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The Effects of Group Mentoring on Teachers' Classroom Activities: An Instrumental Case Study

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As the technologies in the field of education are becoming more and more sophisticated, continuous professional development for teachers is gaining increasing importance. Therefore, teachers need to improve themselves to grow more competent professionally, to adapt to innovations in their field and to be aware of their competencies throughout their professional careers. A support for professional development can be given to teachers through in-service training programs or mentoring practices. This study aims to improve chemistry teachers' adaptation to the renewed curriculum with a group mentoring program and to determine the effects of this program on professional development of teachers by individually and as a group. The study group consists of four (three males, one female) chemistry teachers working in the central districts of the province of Trabzon in Turkey. A Course Evaluation Form developed by the researchers was used to examine the effect of the teachers' mentoring support experiences on their classroom practices. Each teacher was observed before, during and after the mentoring. Every one of the classroom teaching practices was video-recorded. The video recordings were analyzed according to the themes and codes in the course evaluation form. The findings show that there is a change in teachers' in-class practices before, during and after the mentoring, and while this change shows continuous improvement in some cases, it is variable or stationary in some others.

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Introduction

Combining scientific and technological developments lead to the emergence of new approaches in learning and teaching. Integrating these developments into learning environments is a critical issue for all stakeholders of education. In this integration, teachers play the most important role in achieving the values that society expects from education. The renewed curricula such as science, physics and chemistry curriculums have discontinued their focus on the passive student profile, instead of adopting a new focus on the active student profile responsible for their own learning (MEB, 2018a, b, c). Being student-centered, this new approach requires both students and teachers to change their qualities and classroom practices. Teachers, who are the most dynamic and strategic partners of schools, are much more important than they seem in the education system. Therefore, in all education systems, "teacher training" policies emerge as a major controversial subject and the question of "How to train a good teacher?" is frequently asked.

When talking about the quality of education, the emphasis is on the quality of the teachers. A good teacher should be well trained during his/her undergraduate education and should improve himself/herself to keep up with the innovations in education while on duty. In-service training (IST) is the most important method applied to increase the quality of teachers to improve their competencies in educational technology, teaching methods and approaches, special education, and personal development (Budak & Demirel, 2003; Seferoğlu, 2004; Tunca, Alkın, & Aydın, 2015). The development of in-service teachers is performed through IST activities in Turkey and in many European countries (Baloğlu, 2007; Stokes, 2001; Şahinoğlu & Sağlam Arslan, 2019). ISTs aim to eliminate the teacher deficiencies in subjects which they were not taught during their pre-service studies or feel inadequate (Metin & Özmen, 2010). In Turkey, ISTs are organized since - 2004-2005 academic year to help teachers adapt to the student-centered curriculum, to introduce teachers to the changes made in the teaching-learning process, and to equip teachers with the skills to implement the renewed programs as desired (Baykan & Oktay, 2016). During these ISTs, teachers are introduced to the changes in science, school and teaching procedures, and they are informed about the aspects they need to improve on (Akdemir, 2012; Yadigaroğlu, 2014; Tohumat, 2019). When such teacher training activities carried out to ensure quality in education are examined, it can be seen that on the one hand, teachers cannot properly implement the innovations in the curriculum and cannot fully exhibit the teacher behaviors that the program expects from them (Bingimlas, 2009; Hew & Brush, 2007; Kim, Kim, Lee, Spector & DeMeester, 2013; Lim & Khine, 2006; Özden, 2007; Yangın & Dindar, 2007; Alacapınar, 2009; Kurt & Yıldırım, 2010; Ercan, 2011; Küçüköner, 2011; Taşçı, 2011; Ayvacı & Bakırcı, 2012; Demir & Demir, 2012; Ocak et al., 2012; Yadigaroğlu & Demircioğlu, 2012; Yaşar, 2012).). Moreover, it is reported in many studies that in-service training seminars designed to support and improve teachers' practices are inadequate to equip teachers with the targeted skills (Miser et al., 2006; Ayas et al., 2007; Çoruhlu et al., 2008, Çimer et al., 2010, Ayvacı, Bakırcı, Başak, 2014). Hence, in recent years, approaches that can be alternative to ISTs have been investigated to ensure teacher professional development. As teachers are asked to revise their practices according to the changes in the social structure, values or resources, their professional development should be supported. For example, in the light of new developments in technology, teachers are expected to integrate some technological tools such as tablets, phones and applications into their lessons (Rennie, 2001). In line with this situation and many other changes and developments, mentoring practices in the world have started to come first among the approaches used to support the continuous professional development of teachers in recent years.

Mentoring, which is used in many different fields, is defined as the formal or informal help

given by a person who is an expert in his/her field to another less-experienced person (Gray, 1989). According to Alleman (1986), mentor is a teacher who teaches, counsels or guides inexperienced people to develop them in an institution or profession. In mentoring practices, the task of the mentor is to guide the mentee, answer his/her questions, improve the skills of the mentee, and ensure that the mentee gains experience (Berry, Cadwell & Fehrmann, 1995). The mentor contributes to the development of the mentee's self-awareness, supports him/her in managing his/her learning, and helps his/her self-assessment (Rhodes et al.., 2004). In the literature, different types and classifications of mentoring are mentioned. Klasen & Clutterbuck (2002) classified mentoring as formal, semi-formal, and informal mentoring (Klasen & Clutterbuck, 2002, as cited in Doğan Kılıç & Serin, 2017). Tunçay (2014), on the other hand, emphasized the situational, managerial and e-mentoring types of mentoring. In addition to these, different types such as one-to-one mentoring, peer mentoring, group or team mentoring, reverse mentoring and self-mentoring are often included in different studies in the literature (Crisp & Cruz 2009). Considered as a strong professional learning resource (Yarrow & Millwater, 1997), the mentoring process is a holistic approach based on long-term interaction between the trainee and the trainer and includes observation, consultation, feedback, and evaluation processes (Doğan Kılıç, Serin 2017). Multi-faceted analyses of the effects of such an approach in teacher education have important implications for teacher education policies.

When the effects of mentoring practices on teacher education are examined, it becomes clear that teacher-mentoring practices offer great benefits for both mentors and the school (Hobson, Ashby, Malderez & Tomlison, 2009). In education, mentoring is used mostly for teachers who are new to the profession, and it has been shown to help increase self-confidence, reduce feelings of loneliness, ensure professional development, improve self-assessment, and support classroom management (Hobsonet al., 2009). However, it is thought that it will help not only the novice teachers to adapt to innovations, but also in-service teachers' professional development (Bakioğlu & Hacıfazlıoğlu, 2000; Sezgin et al., 2014; Tomlinson, Hobson & Malderez, 2010). In recent years, the mentoring system that has been employed for the development of in-service teachers, as an alternative to ISTs, has attracted great interest in various countries such as (Spain, Japan, the UK, the USA, and Singapore) (Şahinoğlu, 2020). The number of studies on the effects of mentoring practices and especially group mentoring activities on experienced field teachers' in-class practices is limited. Elaborating classroom practices in a subject that requires field-specific education such as chemistry may contribute to evidence-based updates on the structure of group mentoring research and professional development activities. As they are based on one-to-one consultancy mentoring activities can produce positive results as they can be shaped according to the characteristics of the individual(s) participating in the practices or purpose and can be designed according to the needs of teachers.

This study was designed to provide detailed data on the effects of mentoring practices on teachers' classroom practices, which will bring a fresh perspective to teacher education. The hypothesis of this study is that group mentoring practices positively affects the professional development of teachers.

Considering that teachers' professional characteristics directly affect their classroom practices and these characteristics can be developed, this study aimed to define the effects of group mentoring on teachers' professional development. Within the scope of this main problem, the answers to the following sub-problems were sought in this study:

- What effects do the mentoring practices have on teachers' individual professional development?
- What effects do the mentoring practices have on teachers' group development?

Method

Since the mentoring practices to be carried out depending on the purpose of the study aim at mutual sharing between mentors and mentees (teachers participating in the practice), these practices should be designed and implemented in detail. Accordingly, this study also necessitates a qualified examination of the effects of mentoring practices on teachers who have different knowledge, experience, characteristics, beliefs, and attitudes. For all these reasons, this study was conducted using the explanatory case study method. As it is known, case studies allow obtaining narrow but qualified data (Yin, 2003). In case study, instead of generalization, emphasis is placed on the design of studying what is best understood from the situation (Denzin and Lincoln, 1994).

Participants

This study was carried out with four chemistry teachers working in Anatolian high schools in a province of the Eastern Black Sea region of Turkey. These Anatolian High Schools, from which the study group was selected, accepts students with High School Entrance Exam (LGS) score shown on Table 1. The teachers to participate in the mentoring practices were selected according to the purposeful sampling method. The sampling criteria were having a certain length of experience (at least 10 years), ability to use a computer, and willingness (volunteering) to participate in the study. Since more experienced teachers use traditional teaching strategies more often than newly appointed teachers, and therefore they have some difficulties in implementing the program (Yaşar, 2012; Aksu, 2014), they were determined as the study group of this study.

The length of professional experience of the chemistry teachers (code names Bahadır, Zehra, Ali and Mehmet) who voluntarily participated in the study varies from 14 to 27 years, and their ages are between 38 and 53. One of the teachers is a graduate of the Faculty of Arts and Sciences and the others are graduates of the Faculty of Education and teacher who graduated from the faculty of arts and science and literature has completed their pedagogical formation training (a short program for teacher licensing). Ali and Mehmet took part in the TUBITAK school project once, and other teachers did not participate in any project. The general characteristics of the students involved in the project are also shown in Table 1.

Table 1. Demographic characteristics of teachers and students

Teachers	Professional Experience	Graduated University and Faculty	Age	Gender	Class Examined in the Project	Teacher's Project Experience	Base Scores of Schools (Ceiling score: 500,000)	Number of Students
Bahadır	25	Faculty of Education	50	M	10th grade	Unexperienced	306.045	30
Zehra	27	Faculty of Arts and Science	53	F	10th grade	Unexperienced	335.176	27
Ali	25	Faculty of Education	53	M	10th grade	Experienced	248.109	34
Mehmet	14	Faculty of Education	38	M	10th grade	Experienced	444.277	33

Mentoring Program

During the mentoring practices planned in this study, it is aimed to support the development of the mentee (teacher) by sharing their knowledge and experience, and in this way to improve the mentee's knowledge and abilities (Dansky, 1996; Crisp and Cruz, 2009; Koc, 2008; Saratlı, 2007) Since it is planned to train group members in line with similar learning goals, this mentoring model is thought to be more effective than other mentoring models. The stages of the mentoring implementation carried out within the scope of this study are shown in Figure 1. The preparatory work, which started with the needs analysis in the 2015-2016 academic year, continued with the mentoring sessions (implementation stage) in the following two semesters, and the evaluation was concluded in the semester following the implementation.

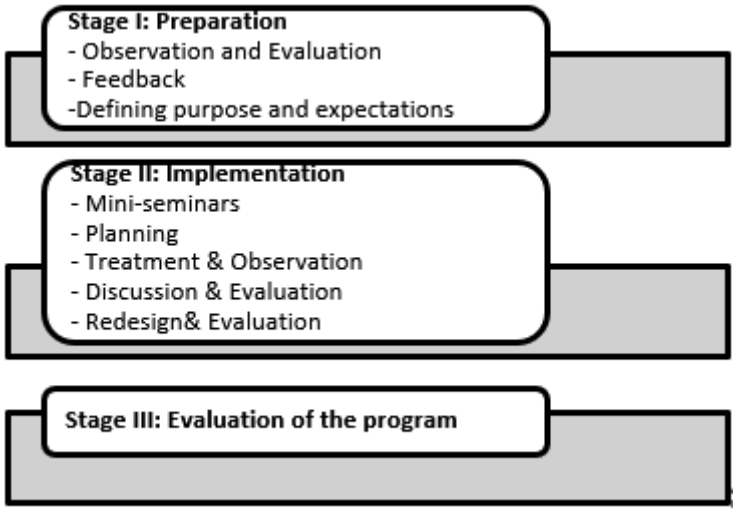

Figure 1. The mentorship model

In the *first stage*, the lectures of the teachers (mentees) were observed and video-recorded for a month and the practices of each mentee in the classroom were classified as strong, medium, and weak. The information obtained as a result of the observation and evaluation was shared with the mentees, and the strengths and weaknesses of each mentee were discussed in light of the video recordings. Thus, the participants were enabled to recognize their competencies in their profession, and the goals and expectations of the mentors and mentees were determined.

In the *second stage*, the implementation phase, 3-4 hours of group mentoring sessions were held weekly for 8 weeks, and these sessions included practices that supported teachers in the presence of mentors: (a) *interactive mini-seminars*: short seminars focusing on the common needs of teachers (mentees) (what are individual differences, how to conduct a scientific discussion, who is an active student, etc.) enriched with mentor-mentee discussions, (b) *design/planning of the lessons*: designing and planning the lessons (materials, activities, etc.) that teachers will conduct with the support of mentors), (c) *Discussion and evaluation of the practices*: determining the extent the objectives of the lessons were met (under the guidance of the mentor) in the previous week's lessons, identifying the problems and difficulties encountered during the delivery of the lessons, and developing solutions, (d) *redesigning the lessons when necessary*: revising the course materials and plans to eliminate the problems determined in the previous stage, (e) *Evaluation of the mentoring session*: evaluation of the sessions held with the participation of the mentors and mentees through the reflective diaries (these diaries filled in at the end of each session were used in designing the next session).

In the *final stage*, the evaluation, the effects of the mentoring activities were determined by analyzing the teachers' classroom teaching practices.

Data Collection and Analysis

The video recordings of the lessons were used as data. The video recording data were collected during three periods: before mentoring process (4 weeks), during mentoring process (8 weeks) and after the process (4 weeks). Table 2 summarizes the lesson observation periods with teacher-focused video recording.

Table 2. Lesson Observation Hours

Teachers	Before Mentoring Program	During Mentoring program	After Mentoring program	Total
Bahadır	12	15	8	35
Zehra	8	16	-	24
Ali	8	16	8	32
Mehmet	8	16	8	32
Total	36	63	24	123

The lessons were observed for two weeks to prevent the emergence of different data from the actual practices by guiding the participant teachers and students about the lesson observation processes and to facilitate their adaptation, and these data were not included in the study.

A total of 123 lesson hours were observed and video-recorded, and the transcripts of all of them were made by the researchers who made the observation. As impartial observers, the researchers only made observations and took short notes, when necessary, but did not intervene in the lessons in any way. Before the mentoring practices, four chemistry teachers participated in the study, but one chemistry teacher (Zehra) had to leave the study due to health problems after the mentoring practices began. Therefore, the post-mentoring data of the teacher who left is not included in the analysis.

The data analysis focused on the structure of a typical lesson considering the teaching experiences of the participant teachers in the classroom, and the effects of mentoring practices on teacher practices were examined in light of the themes related to in-class activities. Contextual analysis was preferred in the analysis of the data. Contextual analysis is the systematic analysis—identification, sorting, organization, interpretation, consolidation, and communication—of the contextual user work activity data gathered in contextual inquiry, for the purpose of understanding the work context for a new system to be designed (Azungah, 2018). Deductive content analysis is similar to inductive content analysis in that it is applied in qualitative research and the data collection method aims to reach data saturation. The main difference between the two analytical techniques is that research in which deductive content analysis is applied usually has prior theoretical knowledge as the starting point (Kyngäs and Kaakinen, 2020) Based on the deductive contextual analysis method, the data analysis was carried out in five stages.

Step 1. After verbatim transcription of the 36 sequences before the mentoring, in-class activity units were created by classifying all of the activities in the course as follows: A-Introduction to the course, B-The didactical structure of the course, C-Communication and classroom management, D-Student-centered approaches, E- assessment and evaluation.

Step 2. For each activity unit, all course transcripts were examined; the activities and expressions used by the teachers were defined and the actions for each activity unit were

determined. For example, the following actions were defined within the scope of introductory activities: greeting students and drawing their attention, checking students' background knowledge, and reminding them about the prior learning, informing about the lesson objective and motivating them. While defining the actions of in-class activities, lesson observation data during and after mentoring were also taken into consideration. In other words, a new action is defined for every situation that does not comply with the actions defined within the scope of in-class practices before mentoring, and thus data loss is prevented. Thus, the classroom activities and actions in this study are based on the data obtained from the actual practices of the participating teachers.

Step 3. The activity units and the actions formulated for these activity units were handled together and a Course Evaluation Form (CEF) to be used throughout the study was created. While the actions in the CEF (as indicated in Step 2) were formulated, since the actions that occur before and/or after the mentoring process were also taken into account, some actions that were not included in the actions of the participant teachers were encountered during or after the mentoring practices. Actions included in each activity unit in CEF were labelled as Not Developed (ND), Partially Developed (PD), Developed (D), and Over-practiced (OP). The status of taking an action was classified as ND, PD, D, and OP, and the average frequencies of the relevant action performed by the participants were taken into account. These expressions reveal the frequency of performing an action, and "overdoing" an action by a teacher indicates the presence of an unsuccessful lesson action, that is, a weakness of the teacher concerned.

Step 4. By analyzing the video recordings of all of the observed lessons of the participant teachers, the frequency of their in-class actions during all the activities stated in the CEF was determined. Then, the individual development of the mentees before, during and after mentoring was analyzed comparatively, based on the change in the frequency of performing the actions.

Validity and Reliability

To ensure validity, first, the researchers analyzed the themes and codes together and then each researcher separately analyzed all the lesson sequences by using the CEFs. The following precautions were taken when categorizing a given teacher action as Not Developed (ND), Partially Developed (PD), Developed (D), and Overpracticed (OP):

- The analysis of course observation transcripts according to CEF was performed by two researchers, and if the researchers did not choose the same expression (ND, PD, D, OP) for any action, the action was discussed until a consensus was reached about it, and a third expert opinion was consulted if such consensus could not be achieved.
- The data were analyzed independently by the researchers. Then, the researchers came together to compare the data obtained, and the coding and classification made by each of them were examined one by one. In cases where there was a disagreement, the researchers expressed their perspectives on the relevant situation and the analysis process was completed by reaching a consensus on the coding or classification of the situation. The percentage of agreement between the two researchers was calculated with Miles and Huberman (1994)'s percentage of agreement formula (Percent of agreement = [Agreement/Disagreement + Consensus]*100) and the agreement percentage was found to be 0.89.While analyzing the data obtained before, during and after mentoring, feedback was given in between the analyses to control the time variable. Thus, the subjectivity of the score given for any action is minimized.

Results

The effects of mentoring practices on teachers' professional development

The effects of the mentoring practices carried out in the study on the individual professional development of the participant teachers were examined under five headings: Course Introduction Activities, Didactical Structure of the Course, Communication and Classroom Management, Student-Centered Approaches, Assessment-Evaluation Approaches.

Course Introduction Activities

The participating teachers' actions before, during, and after the mentoring under theme A (Course Introduction Activities) is summarized in Table 3.

Table 3. The frequency of teacher's in-class actions related to theme A before, during and after the mentoring

Actions	Teacher	Before Mentoring				During Mentoring				After Mentoring			
		ND	PD	D	OP	ND	PD	D	OP	ND	PD	D	OP
A1: Greeting and drawing attention	Bahadır	3	5	0	0	0	1	7	0	0	0	8	0
	Zehra	0	8	0	0	0	2	6	0	-	-	-	-
	Ali	8	0	0	0	0	2	6	0	0	6	2	0
	Mehmet	6	2	0	0	0	1	7	0	0	3	5	0
A2: Checking background knowledge and reminding prior learning	Bahadır	1	0	5	2	0	5	2	1	0	5	3	0
	Zehra	1	1	4	2	4	0	4	0	-	-	-	-
	Ali	8	0	0	0	1	4	2	1	3	5	0	0
	Mehmet	1	3	2	2	0	7	1	0	1	6	1	0
A3: Informing students about the objective and motivating them	Bahadır	3	5	0	0	1	7	0	0	1	6	1	0
	Zehra	2	2	4	0	0	5	3	0	-	-	-	-
	Ali	0	4	4	0	1	3	3	1	3	4	1	0
	Mehmet	0	2	3	3	1	7	0	0	1	6	1	0

Table 3 reveals that Bahadır's status of performing all three actions as part of the introductory activities improved thanks to the mentoring support. There was a significant improvement especially in Bahadır's action of A1 (greeting and drawing attention), and it is observed that his A2 and A3 actions have partially improved, although not as much as A1.

Table 3 shows that Zehra's status of performing A1 and A3 actions improved thanks to the mentoring. However, her lesson observation data does not show a significant level of improvement regarding the action of "check background knowledge and remind (A2)", which has an important place within the lesson introduction activities.

It is seen that Ali's performance of the actions related to the introductory activities improved thanks to the mentoring practices. For example, it is observed that Ali, who never performed the A1 action in his pre-mentoring lessons, started to perform this action with the effect of the mentoring, and this positive change continued after the mentoring at the same rate. However, observation data regarding Ali's action of informing students about the lesson objective and motivating them (A3) show that the progress recorded for the other two actions could not be achieved.

The observation data on Mehmet's introductory actions indicate that his A1, A2 and A3 classroom practices have changed positively. For example, it is observed that Mehmet, who did not perform the A1 (greeting and drawing attention) action in most of the pre-mentoring lessons

(6 lessons), started to do it after the mentoring and continued doing it.

Didactic Structure of the Lesson

The change in the practices of the participants within the scope of theme B (didactic structure of the lesson) after the mentoring is summarized in Table 4.

Table 4. The frequency of teacher's in-class actions related to theme B before, during and after the mentoring

Actions	Teacher	Before Mentoring				During Mentoring				After Mentoring			
		ND	PD	D	OP	ND	PD	D	OP	ND	PD	D	OP
B1:Having scientific discussions	Bahadır	8	0	0	0	8	0	0	0	8	0	0	0
	Zehra	8	0	0	0	8	0	0	0	-	-	-	-
	Ali	8	0	0	0	8	0	0	0	8	0	0	0
	Mehmet	4	3	1	0	7	1	0	0	8	0	0	0
B2: Encouraging students to take effective notes	Bahadır	8	0	0	0	6	2	0	0	6	2	0	0
	Zehra	7	1	0	0	4	4	0	0	-	-	-	-
	Ali	8	0	0	0	4	2	2	0	4	4	0	0
	Mehmet	8	0	0	0	7	1	0	0	4	4	0	0
B3: Making instructional explanations	Bahadır	2	4	1	1	0	0	5	3	0	0	5	3
	Zehra	0	0	1	7	0	1	4	3	-	-	-	-
	Ali	0	0	1	7	0	1	2	5	0	0	3	5
	Mehmet	0	0	3	5	0	1	5	2	0	1	4	3
B4: Making summaries about the main themes of the course	Bahadır	8	0	0	0	8	0	0	0	8	0	0	0
	Zehra	6	2	0	0	7	0	1	0	-	-	-	-
	Ali	8	0	0	0	7	1	0	0	8	0	0	0
	Mehmet	2	6	0	0	4	4	0	0	5	3	0	0
B5:Using different types of presentation	Bahadır	3	5	0	0	5	3	0	0	2	6	0	0
	Zehra	1	7	0	0	0	8	0	0	-	-	-	-
	Ali	0	7	1	0	1	4	3	0	1	5	2	0
	Mehmet	0	3	5	0	3	4	1	0	0	3	5	0
B6:Using instructional materials and tools	Bahadır	1	5	2	0	0	7	1	0	0	8	0	0
	Zehra	0	3	5	0	0	5	3	0	-	-	-	-
	Ali	5	3	0	0	1	6	1	0	3	4	1	0
	Mehmet	1	4	0	3	0	6	2	0	0	0	8	0
B7:Making end-of-unit summaries	Bahadır	6	2	0	0	7	1	0	0	8	0	0	0
	Zehra	0	4	3	1	7	1	0	0	-	-	-	-
	Ali	8	0	0	0	8	0	0	0	8	0	0	0
	Mehmet	1	4	3	0	3	5	0	0	5	3	0	0
B8:Relating subjects or concepts	Bahadır	7	1	0	0	3	5	0	0	6	2	0	0
	Zehra	4	4	0	0	1	7	0	0	-	-	-	-
	Ali	3	5	0	0	4	4	0	0	3	5	0	0
	Mehmet	2	5	1	0	1	7	0	0	5	3	0	0
B9:Giving examples from daily life	Bahadır	7	1	0	0	4	4	0	0	3	5	0	0
	Zehra	5	3	0	0	3	5	0	0	-	-	-	-
	Ali	1	7	0	0	2	4	1	1	1	6	1	0
	Mehmet	5	3	0	0	3	5	0	0	4	4	0	0
B10:Informing about the content of the following lesson	Bahadır	7	0	1	0	3	5	0	0	3	4	1	0
	Zehra	6	2	0	0	4	4	0	0	-	-	-	-
	Ali	8	0	0	0	6	2	0	0	7	1	0	0
	Mehmet	6	2	0	0	1	7	0	0	2	0	6	0

Table 4 demonstrates that Bahadır's status of performing some actions in the didactical structure

of the lesson category has improved, while some of his actions indicate no improvement. His performing of the actions B2, B6, B8, B9 and B10, included in the didactical structure of the lesson, has partially improved. For example, Bahadır, who never performed the B2 action in his pre-mentoring lessons, started to partially perform this action due to the mentoring practices, which he continued after the mentoring. Table 4 shows that there is no noticeable improvement in Bahadır's status of performing actions B3 and B5. It is also observed that Bahadır's level of performing action B3 before mentoring changed with the mentoring he received, but he kept giving some redundant instructional explanations during the course. Looking at Table 4, it is evident that there is no change in the frequency of Bahadır performing some of his actions in theme B, and there is even a regression in some of his actions. Bahadır did not exhibit actions B1 and B4 neither in the pre-mentoring lessons nor in the lessons during and after mentoring, and there is a decrease in his performance of action B7.

It is clear in Table 4 that there is a positive change in Zehra's status of performing a significant part of the didactical actions (B2, B3, B8, B9 and B10). For example, she mostly did not perform action B2 in the pre-mentoring lessons but started to partially perform this action after the mentoring. Despite this improvement in some of her classroom practices, there was no improvement in some actions (B1, B5, B6). For example, while Zehra was observed to perform B5 partially in 7 lessons before the mentoring (ND 1, PD 7), she partially exhibited this action in all lessons during the mentoring (PD 8). However, she never performed action B1 before and during the mentoring practices. Further, there was a regression in the status of Zehra's performing actions B4 and B7. For example, it is observed that the number of lessons that Zehra did not perform action B4 during the mentoring increased compared to the pre-mentoring period (ND-6, PD-2; ND 7, D 1, respectively).

When the change in Ali's status of performing actions related to the didactic structure of the lesson is examined, it is seen that there is a positive change in this teacher's classroom practices, but this change does not show continuity for every action (Table 4). The change in his actions (B2, B5, B6, B8, B10) that show continuity after the mentoring can be exemplified as follows: It is observed that Ali demonstrated action B5 during and after the mentoring, which he had not performed before the mentoring (observation data: Pre-mentoring ND 7, PD 1; during the mentoring ND 1, PD 4, D 3; after the mentoring ND 1, PD 5, D 2). However, it is seen that during the mentoring Ali paid attention to his action of B3, which is a reflection of the traditional teaching that he performed excessively before the mentoring, but after the mentoring, this action regressed to its pre-mentoring level. As can be seen in Table 4, Ali's actions related to the didactical structure of the lesson did not improve with the mentoring practices (eg. B1, B4), and some of his actions even regressed (eg B9).

Table 4 shows that Mehmet's situation of performing some actions (B2, B3, and B6) related to the didactical structure of the lesson improved thanks to the mentoring practices and this development also shows continuity after the mentoring. However, the positive change Mehmet showed during the mentoring for the actions of B9 and B10 regressed after the mentoring (ND 5 PD 3; ND 3, PD 5; ND 6, PD 2 for ND 4, PD 4 for B9 and ND 1, PD 7, ND 2, and D 6 for B10 in the order of observation). It can be seen in Table 4 that despite some improvement in Mehmet's actions, a significant positive development could not be achieved for B5 and B8 actions and there was a negative change in the B1, B4 and B7 actions. For example, before the mentoring, Mehmet displayed B1 partially in 3 lessons and at a sufficient level in 1 lesson; however, he performed this action only partially in 1 lesson during the mentoring and he did not perform it at all after the mentoring.

Communication and Classroom Management

Table 5 summarizes the change in the actions of the teachers participating in the study under theme C (Communication and Classroom Management) before, during and after the mentoring.

Table 5. The frequency of teacher's in-class actions related to theme C before, during and after the mentoring

Actions	Teacher	Before Mentoring				During Mentoring				After Mentoring			
		ND	PD	D	OP	ND	PD	D	OP	ND	PD	D	OP
C1: Intervention in the problems and difficulties encountered	Bahadır	6	2	0	0	4	3	1	0	4	4	0	0
	Zehra	6	1	1	0	2	2	4	0	-	-	-	-
	Ali	3	4	1	0	3	3	2	0	8	0	0	0
	Mehmet	0	4	4	0	4	1	3	0	5	2	1	0
C2: Applying norms, rules and regulations	Bahadır	8	0	0	0	1	6	1	0	2	5	1	0
	Zehra	7	1	0	0	1	2	5	0	-	-	-	-
	Ali	8	0	0	0	0	5	3	0	1	5	2	0
	Mehmet	5	3	0	0	3	4	1	0	4	1	3	0
C3: Addressing students by name	Bahadır	3	5	0	0	5	3	0	0	7	1	0	0
	Zehra	8	0	0	0	2	6	0	0	-	-	-	-
	Ali	7	1	0	0	6	2	0	0	4	4	0	0
	Mehmet	0	0	8	0	0	1	6	1	1	1	6	0
C4: Using body language effectively	Bahadır	7	1	0	0	7	1	0	0	4	3	1	0
	Zehra	0	4	3	1	3	5	0	0	-	-	-	-
	Ali	2	5	1	0	2	6	0	0	5	3	0	0
	Mehmet	3	1	1	3	6	2	0	0	8	0	0	0
C5: Using the tone of voice effectively	Bahadır	6	2	0	0	8	0	0	0	7	1	0	0
	Zehra	7	1	0	0	7	1	0	0	-	-	-	-
	Ali	2	4	2	0	7	1	0	0	8	0	0	0
	Mehmet	6	1	1	0	6	2	0	0	8	0	0	0
C6: Providing extrinsic motivation	Bahadır	5	3	0	0	1	7	0	0	1	7	0	0
	Zehra	2	5	1	0	3	5	0	0	-	-	-	-
	Ali	1	7	0	0	0	7	1	0	8	0	0	0
	Mehmet	3	4	1	0	0	6	2	0	0	6	2	0
C7: Behaviors to sustain students' attention	Bahadır	6	2	0	0	4	4	0	0	4	4	0	0
	Zehra	5	2	1	0	0	8	0	0	-	-	-	-
	Ali	3	5	0	0	2	6	0	0	7	1	0	0
	Mehmet	8	0	0	0	0	7	1	0	6	2	0	0

Examining the participants' actions regarding communication and classroom management activities (Table 5), it is clear that Bahadır's level of performing these actions mostly improved, and some of his actions did not improve, or even regressed. The status of his performing C1, C2, C4, C6 and C7 actions improved, and he was observed to continue performing these actions after the mentoring. On the other hand, Table 5 shows that there is no improvement in the situation of Mehmet's C3 and C5 actions, and there is even a negative change. For example, while Mehmet partially exhibited action C3 in 5 lessons before the mentoring, this number decreased to 3 (ND 5, CG 3) during the mentoring and to 1 (ND 7, CG 1) after the mentoring.

Table 5 clearly shows that Zehra's level of performing some actions regarding theme C improved, some of them did not change, and some of them regressed. When the data on Zehra's actions (C1, C2, C3, C7) with positive changes are examined, it can be seen that she started to exhibit these actions partially or adequately during the mentoring compared to pre-mentoring. On the other hand, during the mentoring practices, there was no improvement in her action C5, and the level of performing C4 and C6 actions decreased. The observation data of the teacher's C4 action exemplify this: PD 4, D 3, and OP 1 before mentoring; ND 3 and PD 5 during the

mentoring.

Examining the change in the actions of Ali regarding theme C (Table 5), it can be seen that there are mostly irregular increases and decreases, in other words, there is a positive change in some actions and regressions in some, contrary to the targeted outcome (ND 2, PD 4, D 2; ND 7, PD 1 and ND 8). As is clear in Table 5, there was a slight increase in Ali's demonstration of the C1, C4, C6 and C7 actions during the mentoring process compared to the pre-mentoring, but there is a significant regression in the level of performing these actions after the mentoring. For example, while Ali exhibited C1 partially in 4 lessons and at a sufficient level in 1 lesson before the mentoring, he performed this action partially in 3 lessons and 2 lessons at a sufficient level during the mentoring, and he did not perform this action at all in any of the lessons after the mentoring. In addition to these irregular changes, Table 5 indicates a noticeable improvement in the level of Ali's performance of the C2 and C3 actions. Accordingly, while it was observed that this teacher did not exhibit the C2 action before the mentoring, this action was partially performed in 5 lessons and 3 lessons at a sufficient level during the mentoring, and this change remained almost the same after the mentoring. On the other hand, it a decreasing can be observed in the level of Ali's demonstration of the C5 action, which continued after the mentoring (observation data: ND 2, PD 4, D 2; ND 7, OP 1 and ND 8, respectively).

When the change of Mehmet's practices regarding communication and classroom management is examined, a positive change for two actions (C2, C6) can be observed, and an initial improvement followed by a significant regression for two actions (C5, C7). Considering the positive changes in the teaching practices of Mehmet, for example, for C2, it is seen that he partially exhibited this action in 3 lessons before the mentoring, while he partially exhibited this in 4 lessons and 1 lesson during the mentoring, and the level of performing this action after the mentoring remained almost the same. In addition to the actions in which these continuous positive changes are observed, some actions indicate a post-mentoring relapse. For example, it is seen that Mehmet, who did not exhibit the C7 action before the mentoring, showed a significant improvement in performing this action during the mentoring practices, but this did not continue at the same level after the mentoring. Nevertheless, as can be seen in Table 5, some uncategorizable changes occurred in some of his actions (C1, C3, C4) in the classroom.

Student-Centered Approaches

The change in the frequency of the actions regarding theme D performed by teachers participating in the study during the mentoring practices is summarized in Table 6.

Table 6. The frequency of teacher's in-class actions related to theme D before, during and after the mentoring process

Actions	Teacher	Before Mentoring				During Mentoring				After Mentoring			
		ND	PD	D	OP	ND	PD	D	OP	ND	PD	D	OP
D1:Asking students questions during the lesson	Bahadır	4	3	1	0	0	5	3	0	0	6	2	0
	Zehra	0	2	3	3	1	6	1	0	-	-	-	-
	Ali	0	8	0	0	0	5	2	1	1	4	1	2
	Mehmet	0	7	1	0	1	5	2	0	1	4	3	0
D2:Keeping students active in reaching information	Bahadır	5	3	0	0	0	2	3	3	5	1	2	0
	Zehra	3	5	0	0	0	3	5	0	-	-	-	-
	Ali	5	3	0	0	1	3	3	1	0	4	4	0
	Mehmet	6	2	0	0	0	2	4	2	0	4	3	1
D3:Giving spontaneous	Bahadır	7	1	0	0	0	6	2	0	0	7	1	0
	Zehra	5	3	0	0	0	3	5	0	-	-	-	-
	Ali	1	6	1	0	0	5	3	0	0	3	5	0

feedback in the class	Mehmet	1	5	2	0	0	4	4	0	0	2	6	0
D4:Creating a collaborative learning environment	Bahadır	8	0	0	0	6	2	0	0	8	0	0	0
	Zehra	6	2	0	0	3	3	2	0	-	-	-	-
	Ali	8	0	0	0	6	2	0	0	8	0	0	0
	Mehmet	8	0	0	0	5	2	1	0	7	1	0	0
D5:Guiding students in reaching information	Bahadır	7	1	0	0	6	2	0	0	8	0	0	0
	Zehra	8	0	0	0	4	4	0	0	-	-	-	-
	Ali	8	0	0	0	1	3	4	0	4	4	0	0
	Mehmet	8	0	0	0	5	3	0	0	8	0	0	0
D6:Planning time flexibly to address student needs	Bahadır	6	2	0	0	6	2	0	0	6	2	0	0
	Zehra	7	1	0	0	4	4	0	0	-	-	-	-
	Ali	6	2	0	0	4	4	0	0	8	0	0	0
	Mehmet	7	1	0	0	8	0	0	0	7	1	0	0

Table 6 shows that overall there was a positive change in the case of Bahadır's actions in D2, D4 and D5, but after mentoring, these actions returned to the pre-mentoring level. In addition, some observable improvements occurred in his level of performing D1 and D3, which continued after the mentoring. However, his demonstration of action D6 did not change with the mentoring practices, with his partial display of this action only in 2 lessons before, during and after the mentoring.

Table 6 indicates that the level of Zehra's performing all actions in the theme of student-centered approaches improved thanks to the mentoring practices. When the data are examined in detail, it becomes clear that this teacher performed actions D2, D3, D4, D5, and D6 more frequently with the mentoring support, which he had not performed much in pre-mentoring, and regulated his action D1, which he performed more often than necessary.

Some of Ali's actions in theme D improved compared to before mentoring, while the expected positive changes in some other actions could not be observed (Table 6). Accordingly, while it was observed that there was a development in an expected way regarding action D3 in the teacher's student-centered approaches theme, the level of performing action D5 was significantly improved compared to the pre-mentoring level, but this change was not permanent after the mentoring and there was a slight decrease in the performance level of the action. On the other hand, some irregularities were observed in Ali's demonstration of the actions D1, D2, D4 and D6, and no significant positive development could be achieved in these actions.

The data on teacher Mehmet's actions under theme D show that some of them changed in the targeted direction compared to pre-mentoring and that no change was observed in some (Table 6). It is clear that Mehmet's actions in D1, D2 and D3 are observed to have developed in the targeted direction from pre-mentoring to post-mentoring. On the other hand, a significant improvement was observed in his level of exhibiting D4 and D5, but this development did not continue after the mentoring. In addition, no change could be observed for his D6 action, and he did not perform this action at all during the mentoring period.

Assessment-Evaluation Approaches

Table 7 summarizes the frequency of the participants' exhibition of theme E actions with (Assessment-Evaluation Approaches) before the mentoring process, during the mentoring process and after the mentoring process.

Table 7. The frequency of teacher's in-class actions related the theme E actions before, during and after the mentoring process

Actions	Teacher	Before Mentoring				During Mentoring				After Mentoring			
		ND	PD	D	OP	ND	PD	D	OP	ND	PD	D	OP
E1:Checking learning at the end of the lesson	Bahadır	6	2	0	0	4	4	0	0	4	2	2	0
	Zehra	2	4	1	1	6	2	0	0	-	-	-	-
	Ali	7	1	0	0	3	4	1	0	7	1	0	0
	Mehmet	6	1	1	0	4	4	0	0	7	1	0	0
E2:Using traditional assessment tools	Bahadır	6	2	0	0	7	1	0	0	5	3	0	0
	Zehra	6	1	0	1	6	2	0	0	-	-	-	-
	Ali	7	1	0	0	6	1	1	0	7	1	0	0
	Mehmet	8	0	0	0	6	2	0	0	4	4	0	0
E3:Using performance-based assessment tools during the class	Bahadır	8	0	0	0	3	3	2	0	8	0	0	0
	Zehra	8	0	0	0	2	4	2	0	-	-	-	-
	Ali	8	0	0	0	5	3	0	0	0	8	0	0
	Mehmet	8	0	0	0	2	4	2	0	6	2	0	0
E4:Giving feedback for assessment work	Bahadır	8	0	0	0	8	0	0	0	8	0	0	0
	Zehra	7	1	0	0	4	4	0	0	-	-	-	-
	Ali	8	0	0	0	6	2	0	0	8	0	0	0
	Mehmet	8	0	0	0	7	1	0	0	8	0	0	0
E5:Giving students performance assignments	Bahadır	8	0	0	0	7	1	0	0	7	1	0	0
	Zehra	5	2	1	0	5	3	0	0	-	-	-	-
	Ali	7	1	0	0	4	4	0	0	7	1	0	0
	Mehmet	8	0	0	0	4	4	0	0	7	1	0	0
E6:Giving performance grades during the class	Bahadır	8	0	0	0	8	0	0	0	8	0	0	0
	Zehra	8	0	0	0	8	0	0	0	-	-	-	-
	Ali	8	0	0	0	7	1	0	0	8	0	0	0
	Mehmet	8	0	0	0	8	0	0	0	8	0	0	0

With the mentoring practices carried out within the scope of this study, it is seen that Bahadır's development related to only action E1 was at the desired level, which continued after the mentoring (Table 7). However, his level of showing action E3 during the mentoring increased compared to before the mentoring, but after the mentoring, it regressed to the pre-mentoring level. Some of this teacher's actions related to the theme E activities (E2, E5) usually had irregular changes and the expected positive changes were not fully observed (Table 7). In addition, the display levels of actions E4 and E6 did not change at all, that is, Bahadır did not exhibit these actions in any of his lessons.

Table 7 clearly shows that there were expected developments in some of Zehra's actions regarding theme E, but positive changes could not be fully observed in some others, and even regression occurred. Thus, a positive change was observed only in her E3 and E4 actions, but no improvement was observed in the level of performing the E5 and E6 actions, and even a negative change was observed in her performing of action E1. Furthermore, it is seen that the number of lessons in which Zehra overperformed E2 (using traditional assessment-evaluation tools) before the mentoring decreased during the mentoring.

Table 7 shows that a significant part of Ali's actions (E1, E2, E4, E5, and E6) related to theme E improved during the mentoring, but after the mentoring, they regressed to their pre-mentoring levels. An expected positive change was only achieved in his performance of action E3: Before the mentoring, Ali did not use performance-based assessment-evaluation tools in the lesson, partially used them in three lessons during the mentoring, and partially used in all lessons after the mentoring.

As can be seen in Table 7, an expected change occurred in Mehmet's teaching during the mentoring at the level of displaying most actions (E1, E2, E3, E5) related to theme E

(assessment-evaluation approaches), but there is some decrease in some of them after the mentoring. For example, although Mehmet had never performed E3 before the mentoring, he exhibited it partially in 4 lessons during the mentoring, and partially in 2 lessons after the mentoring. However, no significant improvement was observed in Mehmet's E4 and E6 actions. He did not exhibit action E6 before, during and after the mentoring.

Discussion and Conclusion

Teachers' individual and group developments regarding each theme as a group are discussed in this section to make reasonable conclusions. Except for a few minor differences, it is seen that all of the teachers have shortcomings, and they need to develop in class actions in all of the lesson introduction activities, which is the first of the themes where teacher activities in the lesson are analyzed. Among these actions, greetings and drawing attention are seen to be improved with the mentoring process and to have a certain permanence. Ali displayed the themes of greeting and attention, probing prior knowledge, and remembering in the lesson more frequently and showed a better improvement compared to his peers. However, in the themes of informing students about the lesson objective and motivating them, Ali and Mehmet differed from their peers in terms of demonstrating a decrease in the frequency of sufficient and partially sufficient actions during the mentoring process. Therefore, it can be said that these teachers actually balanced the mentoring process with the introductory activities. To put it more clearly, teachers started to show more of an action with no or very little demonstration, while the actions they showed more frequently started to show less. Since lesson introduction activities take place in a limited time, it seems that when teachers add new actions to use their time effectively, they choose to reduce the actions they use more frequently. An important acquisition here was that some teachers included lesson introduction activities (greeting, checking prior student knowledge, and motivation), which they had never mentioned before, in their lessons through the mentoring process.

One of the important themes in the evaluation of in-class teacher activities is the didactical structure of the lesson. It was observed that the development of teachers regarding this theme was limited and even some teachers' adequate display of them decreased (see Table 4). Among all the participants, Zehra was the one that made the biggest improvement. The development of Bahadır and Ali was limited, and some of their actions even decreased after the mentoring. Here, it was seen that especially Mehmet showed a negative view of his peers in his classroom practices. In general, teachers seem to need pedagogical development for the didactical structure of the lesson. While the B1 practice/action/behavior (Conducting scientific discussions) was not observed in the classroom of other teachers except for Mehmet, the level of performing this action in the Mehmet's classroom also decreased with the mentoring practices. The number of sufficient or partially sufficient observations of B4 (making summaries for the main themes of the lesson) and B7 (making summaries at the end of the lesson) also decreased for almost all teachers in the process. Furthermore, the action of making instructional explanations (B3), who mostly applied the narrative method, was determined as an action that was used excessively before the mentoring practices. Only Bahadır's action was determined as an action that needed to be developed before the mentoring implementation. During the implementation process, the frequency of teachers showing this action reached the desired level, but it was observed to increase again afterwards. Since the plans were prepared jointly in the mentoring process, Bahadır began to include more instructional explanations in his lesson, by being influenced by his colleagues. Weekly meetings, open communication structure, joint planning and sharing allowed teachers to get closer to each other in classroom behaviors in general and thus to structure common knowledge, as expected (Bjørn, &

Ngwenyama, 2009). The convergence in the classroom actions and behaviors of teachers is a pattern also seen in other themes and behaviors.

The reason for the limited development under the theme of didactic structure is thought to be due to the fact that whereas teacher-centered approaches are used more frequently in the observation form (for example, making mid-term and end-of-course summaries), student-centered approaches are used in the mentoring process. A similar pattern is seen in other themes. The theme of communication and classroom management is one such theme. Among the actions under this theme, the practices of "intervening in the encountered problems and difficulties," "Implementing norms, rules and regulations," "Providing external motivation" and "Behaviors to keep students' attention", which are signs of a change and transformation in the classroom, improved with the mentoring process. Especially, the increase in the implementation of norms, rules and regulations from the actions suggested to be developed compared to the previous ones indicates that teachers develop certain rules and work consistently to apply them. Such changes are observed more clearly in the classroom, especially in the process of adopting innovations (McNeal & Simon, 2000; Turpen & Finkelstein, 2010). Using the tone of voice effectively, using body language and addressing students with their names are some other actions that can be seen more frequently in classrooms where teacher-centered instruction and question-answer technique is used. As a matter of fact, the decrease in the frequency of these actions in the mentoring process can be explained by the transition to student-centered practices. Since the teacher is more active in a teacher-centered approach, he/she has to use body language, voice and gestures more effectively. However, in the new context where students were more active and teachers paying more attention to students individually or as a group, they may have used these features less. In addition, as it may take time for teachers to adapt to this new teaching context and to develop communication skills, it is natural for teachers to apply some targeted practices less frequently after mentoring (Stiles, 2017). Looking at the individual development of teachers under this theme, Bahadır and Zehra are observed to have a better, albeit limited, development than Ali and Mehmet. Although the fact that Mehmet summarized the main themes of the lesson and made summaries less frequently but mentioned the objectives for the next lesson at the end of the class after the mentoring seems negative at first, but it may indicate that his in-class actions have evolved from a teacher-centered to a student-centered style. Indeed, concerning the practices related to the theme of learning-centered approaches, Mehmet's practices such as asking questions to students, giving them feedback, and guiding them, rather than summarizing the lesson content, were observed to have improved.

Except for the actions "Creating a cooperative learning environment (D4)," "Guiding the student in the process of reaching information (D5)" and "Flexible time planning according to student needs", all four teachers were observed to improve in their student-centered approaches. Their actions such as asking students questions during the lesson, giving them feedback, and keeping them active in the process of accessing information improved and this continued after the mentoring. However, while teachers improved in their D4 and D5 actions during the mentoring, these decreased afterwards and even became less exhibited in the post-mentoring period. The mentoring can be said to be partly successful in facilitating teachers' transition from their role as acting as the source of information to setting the learning environment because the observations revealed that the teachers were between partially exhibiting these practices and exhibiting them adequately. Another action with limited development is D6 (flexible time planning according to student needs). The most important of these is the structure of the course work in schools. The implementation of a standard curriculum, administering common exams and crowded classes in Turkish schools make it difficult for teachers to make arrangements to

address individual needs, which might have been the case during the mentoring practices as well. Another important finding is that the practice of creating a cooperative learning environment was exhibited partially and sufficiently during the mentoring, although this was observed partially only during two lesson hours in Zehra's classroom before the mentoring. This finding shows that with the mentoring, teachers started to design their lessons to include more group work, collaboration, and in accordance with the constructivist theory. However, what is striking is that this practice did not continue after the mentoring practice. All three teachers abandoned a collaborative understanding after the mentoring. The most important reason for this is that it takes time to gain student-centered practice skills by focusing only on the content outcomes of the standard exams and curriculum.

Another theme observed in the lessons is assessment and evaluation approaches. The teachers were observed to see to what extent they included result and process-oriented evaluation regarding this theme. The area where teachers were the most insufficient and where mentoring practices had limited contribution was assessment and evaluation. Although teachers made limited progress in this area, lessons that went above the level of "partial display" were very limited. The action of "using performance-based assessment-evaluation tools in the lesson" was the most developed practice of all teachers. Another improved practice was in the use of traditional assessment and evaluation tools in the classroom. When looking at the individual development of teachers, it was determined that although similar tendencies were observed, Ali continued to use performance-based tools after the mentoring. Another striking point is that although teachers performed testing, they stayed away from evaluation and almost never gave any feedback. Although a week is thematically devoted to assessment and evaluation, one of the reasons for the very limited development of teachers in this theme may be the result-oriented "test" habit that is dominant in the Turkish education system. This finding is consistent with the previous research results indicating that formative assessment is underused in daily practices (Black and William, 1998). In addition, the issue of assessment and evaluation has been reported by teachers as their major weakness in which they need to improve. They may have avoided this due to overcrowded classrooms and the extra work that would be created by performance tasks and feedback putting an additional burden on their already intensive course schedules (DeLuca, Luu, Sun, & Klinger, 2012). In addition, addressing the assessment and evaluation theme towards the end of the mentoring practices may be another important factor limiting its implementation in the classroom.

When all the themes are examined, it becomes evident that although the classroom practices of most of the teachers developed in the desired direction thanks to the mentoring practices, some themes and practices were not implemented at the desired level of frequency and competence. As stated before, the transition from a teacher-centered approach to a student-centered approach is at the center of the mentoring practice. It is common for teachers to have difficulties in this transition and tend to revert to previous practices that they have been accustomed to for years, and it is obvious that change will take time. The fact that teachers have made progress in the mentoring process shows that the path is correct, but more effort is needed. While some of these efforts can be met as longer-term mentorship, some of them should be in the form of reconsidering the mentoring process and organizing the process.

While revising the mentoring process, it should be taken into account that teachers' professional background does not primarily affect their classroom practices. As stated in Gess-Newsome's (2015) model for teachers' professional development and skills, subject-specific professional knowledge, teacher attitudes and students' characteristics indeed play a crucial role in shaping how teachers implement assessment and evaluation, curriculum, and how they integrate their

pedagogical content knowledge and students' knowledge into their classroom practices. For this reason, the classroom reflections of the efforts to strengthen the professional knowledge, which is strongly emphasized in mentoring activities remained more limited. Here, the introduction of subject-specific pedagogies, student readiness and differences among the teachers can be counted among the influencing factors (van Driel & Berry, 2012). Although the observation periods were kept long, each teacher was observed for a total of 32 hours on different subjects. Mentoring and preparing a joint plan were carried out for 16 lesson hours. Although extending this period seems to be an appropriate approach to better observe the effect of the practice, observing the desired effect may require a much longer period of practice due to the difficulty in the application of teachers' improved professional knowledge into classroom practice (Makar & Fielding-Wells, 2018). The high number of deficiencies in the participating teachers' basic professional knowledge (Saglam Arslan et al., 2018) convinced the research team that mentoring needed to be done first in this area. After solving the basic professional knowledge problems of teachers, mentoring activities for the field- and subject-specific professional knowledge can be expected to be better reflected in classroom practices. It is reported in the related literature that pedagogical content knowledge is realized at general, field, and subject specific levels (Chan & Hume, 2019). For example, in the present study, although the development of teachers in assessment and evaluation was limited, their development in the assignment of subject-specific performance tasks showed a better development, and this continued after the mentoring activities. Therefore, the classroom effects of the development in behaviors in which subject-specific mentoring activities are carried out will be stronger.

The characteristics of the specific subject covered play an important role in the variation among teachers' in-class practices before, during and after mentoring (Lawrie, Schultz, Bailey, & Dargaville, 2019). If the related outcomes are not suitable for different display styles, naturally, their classroom practices of them are expected to decrease. As a matter of fact, based on their study Aydın & Boz (2013) with experienced chemistry teachers concluded that teachers' pedagogical approaches were subject-specific and individual (idiosyncratic) in teaching electrochemistry and oxidation-reduction reactions. In other words, the fact that the subject is different leads to the differentiation of representation styles and pedagogies. Another issue regarding the practices is the emphasis made on a different point each week in the mentoring process. In the weekly mentor-mentee meetings, a theme was determined, and plans were made around it. For example, one week the argumentation-based chemistry topic was determined as the theme, while another week, the use of three-dimensional models was determined as a priority. These themes may have caused some emphasis to increase and some to decrease in practice. Besides the content (the subject taught), another point that is frequently emphasized in the literature is the contextual effects on teaching practices (Berliner, 2001; Park & Oliver, 2008).

The structure of the mentoring process is similar to the community of practice, as it involves four chemistry teachers from different schools who shared their experiences, planned the lessons, and developed the materials they needed to teach the subject (Mercieca, 2017; Wenger, 2011). During the mentoring practices, teachers worked together to create a common norm by sharing their knowledge and experience for a common goal (Vygotsky, 1978). Another remarkable pattern is the similarity in the observed behaviors of teachers. The effect of preparing the plans for the next lesson together in weekly meetings as a group and sharing experiences were more evident here. However, although the presence of a mentor and the gathering of teachers during the research process causes deviation from the community of practitioners, there are some studies confirming the effectiveness of such practices (Szteinberg, et al., 2014).

In this study, the mentoring process, based on the principles of the community of practitioners, was effective in the teachers' meeting, discussing, planning, and implementing their practices based on the research findings regarding current curricular and instructional approaches under the guidance of the mentor. However, the similarity of teachers' classroom practices does not mean that they do not differ. Although an effort was made to eliminate differences by selecting teachers from similar school types and having similar experiences, the teachers were observed to show varying developments regarding different themes. These differences may be due to teachers' experiences, self-efficacy perceptions, previous in-service training, and the characteristics of the students in their school and class. That the effect of variables based on teachers' individual differences on classroom practices was not investigated can be considered as a limitation of this study. Observing similar trends despite individual differences indicates that the practice of mentoring addresses teacher needs.

Implications for Teaching

Based on discussions and conclusions, following recommendations would be drawn:

- The mentoring program has its effects on teachers' practice, but it is not enough in some aspects of teaching. Thus, further and longer mentoring process would be helpful. The teachers would need longer mentoring especially to adapt more student centered teaching approaches.
- Group mentoring seemed helpful to form a norm in class or a shared pedagogical understanding. In other words, the teachers influence each other in the process.

- The assessment and evaluation is one of the weakest link of the chain thus further and more comprehensive in-service as well as pre-service training is needed for assessment and evaluation including mentoring.

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