observation form. This application was done in the form of an exam. The data obtained from the observation forms were analyzed descriptively according to the scaled framework prepared in accordance with van Es's (2011) theoretical framework.

Observation Forms in the Video Examination

The implementation of this lesson was carried out by the practice teacher and the outcome of the lesson was "Solves problems requiring at least one division operation with natural numbers" in Grade 4.

Observation Form of Preservice Teacher T1

When the data obtained from the observation form of preservice teacher T1 were analyzed, it was seen that she stated that an incorrect explanation she made in division caused misconceptions in students. Preservice teacher T1 explained this observation about misconception as follows; *The teacher explained that in the division 150÷5, we put the zero in the ones place of 150 next to 3. In 170÷5 division, two of the students did 170÷5=30 on the board and found the remainder 2. In other words, they made a mistake by applying the teacher's explanation that we put the "0" here. They left the operation unfinished. The teacher did not explain why we put the "0" there. The teacher gave a wrong explanation. What the student should understand here is that the number 150 consists of 1 hundred, 5 tens and 0 ones. Let's first divide 1 hundred by 5, here they can do it using rhythmic counting, let them find 20. Then let's divide 5 tens by 5 and find 10, again using rhythmic counting. Add the two together and the result is 30. The student will generalize the explanation that we are throwing away the "0" here and in any case will throw away the "0" from the ones digit in the division to the ones digit in the quotient. This created a misconception.* In addition to this thought, preservice

teacher T1 stated that she realized that students could not perform division when there was 0 in the tens digit in 3-digit numbers and that this was also a misconception. She explained this observation as follows; *Students often incorrectly divided 3-digit numbers if there was 0 in the tens digit. For example, they did 307÷3=12. I think the teacher's explanations were too little here. She should have emphasized how many times 3 is in "0" and how many times "0" is in "0", so she should write this in the division.* When these explanations of T1 Preservice teacher are analyzed, it is seen that she identified important situations related to students' misconceptions and presented details from her observations to support her thoughts. While interpreting her observations, she considered the relationship between the students' misconceptions and the teacher's pedagogy. She offered a pedagogical solution based on interpretation. For this reason, T1 preservice teacher's misconception noticing skill was determined as level 4.

Observation Form of Preservice Teacher T2

When the data obtained from the observation form of preservice teacher T2 were analyzed, she stated that in the problems, the students performed the operations by understanding the question "how many times" as "how many more" and that this was a misconception. She expressed this observation in the observation form as follows; *The teacher asked the following problem: Ali reads 150 books a day, Ayşe reads 3 books a day. How many times more books does Ali read in 1 day than Ayşe read in 1 day? One of the students found 150-3=147. There is a misconception here, the student thought "is a multiple" as "is more" and did subtraction. The teacher said, "You made a mistake, who else wants to do it?". However, the teacher should have asked this student why he/she thought this way and found out the reason for his/her mistake. He should have explained that a multiple of a number is a number that can be divided without remainder. He could have modeled the concepts of "more" and "solid". For example, how many times the number 20 is the number 5? How many more than 5 is the number 20? Draw two figures and show these two operations on the board. The students would have seen that the first operation was a repeated division grouping, while the second was a subtraction operation.* When these explanations of preservice teacher S2 are analyzed, it is seen that she identified important situations related to students' misconceptions and presented details from her observations to support her thoughts. While interpreting her observations, she considered the relationship between students' misconceptions and the teacher's pedagogy. She offered a pedagogical solution based on interpretation. For this reason, the misconception noticing skill of T2 was determined as level 4.

Observation Form of Preservice Teacher T3

When the data obtained from the observation form of preservice teacher S3 were analyzed, he stated that he thought that the teacher's explanation that "the divisor should be more and the divisor should be less" could cause misconceptions in students. He expressed this observation as follows; *The teacher made an explanation about division as "in division, the divisor should be more and the dividend should be less". This explanation caused misconceptions in students. Why should the divisor be a large number, the student thought that a small number cannot be divided by a large number. Then the number 1 cannot be divided by 2. In future grades, the student will not understand fractions and decimals. This explanation of the teacher caused the student*

to overgeneralize and create a misconception that the larger number should always be divided by the smaller number. I can give an example like this: 1 apple cannot be divided by two people because 1 is less than 2. In addition, he explained that in division, for example, in the 124÷3 operation, 1 is not divided by 3, so we divide 12 by 3. This explanation was wrong. First, 1 is divisible by 3. But there, 1 is actually 1 100. When the 100s were divided equally by 3, 30 units would fall, 10 units would remain, and so on, he could have continued the division and prevented the students from falling into misconceptions. When these explanations of the preservice teacher S3 are examined, it is seen that he identified important situations related to students' misconceptions and presented details from his observations to support his thoughts. While interpreting his observations, he considered the relationship between the students' misconceptions and the teacher's pedagogy. He offered a pedagogical solution based on interpretation. For this reason, the misconception noticing skill of T3 was determined as level 4.

Observation Form of Preservice Teacher C1

When the data obtained from the observation form of preservice teacher C1 were examined, she stated that she realized the students made many mistakes in division and that these mistakes were misconceptions. She expressed this thought as follows;

Students made many errors in division in the problems and these were misconceptions. I realized that students had a lot of misconceptions in division. This explanation of preservice teacher C1 was very general and expressed her observation in a simplified way. Her explanation was descriptive and she did not provide any evidence to support this explanation. For this reason, preservice teacher C1's misconception noticing skill was determined as level 1.

Observation Form of Preservice Teacher C2

When the data obtained from the observation form of preservice teacher C2 were examined, she stated that she realized the students had misconceptions about the concepts of "being solid" and "being more". She expressed this observation with her explanation; *Students confused the concepts of "is solid" and "is more" in the problems and performed the operations accordingly. They tried to solve the problems by thinking "How many solids" as "How many more". This was a misconception.* This explanation of misconception made by C2 Preservice teacher was very general and she gave very few details to support her explanation. Her explanation is descriptive. For this reason, preservice teacher C2's misconception noticing skill was determined as level 1.

Observation Form of Preservice Teacher C3

When the data obtained from the observation form of preservice teacher C3 were examined, she stated that she realized the students had misconceptions but the teacher did not take this into consideration. She explained this thought as follows; *I realized that the students had misconceptions in the problems, but the teacher did not take this into account.* This explanation of preservice teacher C3 was very general and expressed her observation in a simplified way. Her explanation was descriptive and he did not provide any evidence to support this explanation. For this reason, preservice teacher C3's misconception noticing skill was determined as level 1.

Observation Form of Preservice Teacher C4

When the data obtained from the observation form of preservice teacher C4 were examined, she stated that she realized an explanation made by the teacher was wrong and that she thought this would cause misconceptions in students. She expressed this observation as follows; *One of the students set up a division problem, but in the problem the smaller number had to be divided by the larger number, and the teacher said "the divisor should be more and the divisor less". He may have wanted them to do this for this lesson, but he said it like a rule or as if it had to be, which may have caused misconceptions in the students.* This explanation made by C4 shows that she tried to define an event that she considered important. Although she mentions a specific student and moment to support her explanation, she fails to expand her interpretation and elaborate her observation. For this reason, preservice teacher C4's misconception noticing skill was determined as level 2.

Observation Form of Preservice Teacher C5

When the data obtained from the observation form of preservice teacher C5 were analyzed, she stated that she observed the teacher did not check the students' prior knowledge at the beginning of the lesson. She expressed this observation as follows;

The teacher did not check students' prior knowledge at the beginning of the lesson. They need to have a certain level of readiness before they can do division correctly. For example, the multiplication table. This explanation made by C5 shows that she tried to define an event that she considered important. Although she mentions a specific situation to support her explanation, she is insufficient in expanding her interpretation and elaborating her observation. For this reason, preservice teacher C5's misconception noticing skill was determined as level 2.

Observation Form of Preservice Teacher C6

When the data obtained from the observation form of preservice teacher C6 were examined, she stated that she thought that she realized that students had a misconception about division. She expressed this observation as follows; *While doing the operations, students say "Is the number 1 divisible by 3? It is not divisible. Then, is 12 divisible by 3, it is divisible by 3, we get 4..." This shows that they have a misconception, I think the statement "the number 1 is not divisible by 3" is a misconception.* This explanation made by C6 shows that she tried to define an event that she considered important. Although she mentions a specific situation and a specific student to support her explanation, she fails to expand her interpretation and elaborate her observation. For this reason, pre- service teacher C6's misconception noticing skill was determined as level 2.

As a result, the noticing skills of preservice teachers at the end of the video exam can be summarized as follows; the misconception noticing skills of preservice teachers T1, T2 and T3 were determined as level 4, the misconception noticing skills of preservice teachers C1, C2 and C3 were determined as level 1, and the noticing skills of preservice teachers C4, C5 and C6 were determined as level 2.

Table 4 below shows the noticing skills of preservice teachers T1, T2, T3, C1, C2, C3, C4, C5 and C6 as a result of the analysis of the data obtained at the end of the video exam.

Table 4

Noticing Skills of Lesson Study Group and Comparison Group Preservice Teachers at the End of the Video Exam (Last Lesson)

Preservice Teacher	Misconception Noticing Skills
T1	Level 4
T2	Level 4
T3	Level 4
C1	Level 1
C2	Level 1
C3	Level 1
C4	Level 2
C5	Level 2
C6	Level 2

Table 4 shows that, as a result of the video exam, the noticing skills of the lesson study group preservice teachers were determined as level 4, while the noticing skills of the comparison group preservice teachers were predominantly determined as level 1 and level 2. As a result of the video exam, it was concluded that the lesson study group preservice teachers gained noticing skills with the lesson study model. In addition, when all the data obtained from these two data sources were analyzed throughout the Teaching Practicum-II process and at the end of the video exam at the end of the process, the final noticing levels of the preservice teachers were determined as follows; T1 teacher's misconception noticing level is level 4, T2 preservice teacher's misconception noticing level is level 4, T3 preservice teacher's misconception noticing level is level 4, C1 preservice teacher's misconception noticing level is level 1, C2 preservice teacher's misconception noticing level is level 1, Misconception noticing level of preservice teacher C3 was determined as level 1, misconception noticing level of preservice teacher C4 as level 2, misconception noticing level of pre- service teacher C5 as level 2, misconception noticing level of preservice teacher C6 as level 1.

Discussion

Misconception Noticing Skills of Preservice Teachers

In the Teaching Practicum-II course, the misconception noticing skills of T1 preservice teacher from the lesson study group were determined as level 4 and level 3 for eight lessons. From this point of view, it was concluded that the lesson study model improved T1 preservice teacher's ability to recognize students' misconceptions. This result of the study is in parallel with the result of Mostofo's (2013) study. In his study, Mostofo (2013) found that the lesson study model improved preservice mathematics

teachers' ability to recognize students' misconceptions and responses. Although the misconception noticing skill of T1 was determined as level 4 in six lessons, it was determined as level 3 in the third and fifth lessons. The reason for this may be the lack of subject matter knowledge of T1 preservice teacher. As a result, it can be said that noticing varies according to content knowledge. According to Shulman (1987), teachers with inadequate subject matter knowledge are generally inadequate in defining concepts and relationships by making incomplete definitions. Similarly, Liu (2014) argued that teachers' knowledge, beliefs and goals affect their noticing of student thinking. Here, it can be said that the inadequate content knowledge of the pre- service teacher T1 prevented her from making correct determinations and definitions about misconceptions, interpreting important situations after defining them, and making suggestions about them. The teacher's content knowledge directly affected the teacher's noticing and will indirectly affect the success of the students. In the literature, there are studies showing that teachers' content knowledge affects students' achievement (Jacob, John & Gwany, 2020; Lee, Capraro & Capraro, 2018). When the contents of the courses in which the misconception noticing skill of preservice teacher T1 was determined as level 3, the subject of the third course and the subject of the fifth course overlapped. The outcome of the third lesson is "Makes conversions between meters and centimeters that do not require writing decimal fractions." and the outcome of the fifth lesson is "Solves and constructs problems using units of meters and centimeters." From this point of view, it is thought that it is not a coincidence that T1 preservice teacher's misconception noticing skill was level 3 in both lessons. This situation may be an evidence that it may be due to the lack of subject area knowledge that he/ she has about the subject. In both lessons, T1 preservice teacher could not establish a connection between what she observed and the principles of teaching and learning and could not offer alternative pedagogical solutions based on interpretation. Ma (1999) stated that teachers cannot show a behavior beyond their own understanding of the subject matter in order to guide students' understanding. Here, it can be said that T1 preservice teacher could not show a behavior beyond his/her own understanding of students' misconceptions in the lessons on meters and centimeters. To summarize, in general, the misconception noticing skill of preservice teacher T1 was determined as level 4 in terms of weight. T1 preservice teacher's noticing skill in any lesson was not determined as level 1 or level 2.From this point of view, it can be said that the lesson study model positively affected the development of preservice teacher's misconception noticing skills. The reason for this is thought to be the fact that the preservice teachers made video reflections by watching the teaching of both themselves and other preservice teachers in the lesson study. Similarly, studies in the literature suggest that video reflections with peers provide an important opportunity for a teacher to receive feedback, learn about specific teaching needs and strengths, and generate ideas to improve their pedagogy (Arya et al., 2013; Arya et al., 2015; Christ et al., 2012, 2014; Eröz-Tuga, 2013; Harford et al., 2008; Shanahan et al., 2014; Tripp et al., 2012; van Es et al., 2010; Yaffe, 2010).

It was concluded that the misconception noticing skills of T2, one of the preservice teachers in the Lesson Study group in the Teaching Practicum-II course, were at level 3 and level 4 for eight lessons. It was concluded that although the misconception noticing skill of T2 preservice teacher was determined as level 3 in four lessons, it was level 4 in the other four lessons. The misconception noticing skill of T2

preservice teacher was in the form of level 3-4-4-4-3-4-3-4-3-4-3 for eight lessons. The objectives of the fifth lesson, in which the noticing of the preservice teacher was determined as level 4, were "Divides a whole into equal parts and states that each of the equal parts is the unit of the fraction. Obtains fractions whose numerator is less than the denominator and whose denominator is at most a two-digit natural number."In this lesson, which includes the objectives related to fractions, the preservice teacher T2 reasoned about the observations she made about the misconceptions of the students and tried to explain the reasons. She addressed the situations she considered important and presented details from her observations to support her thoughts. While interpreting her observations, she considered the relationship between students' misconceptions and the teacher's pedagogy. C1 tried to offer alternative solutions to the preservice teacher about the misconceptions that she thought might occur in students. The concept of fraction is one of the difficult subjects in mathematics (Brown & Quinn, 2006; Ergöl& Memnun, 2020; Işık, 2011; Önal & Yorulmaz, 2017; Sartono& Karso, 2020), and it can be said that it is also one of the subjects that teachers find difficult to teach.Nevertheless, it was observed that T2 preservice teacher had the highest level of misconception noticing (level 4). There are many studies on misconceptions about fractions in the literature (Alacacı, 2012; Biber, Tuna, & Aktaş, 2013; Hansen, 2014; Haser, Ubuz, 2003; Işık & Kar, 2012; Kocaoğlu & Yenilmez, 2010; Ojose, 2015; Önal & Yorulmaz, 2017; Steffe & Olive, 2010; Taşkın & Yıldız, 2011; Yetim & Alkan 2010; Yılmaz & Yenilmez, 2007). While planning the lesson on fractions during the lesson planning process, discussing the misconceptions related to the subject of that lesson by focusing on the mathematics curriculum, discussing what should be done to prevent these misconceptions, discussing what should be done by taking into account the results of these misconceptions studies (Hart, 1993; Haser & Ubuz, 2003; Steffe & Olive, 2010) or the researcher's guidance on what should be done by taking into account the results of these misconceptions studies (Hart, 1993; Haser & Ubuz, 2003; Steffe & Olive, 2010) or the meetings held during the discussion and reflections phase of the lesson may have caused the preservice teacher to gain a competence on the subject to be covered. It was concluded that the misconception noticing skill of T3, one of the preservice teachers in the Lesson Study group in the Teaching Practicum-II course, was at level 3 and level 4 for eight lessons.

Although the misconception noticing skill of T3 preservice teacher was determined as level 3 in four lessons, it was concluded that it was level 4 in the other four lessons.The misconception noticing skill of T3 preservice teacher was in the form of level 3-4-3-3-4-4-4-3-4-3-3 for eight lessons. In the first and second lessons, preservice teacher T3 identified important situations related to decimal fractions, and in the second lesson, she offered pedagogical solutions for these situations and therefore her noticing was determined as level 4. The comments made by preservice teacher T3 as a result of her observations about decimal fractions in the second lesson show that she is aware of some misconceptions about decimals in the literature. For example, preservice teacher T3 stated that she realized that students had a misconception that the longer decimal number was larger and that preservice teacher C4 did not realize this and therefore did not intervene. When the literature is examined, Steinle and Stacey (1998) concluded in their study that students have a misconception that the decimal number with more digits in the fraction part is larger. Gür and Seyhan (2004) concluded that

students had misconceptions such as ignoring the decimal comma and thinking that multi-digit decimal numbers are larger. In other words, it was seen that the misconception that T3 preservice teacher realized about decimal numbers, that the longer decimal number is larger, is in line with the studies in the literature (Nesher & Peled, 1986; Resnick, Nesher, Leonard, Magone, Omanson, & Peled, 1986; Sackur-Grisvard & Leonard, 1985; Stacey & Steinle, 1998). In this way, it was determined that students with overgeneralization type misconceptions generalized a property of the set of natural numbers to the set of decimal numbers. From this point of view, it is thought that the preservice teacher may have read about misconceptions in the subject of that course before the lesson. As a result, it is thought that the lesson study process may have provided the preservice teacher with the behavior of focusing on misconceptions related to the subject of that lesson before the lesson.

In the Teaching Practicum-II course, it was concluded that the misconception noticing skill of C1, one of the comparison group preservice teachers, was level 1 for seven lessons, except for the fifth lesson. The misconception noticing skill in the fifth lesson was determined as level 2. As a result, it can be said that C1 preservice teacher's misconception noticing skill was level 1. Because the determination of noticing as level 1 in seven lessons out of eight lessons shows that the noticing of the preservice teacher is predominantly level 1. When the misconception noticing skills of pre- service teacher C1 were compared with the misconception noticing skills of preservice teacher T2 in his group, the misconception noticing skills of preservice teacher T2 were determined as level 3 or level 4. It is thought that the reason why preservice teacher C1's misconception noticing skills remained at the first stage of van Es' noticing framework, unlike preservice teacher T2's misconception noticing skills, is that she did not participate in the lesson study process. It was observed that C1 was only able to define what is important or noteworthy about a lesson situation, which is one of the three basic aspects of the noticing proposed by van Es and Sherin (2002). In the lesson study group, preservice teacher T2 tried to use what she knew about the content or what she knew about the sources of justification for her classroom interactions to reason about the situation she identified. For this reason, the noticing skills of preservice teacher T2 were determined as level 3 or level 4.According to Sherin and van Es (2005), preservice teachers should be given the opportunity to do practices in which they can develop their noticing skills, and in this study, it is thought that the environment that provided the opportunity for preservice teacher T2 to develop noticing skills, like the other lesson study group preservice teachers, was the lesson study process. In the Teaching Practicum-II course, it was concluded that the misconception noticing skill of C2, one of the comparison group preservice teachers, was in the form of level 2-1-2-2-2-2-1-1-1-1 for eight lessons. The misconception noticing skills of preservice teacher C2 were lower than pre- service teacher T2 but higher than preservice teacher C1. Because, although preservice teacher C1's misconception noticing skill was determined as level 1, preservice teacher C2's misconception noticing skill was determined as level 1 in four of the eight lessons and level 2 in the other four lessons. Even if preservice teacher C2's noticing skill was level 2, unlike preservice teacher C1, it was determined that preservice teacher C2 could not make inferences about students' misconceptions, elaborate her explanations, or offer pedagogical solutions for the student misconceptions she identified, as shown by preservice teacher T2. It is thought that the

reason why preservice teacher T2 was able to show these behaviors, unlike preservice teacher C2, is the noticing that preservice teacher T2 gained during the lesson study process about what can be done to recognize and eliminate students' misconceptions. According to Zembat (2013), it is important for the teacher to be aware of misconceptions and to analyze these misconceptions well.The reason for the preservice teacher T2, unlike the preservice teacher C2, to show this behavior or to gain this noticing before analyzing the misconceptions may be the lesson study activities carried out during a semester.

In the Teaching Practicum-II course, it was concluded that the misconception noticing skill of C3, one of the comparison group preservice teachers, was in the form of level 1-1-1-1-2-2-1-1-1-1 for eight lessons. From this point of view, it can be said that the misconception noticing skill of pre- service teacher C3 is predominantly level 1. On the other hand, the misconception noticing skill of the lesson study group Preservice Teacher T3, who was in the group of C3 Preservice Teacher, was determined as level 3 or level 4 for eight lessons. In lessons 2 and 7, this difference is much more obvious. Because while C3 preservice teacher's noticing was level 1, that of T3 preservice teacher was determined as level 4. When the subjects of these two lessons were analyzed, it was seen that the subject of the seventh lesson was "symmetry". The reason for this difference in noticing skills is thought to be a result of the fact that the subject of the 8th lesson, which the preservice teacher T3 practiced in the lesson study carried out in the first semester, was the subject of "symmetry". Because in the 8th lesson study in the first semester, T3 Preservice teacher could not show the symmetry axes of the star shape to the students and in addition to this, she caused the students to have a misconception that "every geometric shape has only one axis of symmetry". Both during the implementation phase of the plan by other preservice teachers (T1 and T2) in the observation forms and during the discussions during the discussion and reflections phase of the lesson, the teaching of preservice teacher T3 was discussed a lot about misconceptions. It can be said that this situation positively affected the noticing skill of T3 preservice teacher. According to Sherin and van Es (2005), teacher training programs should include noticing skills and preservice teachers should be given the opportunity to do practices that can develop these skills, and it is thought that the lesson study conducted in this study is a suitable environment in which the preservice teacher can develop noticing skills. In summary, it was concluded that in the lesson study process, T3 preservice teacher gained noticing skills differently from C3 preservice teacher.

In the Teaching Practicum-II course, it was concluded that the misconception noticing skill of C4, one of the comparison group preservice teachers, was 2-1-2-1-1-1-1-2-2-2-1 for eight lessons. From this point of view, it can be said that C4 preservice teacher's misconception noticing skill varied between level 1 and level 2. When the misconception noticing skills of preservice teacher C4 were compared with the misconception noticing skills of preservice teacher T3, the most significant difference emerged in the 2nd, 4th and 5th lessons. Because in these lessons, while the misconception noticing skills of T3 preservice teacher was determined as level 4, the misconception noticing skills of C4 preservice teacher could not go above level 1. This difference is very significant. It is thought that the reason for this is that the lesson study group focused on a special topic in mathematics. Decimal fractions and fractions are

two of the topics in mathematics where students, preservice teachers or teachers have misconceptions (Baki & Güç, 2014; Biber, Tuna, & Aktaş, 2013; Pesen, 2007).It is thought that focusing on such difficult mathematics topics in the lesson study and drawing the attention of the preservice teachers to important situations during the lesson study and discussing the misconceptions of the students and themselves, as well as their fellow teachers, may have caused the preservice teacher to focus on a specific area - in this case, decimal fractions and fractions - and to gain an noticing about it.

In the Teaching Practicum-II course, it was concluded that the misconception noticing skill of C5, one of the comparison group preservice teachers, was in the form of level 1-2-1-2-1-2-1-1-1-1 for eight lessons. From this point of view, it can be said that C5 preservice teacher's misconception noticing skill is level 1 in general. When C5 preservice teacher's misconception noticing skill was compared with the misconception noticing skill of T1 preservice teacher who participated in the lesson study, besides being low and different from each lesson, the biggest difference determined as level 1 and level 4 emerged in the 1st, 2nd, 4th, 7th and 8th lessons. When the contents of these lessons were analyzed, it was determined that there was an overlap in two lessons on "multiplication" and in the other two lessons on "fractions". It is thought that the overlaps identified in this way are not coincidental. This situation suggests that the noticing of the preservice teacher is related to his / her content knowledge. The fact that the misconception noticing of the comparison group pre- service teachers was different and lower than that of the lesson study group preservice teachers in the lessons where the subject matter of the lesson was the same can be shown as evidence that it may be related to subject matter knowledge. It is thought that the lesson study activities that the pre- service teacher in the lesson study group participated in caused her to be aware of her deficiencies in subject matter knowledge, to make more detailed observations and to make determinations about her or the other preservice teacher's teaching. As a result of this, it is thought that the noticing of the preservice teacher in the lesson study group, T1, was high. According to experienced teachers, pre- service teachers tend to notice more superficial classroom characteristics (Wise, Padmanabhan, & Duffy, 2009).Although both of the two preservice teachers compared here had the same experience, the fact that the noticing of the lesson study group preservice teacher T1 was high shows that she noticed more detailed situations instead of superficial classroom features, which can be said to have gained this experience through lesson study activities.

In the Teaching Practicum-II course, it was concluded that the misconception noticing skill of C6, one of the comparison group preservice teachers, was level 1 for seven lessons except the sixth lesson. The misconception noticing skill in the sixth lesson was determined as level 2. Unlike the preservice teachers in the lesson study group, the noticing skill of preservice teacher C6 was very low. It is thought that the reason for this is that the preservice teachers in the lesson study group gained the ability to focus on misconceptions through lesson study activities. According to Sadi (2007), teachers should focus more on misconceptions that are realized through study. Lesson study activities conducted with the preservice teachers in the lesson study group provided them with the opportunity to study more, see more examples, increase their noticing and focus on their misconceptions. For this reason, it is thought that the fact that preservice teacher C6 did not participate in the lesson study process caused her to

be inadequate in focusing on misconceptions and recognizing important situations related to misconceptions.

Misconception Noticing Skills of Preservice Teachers at the End of the Video Exam (Last Lesson)

At the end of the whole process, when the noticing skills of the preservice teachers who watched the video of this lesson of the mentor teacher, whose one mathematics lesson was videotaped from the practice school, and filled in the observation form, were examined at the end of this video exam, it was concluded that the noticing skills of the lesson study group preservice teachers were at level 4, while the noticing skills of the comparison group preservice teachers were mainly at level 1 and level 2. When the observation results of the lesson study group preservice teachers about this lesson whose outcome was "Solves problems requiring at least one division operation with natural numbers" were analyzed, it was found that the misconception noticing skills of C1 and C3 preservice teachers were determined as level 4 for each of them. It is thought that this difference in the noticing skills of the lesson study group and comparison group preservice teachers was caused by the fact that the lesson study group pre- service teachers were able to focus on the events occurring in the classroom. Stigler and Hiebert (1999) argue in their study that the lesson study model provides a different perspective on classroom practices. It is thought that the participation of the preservice teachers in the lesson study group in the lesson study process caused them to look at the practices in the classroom with a different perspective, to notice the events, and as a result of this, to develop their noticing skills. In addition, in the light of the findings of the study, it is thought that as a result of the development of knowledge of teaching the content through lesson study, preservice teachers' noticing skills also developed. Studies in the literature suggest that lesson study supports the development of teachers' or preservice teachers' content knowledge (Akbaba-Dağ, 2014; Baki, 2012; Budak, Bozkurt, & Kaygın, 2011; Bütün, 2012; Corcoran, 2008; Fernandez, 2010; Gözel, 2016; Lewis, 2016; Meyer et al., 2011; Sudejamnongvd., 2014; Verhoef et al., 2011; Yoshida et al., 2011). From this point of view, it can be said that preservice teachers gained noticing skills as a result of the development of knowledge of teaching the content with the lesson study model.

To summarize at the end of the whole research process, in the most general terms, when the noticing skills of the preservice teachers were examined, it was concluded that the noticing skills of the lesson study group preservice teachers were mainly at level 4, while the noticing skills of the comparison group preservice teachers were mostly at level 1 and level 2. In other words, when the noticing skills of the lesson study group preservice teachers were compared with the noticing skills of the comparison group preservice teachers, the misconception noticing skills of the lesson study group preservice teachers were determined as level 4, different from the noticing skills of the comparison group preservice teachers. The misconception noticing skills of the comparison group preservice teachers, unlike the lesson study group pre- service teachers, did not go above level 1 or level 2 in any lesson.From this point of view, it can be said that the lesson study professional development model positively affected preservice teachers' noticing skills. Similar to this result of the study, some studies in the literature also state that professional development models positively affect noticing

(Franke, Carpenter, Levi, Fennema, 2001; Lee, 2019; Lewis, Friedkin, Baker, & Perry, 2011).

In the lessons where the misconception noticing skills of the lesson study group preservice teachers were determined as level 4, it was determined that they generally made suggestions on how to prevent misconceptions before they occur and gave examples from the meetings in the lesson study process. To give an example from the findings, the preservice teachers stated that they realized that "0" was a problem for students in every subject and suggested that the appropriate teaching method should be chosen and more attention should be paid to teaching "0". It is thought that this situation is caused by the fact that while planning the lessons in the lesson study process, there was a lot of focus on the need to choose appropriate teaching methods to prevent misconceptions, or the misconceptions that students were thought to have or the teacher behaviors that caused these misconceptions were discussed in the discussion meetings. As a result, it was determined that the preservice teachers had a high level of noticing about the subjects where misconceptions were more expected, as well as making suggestions about the selection of appropriate teaching methods in this regard. In support of this result, Zembat (2010) also stated in his study that it is important for teachers to adopt approaches to prevent misconceptions before they occur by choosing appropriate teaching methods and techniques in subjects where misconceptions are more likely to occur. As a result, it is thought that the reason for the development of the misconception noticing skills of the preservice teachers in the lesson study group in this way is that the lessons recorded during the lesson study process were monitored by focusing on misconceptions. It can be said that discussing the misconceptions of the students observed in the video recordings, discussing the contribution of the preservice teacher in the formation of these misconceptions or discussing what should be done to prevent the emergence of these misconceptions positively affected the noticing development of the preservice teachers. Studies conducted in the literature on video-based lessons have also shown that preservice teachers' noticing skills improve when they analyze and discuss videos in a systematic and structured way (Barnett, 2006; Barnhart et al., 2015; Brouwer et al., 2015; Calandra, 2015; Fadde et al., 2013; Kleinknecht et al., 2016; Seidel et al., 2013; Star et al., 2008). In addition, noticining studies in the literature show that teachers who analyze their lessons using video recordings pay more attention to student behavior, subject teaching and activities (Bozkuş, 2020; Hollingsworth & Clarke, 2017; Özdemir Baki, 2020), have the opportunity to observe their classes and notice classroom events, ıt was concluded that they had the opportunity to improve their interpretation skills (Santagata et al., 2018; Türker Biber, 2017). When the noticing of the lesson study group preservice teachers and the comparison group preservice teachers were compared by taking van Es's (2011) noticing framework into consideration, it was concluded that the lesson study group preservice teachers reasoned about their observations as a result of their lesson observations and as a result, they were able to make informed instructional decisions. It was observed that the preservice teachers in the lesson study group generally showed behaviors in the third stage, which is the third stage of the three parts of noticing characterized in the literature (Hiebert et al., 2007; Jacobs et al., 2010; Richert, 2005; Santagata et al., 2007; Sherin, 2007; van Es et al., 2002). It is thought that the lesson study process was effective in these behaviors. Because it was observed that in the

lessons in which teachers were involved in the lesson planning stage, they started to notice students' mathematical thinking by focusing on issues such as determining the mathematical purpose of the lesson, associating prior knowledge with the subject of the lesson, anticipating possible student responses and waiting for these responses, and showed improvement in this regard (Fernandez et al., 2005). The improvement in teacher behaviors in these issues during the lesson study process may have contributed to the development of teacher noticing in direct proportion to this progress. It is thought that the lesson study group Preservice teachers gained the behavior of looking at the lessons they observed with a different perspective than the comparison group Preservice teachers. Similarly, Stigler and Hiebert (1999) defined lesson study as a professional development model that enables teachers to look at classroom practices with a different perspective.

As a result, the misconception noticing skills of preservice teachers in the lesson study group were determined as level 4, while the noticing skills of preservice teachers in the comparison group were predominantly determined as level 1 or level 2. It is thought that the reason why the noticing skills of the comparison group preservice teachers were lower than the noticing skills of the lesson study group preservice teachers was the implementation of the lesson study professional development model with the lesson study group preservice teachers for one semester. Because teachers do not possess noticing skills spontaneously or noticing skills are not a skill that can be developed through experience without any support (Sherin, Jacobs, & Philipp, 2011). For this reason, it was concluded that the noticing skills of the Preservice teachers in the lesson study group supported by the lesson study professional development model showed a positive development different from the noticing skills of the Preservice teachers in the comparison group.

Conclusion

As a result of the study, it was concluded that the misconception noticing skills of the lesson study group preservice teachers (T1, T2, T3) were level 4, while the misconception noticing skills of the comparison group preservice teachers (C1, C2, C3, C4, C5, C6) were mainly level 1 and level 2. It was concluded that the misconception noticing skills of the comparison group preservice teachers, unlike the lesson study group preservice teachers who were involved in the lesson study process, could not go above level 1 or level 2 in any lesson. When the misconception noticing skills of T2, C1 and C2 preservice primary school teachers in Group 1 were compared, it was concluded that the biggest difference between level 4 and level 1 emerged in the 2nd and 7th lessons. When the misconception noticing skills of T3, C3 and C4 preservice primary school teachers in Group 2 were compared, it was concluded that the biggest difference between level 4 and level 1 emerged in the 2nd lesson. When the misconception noticing skills of T1, C5 and C6 preservice primary school teachers in Group 3 were compared, it was concluded that the biggest difference between level 4 and level 1 emerged in the 1st, 7th and 8th lessons. When the results of the video exam at the end of the study were analyzed, it was concluded that the misconception noticing skills of the lesson study group preservice teachers who were involved in the lesson study process were level 4, while the noticing skills of the comparison group preservice teachers were mainly level 1 and level 2. It was concluded that the misconception noticing skills of the

comparison group preservice teachers could not go above level 1 or level 2. It was concluded that lesson study activities positively affected primary school preservice teachers' ability to recognize students' misconceptions.

Implications

In order to support preservice teachers noticing development through lesson study studies, course contents can be arranged in this direction by including such practices in undergraduate courses and teaching practice courses. By carrying out this study longitudinally, it can be investigated whether the development in preservice teachers noticing turns into behavior or, in other words, the permanence of their noticing development.

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Statement of Responsibility

All data generated and analyzed during this study are included in this published article.

Conflicts of Interest

None of the authors have potential conflicts of interest to be disclosed.

Author Bios:

Yasemin TÜRK graduated from Karadeniz Technical University, Department of Primary Education, Department of Classroom Teaching in 2005. In the same year, she started working as an instructor at Karadeniz Technical University, Fatih Faculty of Education, Department of Primary Education. She successfully completed her master's degree in Mathematics Education at Karadeniz Technical University in 2010 and her doctorate education in 2020. She worked as a lecturer at Trabzon University, Fatih Faculty of Education, Department of Basic Education until 06.10.2021. As of 06.10.2021, she has been working as a lecturer doctor at Karadeniz Technical University, Rectorate Corporate Communications Coordinator. The researcher's research areas are Education, Teacher Education, Mathematics Education.

Adnan BAKİ graduated from Karadeniz Technical University, Department of Secondary Education Science and Mathematics Education Mathematics Education in 1982. He completed his master's degree at the University of New Brunswick Faculty of Education Curriculum and Instruction in Canada in 1990. In 1994, he successfully completed his doctorate education at the University of London-Institute of Education, Mathematics, Statistics and Computing, United Kingdom. The researcher has been working at Karadeniz Technical University, Fatih Faculty of Education, Department of Secondary Education Science and Mathematics Education since 2004. The researcher's research areas are Social and Human Sciences, Education, Computer and Instructional Technology Education, Secondary Education Science and Mathematics Teaching.

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