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| Research Article / Araştırma Makalesi |

How to be a good science teacher? Teacher practices in the perspective of seven principles for good practice

İyi bir fen bilimleri öğretmeni nasıl olunur? İyi bir eğitim ortamı için yedi ilke perspektifinde öğretmen uygulamaları

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Keywords
1.Seven Principles
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Abstract

Purpose: The study aims to determine the practices and suggestions of science teachers toward seven principles for good practice.

Design: The research used a case study design. 73 science teachers (43 women and 30 men) working in different areas of Türkiye participated in this research. The researcher developed an open-ended questionnaire (Questionnaire of Seven Principles-QSP) to collect data. The frequency and percentage values of the answers were examined, and content analysis was made.

Findings: When evaluated according to gender, school type, experience, and region variables, science teachers had low knowledge about the seven principles. However, they practiced different practices related to each principle in and out of the classroom. In addition, as their experience increased, they had more social activities, valued communication with the family, and practiced more in the classroom.

Highlights: This study aims to determine what practices science teachers use to provide good practice and what suggestions they have. The results are important for improving the quality of science education.

Öz

Çalışmanın amacı: Araştırmanın amacı fen bilimleri öğretmenlerinin iyi bir eğitim ortamı için yedi ilkeye yönelik uygulama ve görüşlerinin belirlenmesidir.

Yöntem: Araştırmada özel durum çalışması deseni kullanılmıştır. Araştırmaya Türkiye'nin farklı bölgelerinde görev yapan 73 (43 kadın, 30 erkek) fen bilimleri öğretmeni katılmıştır. Veri toplamak amacıyla araştırmacı tarafından geliştirilen açık uçlu bir anket (Yedi ilke anketi) kullanılmıştır. Verilerin analizi için fen bilimleri öğretmenlerinin verdikleri cevapların frekans ve yüzde değerlerine bakılmış ve içerik analizi yapılmıştır.

Bulgular: Araştırmada cinsiyet, okul türü, tecrübe ve bölge değişkenlerine göre değerlendirildiğinde fen bilimleri öğretmenlerinin "yedi ilke" kavramı ile ilgili düşük bilgi sahibi oldukları görülmüştür. Bununla birlikte, öğretmenlerin her bir ilke ile ilgili sınıf içi ve sınıf dışında farklı uygulamalar yaptıkları görülmüştür. Ayrıca fen bilimleri öğretmenlerinin tecrübesi arttıkça daha fazla farklı sosyal aktiviteler yaptırdıkları, aile ile iletişime önem verdikleri ve sınıf içinde daha çok uygulama yaptıkları belirlenmiştir.

Önemli Vurgular: Çalışmada fen bilimleri öğretmenlerinin iyi bir eğitim ortamını sağlamada ne gibi uygulamalar yaptıkları ve nasıl önerilerinin olduğunun belirlenmesi amaçlandığı için fen eğitiminde kalitenin artırılması adına bu çalışmanın sonuçlarının önem arz ettiği düşünümektedir.

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INTRODUCTION

Education is an important area that all states emphasize to pass on the cultural heritage of societies to future generations and raise individuals who benefit society. Schools aim to teach science, social studies, and language and raise good citizens. Therefore, improving the quality of education and training is essential in teaching and education. In this context, "Seven Principles for Good Practice- SPGP" was created by Chickering and Gamson to improve the quality of undergraduate education in 1987. The SPGP includes encouraging contact between students and faculty, developing reciprocity and cooperation among students, encouraging active learning, giving prompt feedback, emphasizing time on task, communicating high expectations, and respecting diverse talents and ways of learning (Chickering & Gamson, 1987).

The SPGP was created mainly to increase the quality of undergraduate education. However, it can also be applied to other educational levels. For this purpose, instead of student-faculty interaction in the first principle, the expression student-school (such as teacher, administration) can be used (Okumuş & Doymuş, 2020). Other principles can be used equally at all educational levels. Çavdar (2016) and Okumuş (2017) determined that the SPGP is effectively applied in secondary school science lessons. Increasing the interaction of students with the school (teachers, administrators, etc.), expressed in the first principle of the SPGP, helps the student to be more willing to go to the school. Also, the first principle makes it easier for the students to express themselves more comfortably in the school environment. When faced with any problem, students share it with their teachers or school administration more comfortably. This situation enables cooperation with the school administration in solving students' problems. In addition, the high student-school interaction makes it easier for the students to adapt to the school, especially in the first years. Regarding teachers, students' correct communication with the teacher allows the teacher to get to know the student better (Bolliger & Martin, 2018; Jensen & Bennett, 2016; Taylor et al., 2020).

Peer learning is one of the critical issues emphasized in education. Students may only sometimes ask the teacher about parts, thoughts, or questions about the subject that they need help understanding. This situation is common, especially for shy students. In this context, peer learning based on students' learning from each other comes to the fore. Because students express themselves more comfortably to their friends (Bishoff, 2010; Okumuş, 2017). Collaboration of students during the peer learning process makes it easier for them to learn the subject and helps them express themselves more comfortably. Accordingly, the cooperation of students in the lessons also increases the quality of education and training (Shoval, 2011). This situation also makes it easier for students to collaborate and share their knowledge, resources, and experiences (Bolliger & Martin, 2018; Tanis, 2020). Johnson (2014) stated that working in cooperation with students away from competition ensures their social development and protects students from isolation.

The third principle of the SPGP is to ensure active learning. Active learning involves the students' participation in the learning process and being responsible for their learning (Al-Furaih, 2017; Hathaway, 2014). According to constructivist philosophy, it is essential for students to actively participate in the learning process so that they can structure information correctly in their minds. From this perspective, the students must direct the learning process for effective teaching. The information becomes memorized because the individuals learn better what they do. Students should talk, write about what they have learned, relate the topic to their past experiences, and apply it to their daily lives. Accordingly, teaching methods and techniques that will actively involve students in the process, such as projects, discussions, and collaborative work, will also increase the quality of teaching (Al-Furaih, 2017; Chickering & Gamson, 1987; Gonda et al., 2018). In addition, active learning activities facilitate students 'learning and are crucial for developing teachers' teaching skills. Because in the active learning process, the teacher participates in all teaching stages with the students (Taylor et al., 2020).

Feedback is one of the most important factors for learning in education. Feedback, one of the essential variables that the teacher should focus on in the lesson process, allows the students to ask about the parts they do not understand in the lesson and whether their answers are correct or incorrect. When students see their mistakes, they correct them, and if there is a deficiency, they complete it (Beydoğan, 2018; Chickering & Ehrmann, 1996; Duijnhouwer et al., 2012; Şimşek et al., 2012; Voerman et al., 2012). Also, feedback increases communication between students and teachers. A teacher who gives effective feedback gains the students' trust and gives students the feeling that their answers are important. In this way, students see that they are essential in the eyes of the teacher. Thus, teacher-student communication is strengthened, and students participate more in the lesson thanks to effective feedback (Dahalan et al., 2013; Tanis, 2021). Another critical point to be considered while giving feedback is that feedback should be designed in such a way that it is given effectively and in the shortest time. Given feedback to students should be conveyed in a written, verbal, or virtual environment depending on the situation of the subject (Besser & Newby, 2020; Chickering & Ehrmann, 1996; Getzlaf et al., 2009; Gielen et al., 2010; Okumuş & Doymuş, 2020). Rowe and Wood (2008) stated that the most effective feedback is student performance-based feedback that informs students about why they do not understand and what they should do to learn about a topic they do not understand and leads students to think about what they do.

The fifth principle of the SPGP includes the "time on tasks." The student who fulfills his/her task on time learns to work more disciplined, to take responsibility, and to fulfill this responsibility (Al-Furaih, 2017; Chickering & Gamson, 1987; Graham et al., 2001; Okumuş & Doymuş, 2020). Students need help for effective time management in learning (Chickering & Gamson, 1987). In this respect, it is not enough for students to fulfill their tasks on time. Here, the students must do the homework that the teacher gives them on time, and the teacher must check it on time, which is especially important. The teacher checks the tasks (s)he gives on time and gives them confidence that their efforts will not be unrequited. In this way, the sense of trust between teacher and

student is reinforced. In addition, a teacher checks the task given to the students promptly, which contributes to revealing the students' deficiencies or determining if there are any points they know wrongly about the subject. In this respect, it is essential to fulfill the duties on time to provide good practice and strengthen the feelings of mutual responsibility (Bishoff, 2010; Okumuş, 2017; Okumuş & Doymuş, 2020).

Every student goes to school with certain expectations. Some students have high expectations for the profession and business life, while others aim only to finish school. Johnson (2014) emphasizes that every student goes to school with a small or large expectation. In this context, guiding teachers is important (Tanis, 2020). Directing each student to a suitable school or profession according to their abilities, interests, and abilities will increase the quality of education. At this point, teachers know their students well, and guiding them toward achievable goals is essential (Alyar & Doymuş, 2020; Chickering & Gamson, 1987; Şimşek et al., 2012).

Each student is a different world and has different characteristics: learning styles and styles are different. Some students learn by writing, some by reading, others by seeing, and some by touching. Students' abilities to learn information also differ due to these differences (Chickering & Gamson, 1987; Demirel, 2010; Legg et al., 2020; Okumuş, 2017). For this, diversifying the learning environment and employing different teaching methods and techniques in the course process are necessary. In this context, there are many different teaching approaches, models, methods, and techniques, such as cooperative learning, REACT, argumentation, problem-based learning, STEM, model-based learning, inquiry-based learning, and computer-assisted learning, which are suitable for constructivist learning theory and active add students to the process. When considered in terms of the content of the science course, these approaches/models/methods/ are suitable for these applications. In this context, science teachers diversify the teaching process to actively include students with different learning styles in the course process, as stated in the literature (Al-Furaih, 2017; Martin & Bolliger, 2018; Tanis, 2020).

Good practices performed in the educational process increase the cognitive and affective development of students, ensure the permanence of learning, and help students in their career goals (Culver et al., 2021; Jessup-Anger, 2012; Loes et al., 2014; Padgett, 2011; Pascarella et al., 2011). Accordingly, the importance of the SPGP increases in the education process. Considering the studies conducted on the SPGP in the literature, most of the work focused on determining the situation (Aydoğdu, 2012; Bishoff, 2010; Frederickson, 2015; Hathaway, 2014; Jabar & Albion, 2016; Musaitif, 2013; Tirrell, 2009), applied studies are pretty limited (Alyar, 2018; Çavdar, 2016; Okumuş, 2017; Öztürk, 2017; Pascarella et al., 2006), and there are generally studies on the SPGP in online and distance education (Al-Furaih, 2017; Crews et al., 2015; Hathaway, 2014; Kocaman Karaoğlu et al., 2014; Tanis, 2020). There is no study in which science teachers practice in detail. This study reveals to what extent science teachers know and apply the SPGP and their opinions about the more effective implementation of the SPGP. The questions for which answers are sought within the framework of this purpose are as follows:

1. What is science teachers' knowledge of the SPGP?
2. What are the applications of science teachers regarding the SPGP?
3. What are the science teachers' suggestions about using the SPGP effectively?

METHOD

Methodology

A case study was used in this research. A case study is used when one or more events or situations are intended to be examined in detail (McMillan & Schumacher, 2010). It is used to identify and describe the details that make up an event, provide explanations about an event, and evaluate an event (Gall et al., 2007). In this research, the case study design was chosen because the views and practices of science teachers about the SPGP were wanted to be determined in detail.

Participants

The sample consists of 73 science teachers from different regions of Türkiye, serving in 23 cities (Adana, Ağrı, Amasya, Ankara, Bingöl, Bursa, Erzincan, Erzurum, Eskişehir, Gaziantep, Iğdır, İstanbul, İzmit, Kahramanmaraş, Kayseri, Mersin, Muğla, Muş, Rize, Şırnak, Tekirdağ, Van and Zonguldak). 43 (58.9%) of the science teachers participating in the study are women and 30 (41.1%) are men. Convenience sampling methods and science teachers collected the data from all geographical regions Türkiye has tried to reach. Convenience sampling is used when sampling is easy to access and requires time and labor convenience (McMillan & Schumacher, 2010). There are seven geographic regions in Türkiye. The data obtained from the science teachers who participated in this study were evaluated under "east" and "west" regions, not separately in seven geographical regions. Turkey's western part (Marmara, Aegean, Western Black Sea Region, Mediterranean Region, and the Western part of Central Anatolia) is more advanced and economically, creating the part of the more affluent, eastern part (Eastern Black Sea Region, the Eastern Part of Central, Eastern and Southeastern Anatolia) is more includes underdeveloped cities. Ministry of Education, teacher assignments mostly take place in less developed cities of Türkiye's eastern (especially in Eastern and Southeastern Anatolia), which gives priority to Türkiye. Therefore, most science teachers who are new to the profession work in the eastern part of the country. Table 1 shows the distribution of the teachers participating in the study according to experience, the type of school, and gender.

Table 1. Science teachers participating in the study (gender, experience/seniortiy, the type of school served)

Gender	Region	Experience/Seniority (f)				Total
		1-5 years	6-10 years	11-15 years	16-20 years	
Women	East	22 (16SS, 6PS)	1PS	2SS	1SS	26
	West	13SS	2SS	1SS		17
Men	East	14 (8SS, 6PS)	6 (5SS, 1PS)	2SS	1SS	23
	West	3 (2SS, 1PS)	4 (3SS, 1PS)			7
Total		52	13	5	3	73

SS: State school, PS: Private school

According to Table 1, while 49 (26 women, 23 men) science teachers work in eastern cities, 24 (17 women, seven men) work in western cities. In addition, most of the science teachers who participated in the study were novices (1-5 years).

All ethical rules were followed, and the teachers' identities were kept confidential in this study. The teachers' names were not disclosed; each science teacher was coded ST1, ST2, or ST3… In this way, privacy was tried to be provided. Teachers voluntarily participated in this study; they were fully informed, and their consent was obtained before the study.

Data Collection

A questionnaire (Questionnaire of Seven Principles-QSP) consisting of 8 open-ended questions was used to collect data. Although the questionnaires generally contain closed-ended and short questions, open-ended questions are also used because they allow more detailed information to be obtained and can be used with smaller samples (McMillan & Schumacher, 2010). In addition, open-ended questionnaires should be used when individuals' answers regarding the research subject are essential and more appropriate (McMillan & Schumacher, 2010). For the research, the questionnaire was arranged to be open-ended. The questions were prepared to include all the SPGP created by Chickering and Gamson (1987). In the first question, teachers were asked what the SPGP was, and in the other questions, the practices and suggestions of the teachers for each principal were taken. Accordingly, the first question in the QSP consists of one; the other questions consist of two open-ended questions. After the questions were created, the QSP was reviewed by two science education experts. According to expert opinions, formal and semantic arrangements were made in the questionnaire. Later, the QSP was piloted with two science teachers. At the end of the pilot application, necessary corrections were made to the incomprehensible parts of the questions, and the survey was finalized. The QSP was applied directly to science teachers and on the internet. The questionnaire was directly applied to the teachers in the city where the researcher lived. The direct data collection process applied the QSP to science teachers face-to-face. To collect data online, the researcher sent the QSP to the participants via e-mail and a social media application and received feedback. The data in the study were collected on an entirely voluntary basis. Science teachers' identities would not be divulged, and they were asked to answer the questions honestly. The teachers were not asked for their names; only their city of residence, gender, state or private school, work, and experience (seniority) were taken.

Data Analyses

Descriptive statistics were made to the QSP data for the analysis, and the frequency and percentage values were examined. In addition, the answers given to the QSP by the science teachers participating in the study were analyzed according to gender, experience (seniority), and geographical region categories.

Content analysis is the systematic summarization of parts of a text in smaller and fewer words (Büyüköztürk et al., 2012). Separate themes and codes were created for each question when conducting the content analysis in this study. The codes created by the researcher were then re-coded by an expert. The percentage of agreement between the researcher and the expert was calculated by Miles and Huberman's (1994) formula [Reliability = consistency / (consistency + disagreement) x 100]. Consistency percentage was calculated as 98.3%. The themes and codes used in data analysis differ for each question. Therefore, the themes and codes were given in the findings section.

FINDINGS

Findings Related to the First Question of the QSP

The first question in the QSP aims to reveal science teachers' general knowledge of the SPGP. The science teachers' answers to the question were grouped under six themes. Table 2 shows the science teachers' answers to the first question.

Table 2. Findings regarding the first question in the QSP

Explain	Gender				Type of school				Experience (Seniority)								Region			
	Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Correct	5	11.6	2	6.7	5	8.8	2	12.5	5	9.6	2	15.4	-	-	-	-	5	10.2	2	8.3
Partially correct	15	34.8	12	40	22	38.6	5	31.3	18	34.6	6	46.2	2	40	1	50	16	32.7	9	37.5
I have no information. However, I think...	2	4.7	3	10	4	7	1	6.3	5	9.6	-	-	-	-	-	-	3	6.1	2	8.3
I have no information.	12	27.9	10	33.3	17	29.8	5	31.3	14	26.9	5	33.3	3	60	-	-	13	26.5	9	37.5
False	4	9.3	2	6.7	3	5.3	3	18.8	6	11.5	-	-	-	-	-	-	5	10.2	1	4.2
Empty	5	11.6	1	3.3	6	10.5	-	-	5	9.6	-	-	-	-	1	50	6	12.2	-	-

SS: State school, PS: Private school, E: East, W: West

According to Table 2, most science teachers participating in the study needed more information about the SPGP. Some sample expressions from science teachers' knowledge and opinions about the SPGP are given.

"One of the SPGP can be student-school, student-teacher interaction. The better the students adapt to the school, the higher the efficiency of education. The frequency of the relationship between the student and the teacher in the school affects the motivation of the student's interest in school. At the same time, the method and technique used in teaching can be one of these SPGP." ST4 (partially correct)

"I do not have detailed information on this subject. However, I think it covers the following questions I have been asked." ST24 (I have no information. But I think…)

Based on the examples above, some science teachers are aware of their contents even if they do not know the SPGP by name can be inferred.

Findings Related to the Second Question of the QSP

The second question in the QSP concerns student-school communication, which is the first principle of the SPGP. This question consists of two parts. In the first part, science teachers were asked what they did to increase student-school interaction, and in the second part, teachers' suggestions were taken on this issue. The first part of the question has been analyzed using three themes and 12 codes. Table 3 shows the science teachers' answers regarding the first part of the second question.

Table 3. Findings about the first part of the second question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Out-of-class Activities	Social	13	30.2	6	20	19	33.3	1	6.3	12	23.1	5	38.5	2	40	1	50	14	28.8	3	12.5
	Scientific/ related to subject	3	7	2	6.7	4	7	1	6.3	3	5.8	2	15.4	-	-	-	-	3	6.1	2	8.3
	Positive school environment	5	11.6	5	16.7	6	10.5	4	25	9	17.3	1	7.7	-	-	-	-	8	16.3	2	8.3
Communication	Students	10	23.3	3	10	10	17.5	3	18.8	11	21.2	2	15.4	-	-	-	-	7	14.3	6	25
	Parents	6	14	3	10	7	12.3	2	12.5	5	9.6	2	15.4	2	40	-	-	5	10.2	4	16.7
	School Management	1	2.3	1	3.3	1	1.8	1	6.3	1	1.9	1	7.7	-	-	-	-	2	4.1	-	-
	Guidance service	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
In-class Activities	Different methods, techniques	12	27.9	8	26.7	18	31.6	2	12.5	15	28.8	5	38.5	-	-	-	-	14	28.8	6	25
	Duty/ responsibility	3	7	3	10	4	7	2	12.5	3	5.8	2	15.4	-	-	1	50	4	8.2	2	8.3
	Positive classroom environment	6	14	5	16.7	10	17.5	1	6.3	8	15.4	1	7.7	1	20	1	50	7	14.3	4	16.7

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
	Relative to the student	2	4.7	3	10	5	8.8	-	-	2	3.8	1	7.7	2	40	-	-	2	4.1	3	12.5
	Active participation	3	7	3	10	3	5.3	3	18.8	6	11.5	-	-	-	-	-	-	4	8.2	2	8.3
I didn't make an effort		1	2.3	1	3.3	-	-	2	12.5	1	1.9	1	7.7	-	-	-	-	2	4.1	-	-
Empty		-	-	1	3.3	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 3, science teachers prioritize in-class and out-of-class activities to ensure student-school interaction. They tend to apply different methods and techniques for in-class activities and prioritize social activities for out-of-class activities. In addition, they try to communicate with students, parents, school administration, and guidance services to ensure student-school interaction. Sample responses of science teachers' practices regarding student-school interaction are given.

"I try to spend more time with the students. We attach importance to extracurricular activities. As extracurricular activities, we include music, painting, physical education, etc., only activities that students can do together in the school." ST40 (Out-of-class Activities- social)

"As a science teacher, I endeavor to teach the lessons in a fun way to both endear my class and encourage them to come to school." ST56 (Out-of-class Activities- Positive school environment)

"I try to chat with them outside of class and make them feel valued and love the school." ST5 (Communication- students)

"I try to process my lessons with activities and experiments as much as possible. I take advantage of all the possibilities to concretize the lesson." ST33 (In-class Activities- Different methods, techniques)

"There is a wide variety of studies. Some: By including students in board meetings, we receive their ideas, opinions, and suggestions. It also uses a 'wish box'. Every Friday, the principal examines the requests in the wish box and shares the suggestions and complaints with the school's stakeholders at the flag ceremony. Social media group information sharing (Facebook), school clubs, school family association meetings, and student-teacher sports activities (table tennis, chess, football matches) are held. One-to-one and group follow-ups are carried out with the student coaching system. Parent home visits and one-to-one meetings with appointments are held." ST18 (Out-of-class Activities- Scientific/ related to subject, Communication- Parents and School Management, In-class Activities- Duty/responsibility)

According to the examples, science teachers practice different practices inside and outside the school to ensure student-school interaction.

The second part of the question was analyzed using four themes and 17 codes. Table 4 shows the answers of the science teachers regarding the second part of the second question.

Table 4. Findings about the second part of the second question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Out-of-class Activities	Social	6	14	4	13.3	8	14	2	12.5	8	15.4	2	15.4	-	-	-	-	9	18.4	1	4.2
	Course load	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
	Positive school environment	1	2.3	2	6.7	2	3.5	1	6.3	3	5.8	-	-	-	-	-	-	1	2	2	8.3
	Physical facilities	2	4.7	1	3.3	3	5.3	-	-	1	1.9	1	7.7	1	20	-	-	2	4.1	1	4.2
Communication	Student	10	23.2	7	23.3	13	22.8	4	25	13	25	4	30.8	-	-	-	-	12	24.5	5	20.8
	Parent	5	11.6	1	3.3	5	8.8	1	6.3	5	9.6	1	7.7	-	-	-	-	5	10.2	1	4.2
	School Management	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
	Desire towards school/ lesson	3	7	3	10	5	8.8	1	6.3	5	9.6	-	-	1	20	-	-	4	8.2	2	8.3

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
	Trust	4	9.3	4	13.3	6	10.5	2	12.5	7	13.5	1	7.7	-	-	-	-	6	12.2	2	8.3
	Values education	1	2.3	1	3.3	2	3.5	-	-	2	3.8	-	-	-	-	-	-	2	4.1	-	-
In-class Activities	Different methods, techniques	5	11.6	1	3.3	6	10.5	-	-	4	7.7	1	7.7	-	-	1	50	2	4.1	4	16.7
	Duty/ responsibility	3	7	1	3.3	3	5.3	1	6.3	3	5.8	1	7.7	-	-	-	-	1	2	3	12.5
	Positive classroom environment	3	7	3	10	4	7	2	12.5	4	7.7	1	7.7	1	20	-	-	5	10.2	1	4.2
	Relative to the student	2	4.7	1	3.3	3	5.3	-	-	2	3.8	1	7.7	-	-	-	-	2	4.1	1	4.2
	Activities	8	18.6	5	16.7	10	17.5	3	18.8	9	17.3	-	-	2	40	2	100	8	16.3	5	20.8
	Active participation	2	4.7	-	-	2	3.5	-	-	2	3.8	-	-	-	-	-	-	1	2	1	4.2
Job	Teacher	2	4.7	-	-	2	3.5	-	-	2	3.8	-	-	-	-	-	-	2	4.1	-	-
Empty		4	9.3	4	13.3	6	10.5	2	12.5	5	9.6	1	7.7	2	40	-	-	6	12.2	2	8.3

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 4, they mainly made suggestions for communication and classroom activities to increase student-school interaction. In addition, some science teachers stated that student-school interaction would be increased with out-of-class activities. Some crucial suggestions of science teachers to increase student-school interaction are given.

"The needs of the children must be met. I think the biggest task here falls to the school administration. This unit manages the training needs and staffing required." ST70 (Out-of-class Activities- Physical facilities)

"Environments where the student can feel comfortable should be prepared." ST34 (Communication- Trust)

"Remarkable, up-to-date project assignments can be presented to the class, and a process can be planned per the student's request. For students to participate in the lesson more, current news on the subject can be brought to the classroom environment, and a discussion environment can be provided. Students can thus exchange ideas with each other. In addition, if there are areas of application in life-related to the subject covered in the course, a short explanation can be given to the student. If the student is informed about why he/she learns and where in his/her life he/she learns, his/her attitude towards the lesson will change. Having a positive attitude towards the lesson will increase school-student interaction." ST16 (In-class Activities- Different methods, techniques, Duty/ responsibility, and Positive classroom environment)

Considering the suggestions of science teachers to increase student-school interaction in the examples given, to increase interaction within and outside the school, improve communication, and create a positive classroom environment were emphasized.

Findings Related to the Third Question of the QSP

The third question in QSP is related to cooperation between students. This question consists of two parts. In the first part, science teachers were asked what they did to increase student-student interaction, and in the second part, teachers' suggestions were taken on this issue. The first part of the question was analyzed using two themes and nine codes. Table 5 shows the answers of the science teachers regarding the first part of the third question.

Table 5. Findings about the first part of the third question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
In-class Activities	Group work	18	41.9	19	63.3	29	50.9	8	50	23	44.2	9	69.2	3	60	2	100	26	53.1	11	45.8
	Group assignment	12	27.9	3	10	11	19.3	4	25	14	26.9	1	7.7	-	-	-	-	10	20.4	5	20.8
	Cooperative learning	3	7	3	10	4	7	2	12.5	4	7.7	2	15.4	-	-	-	-	4	8.2	2	8.3

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
	Different methods, techniques	14	32.6	8	26.7	16	28.1	6	37.5	16	30.8	3	23.1	3	60	-	-	13	26.5	9	37.5
	Interaction	3	7	4	13.3	6	10.5	1	6.3	4	7.7	3	23.1	-	-	-	-	5	10.2	2	8.3
Out-of-class Activities	Project	4	9.3	4	13.3	6	10.5	2	12.5	6	11.5	2	15.4	-	-	-	-	7	14.3	1	4.2
	Research	2	4.7	-	-	2	3.5	-	-	2	3.8	-	-	-	-	-	-	2	4.1		
	Quiz program	-	-	1	3.3	-	-	1	6.3	1	1.9	-	-	-	-	-	-	1	2		
	Social activities	2	4.7	3	10	4	7	1	6.3	4	7.7	1	7.7	-	-	-	-	3	6.1	2	8.3
Empty		1	2.3	1	3.3	1	1.8	1	6.3	2	3.8	-	-	-	-	-	-	2	4.1		

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 5, the majority of science teachers stated that they prefer classroom activities to increase student cooperation. At this point, science teachers especially value group work. Sample responses of science teachers' practices regarding cooperation between students are given.

"I do group work." ST71 (In-class Activities- Group work)

"I assign homework, solve tests in groups, and try to increase their cooperation by assigning project assignments." ST29 (In-class Activities- Group assignment and Different methods, techniques; Out-of-class Activities- Project)

"We spend time with our students not only in the school environment but also in environments that allow them to socialize with their environment (cinema, bowling, taboo, ..." ST35 (Out-of-class Activities- Social activities)

According to the examples, science teachers emphasize in-class and out-of-class student communication.

The second part of the question was analyzed using two themes and nine codes. Table 6 shows the science teachers' answers to this part of the third question.

Table 6. Findings about the second part of the third question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
In-class Activities	Group work	12	27.9	9	30	15	26.3	6	37.5	15	28.8	4	30.8	1	20	1	50	15	30.6	6	25
	Group assignment	6	14	3	10	3	5.3	6	37.5	8	15.4	1	7.7	-	-	-	-	8	16.3	1	4.2
	Cooperative learning	3	7	5	16.7	7	12.3	1	6.3	4	7.7	4	30.8	-	-	-	-	6	12.2	2	8.3
	Different methods, techniques	7	16.3	5	16.7	11	19.3	1	6.3	9	17.3	2	15.4	-	-	-	-	8	16.3	4	16.7
	Responsibility	4	9.3	2	6.7	4	7	2	12.5	4	7.7	1	7.7	-	-	1	50	4	8.2	2	8.3
	Interaction	12	27.9	8	26.7	15	26.3	5	31.3	13	25.0	6	46.2	1	20	-	-	16	32.7	4	16.7
Out-of-class Activities	Project	4	9.3	2	6.7	4	7	2	12.5	5	9.6	1	7.7	-	-	-	-	4	8.2	2	8.3
	Research	-	-	1	3.3	1	1.8	-	-	-	-	-	-	1	20	-	-	1	2	-	-
	Social activities	2	4.7	2	6.7	3	5.3	1	6.3	4	7.7	-	-	-	-	-	-	3	6.1	1	4.2
Empty		7	16.3	5	16.7	11	19.3	1	6.3	9	17.3	1	7.7	2	40	-	-	7	14.3	5	20.8

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 6, science teachers had the most suggestions about classroom activities, especially group work and communication, to increase student cooperation. Some crucial suggestions of science teachers for increasing cooperation between students are given.

"Students should be given not only individual responsibilities but also responsibilities to keep them organized and cooperative in group work." ST9 (In-class Activities- Responsibility)

"It is necessary to instill the belief that "unity is strength." They should observe that different ideas produce good work." ST12 (In-class Activities- Interaction)

"My recommendations are to increase out-of-school student interaction, increase cluster and group work, and adopt a cooperative learning model." ST45 (In-class Activities-Group work, Cooperative learning; Out-of-class Activities- Social activities)

According to the examples, science teachers value responsibility and interaction to ensure student cooperation and suggest cooperative learning.

Findings Related to the Fourth Question of the QSP

The fourth question in the QSP concerns the provision of active learning, which is the third principle of the SPGP. In the first part, science teachers were asked what they did to increase active learning, and in the second part, teachers' suggestions were taken on this issue. The first part of the question was analyzed using four themes and ten codes. Table 7 shows the answers of the science teachers regarding the first part of the fourth question.

Table 7. Findings about the first part of the fourth question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Different methods, techniques	Different methods	3	7	1	3.3	4	7	-	-	3	5.8	1	7.7	-	-	-	-	3	6.1	1	4.2
	Different techniques	21	48.8	18	60	31	54.4	8	50	32	61.5	6	46.2	-	-	1	50	25	51	14	58.3
	Technology	2	4.7	1	3.3	3	5.3	-	-	2	3.8	1	7.7	-	-	-	-	2	4.1	1	4.2
	Research/ Project	5	11.6	5	16.7	7	12.3	3	18.8	8	15.4	1	7.7	1	20	-	-	8	16.3	2	8.3
Communication	Responsibility	3	7	1	3.3	4	7	-	-	1	1.9	-	-	2	40	1	50	4	8.2	-	-
	Orientation	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
Learning by doing and experiencing	Active participant	12	27.9	7	23.3	15	26.3	4	25	14	26.9	4	30.8	1	20	-	-	12	24.5	7	29.2
	Take attention	6	14	5	16.7	8	14	3	18.8	6	11.5	4	30.8	1	20	-	-	6	12.2	5	20.8
	Creating environment	10	23.2	5	16.7	11	19.3	4	25	11	21.2	2	15.4	1	20	1	50	9	18.4	6	25
	Associating daily life	2	4.7	1	3.3	2	3.5	1	6.3	2	3.8	1	7.7	-	-	-	-	2	4.1	1	4.2
I am not doing anything		1	2.3	1	3.3	1	1.8	1	6.3	1	1.9	1	7.7	-	-	-	-	1	2	1	4.2

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to the answers given in Table 7, science teachers mostly turned to different methods and techniques to ensure active learning, and they tried to learn by doing and experiencing. Sample responses of science teachers' practices regarding providing active learning are given.

"Active learning is not possible for all subjects. However, I aim to reach information by combining parts like questions and answers, brainstorming, and induction. Since safety is at the forefront in laboratory activities, although I generally do it as a demonstration experiment, I include them in the work when necessary." ST7 (Different methods, techniques- Different techniques)

"I would like my students to do research. I want them to present their research in the classroom. I want them to work independently, and I want their work to relate to daily life." ST37 (Different methods, techniques- Research/ Project)

"I make the students participate in the lesson by giving them more responsibility. I also apply question and answer, brainstorming, and six hat techniques." ST39 (Different methods, techniques- Different techniques, responsibility)

"I put students at the center of the topic." ST28 (Learning by doing and experiencing- Active participant)

"To realize active learning, I am preparing an environment for students to participate in the class" ST15 (Learning by doing and experiencing- Creating environment)

According to the examples, science teachers apply different learning methods and techniques to ensure active learning and care about students' responsibilities and participation.

The second part of the question was analyzed using four themes and 19 codes. Table 8 shows the science teachers' answers to this part of the fourth question.

Table 8. Findings about the second part of the fourth question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Different methods, techniques	Different methods	4	9.3	1	3.3	4	7	1	6.3	4	7.7	1	7.7	-	-	-	-	4	8.2	1	4.2
	Different techniques	6	14	4	13.3	9	15.8	1	6.3	7	13.5	2	15.4	-	-	1	50	6	12.2	4	16.7
	Technology	1	2.3	3	10	3	5.3	1	6.3	4	7.7	-	-	-	-	-	-	4	8.2	-	-
	Thinking skills	1	2.3	-	-	1	1.8	-	-	-	-	1	7.7	-	-	-	-	-	-	1	4.2
	Research/ Project	2	4.7	-	-	2	3.5	-	-	2	3.8	-	-	-	-	-	-	1	2	1	4.2
Communication	Responsibility	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	-	-	1	4.2
	Orientation	1	2.3	4	13.3	3	5.3	2	12.5	1	1.9	4	30.8	-	-	-	-	3	6.1	2	8.3
	Interest, desire	-	-	2	6.7	1	1.8	1	6.3	1	1.9	-	-	-	-	1	50	2	4.1	-	-
	Interaction	-	-	1	3.3	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
	Self-expression	1	2.3	1	3.3	1	1.8	1	6.3	2	3.8	-	-	-	-	-	-	1	2	1	4.2
	Practitioners	1	2.3	1	3.3	2	3.5	-	-	1	1.9	1	7.7	-	-	-	-	2	4.1	-	-
Learning by doing and experiencing	Active participant	13	30.2	5	16.7	14	24.6	4	25	14	26.9	3	23.1	1	20	-	-	14	28.6	4	16.7
	Take attention	1	2.3	3	10	3	5.3	1	6.3	4	7.7	-	-	-	-	-	-	2	4.1	2	8.3
	Creating environment	2	4.7	1	3.3	2	3.5	1	6.3	2	3.8	1	7.7	-	-	-	-	3	6.1	-	-
	Individual differences	6	14	-	-	5	8.8	1	6.3	6	11.5	-	-	-	-	-	-	4	8.2	2	8.3
	Associating daily life	2	4.7	3	10	1	1.8	4	25	5	9.6	-	-	-	-	-	-	5	10.2	-	-
Extracurricular situations	Physical facilities	2	4.7	2	6.7	3	5.3	1	6.3	3	5.8	1	7.7	-	-	-	-	2	4.1	2	8.3
	Opportunity Equality	2	4.7	1	3.3	2	3.5	1	6.3	2	3.8	-	-	1	20	-	-	2	4.1	1	4.2
	Curriculum	1	2.3	1	3.3	1	1.8	1	6.3	1	1.9	1	7.7	-	-	-	-	-	-	2	8.3
Empty		7	16.3	5	16.7	11	19.3	1	6.3	9	17.3	-	-	3	60	-	-	8	16.3	4	16.7

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 8, they mostly touched on learning by doing for active learning. Also, teachers drew attention to communication issues with different methods and techniques. Some crucial suggestions for science teachers to increase active learning are given.

"There should be student assignments and activities that more students can do. Teaching should be done through project-based teaching or invention." ST17 (Different methods, techniques- Different methods)

"The most important learning for the science lesson is the one in which the laboratory is used, and the students take an active role. First, a laboratory environment must be created at the secondary school level. However, educational technologies should be supported and used as much as possible." ST40 (Different methods, techniques- Different techniques and technology)

"For students to express themselves, it is necessary to guide them and direct various scientific studies by respecting their ideas." ST8 (Different methods, techniques- Different techniques; Communication- Orientation and Self-expression; Learning by doing and experiencing- Associating daily life)

"My advice is to pay maximum attention to individual differences." ST3 (Learning by doing and experiencing- Individual differences)

"Every school should have a well-equipped library and technological equipment" ST-66 (Extracurricular situations- Physical facilities)

According to the examples, science teachers recommend using different teaching methods and techniques to ensure active learning, increase student interaction, associate the subjects with daily life, and improve the school's physical facilities.

Findings Related to the Fifth Question of the QSP

The fifth question in the QSP concerns prompt feedback, the fourth principle of the SPGP. In the first part, science teachers were asked what they did to give prompt feedback, and in the second part, teachers' suggestions were taken on this issue. The first part of the question was analyzed using four themes and 18 codes. Table 9 shows the answers of the science teachers regarding the first part of the fifth question.

Table 9. Findings about the first part of the fifth question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Different applications	Techniques	3	7	-	-	3	5.3	-	-	2	3.8	-	-	1	20	-	-	3	6.1	-	-
	Technology	-	-	1	3.3	-	-	1	6.3	1	1.9	-	-	-	-	-	-	1	2	-	-
	Research/ Project/ Homework	1	2.3	2	6.7	1	1.8	2	12.5	3	5.8	-	-	-	-	-	-	3	6.1	-	-
Feedback	Show errors	8	18.6	3	10	9	15.8	2	12.5	8	15.4	3	23.1	-	-	-	-	6	12.2	5	20.8
	Understanding the wrong	7	16.3	4	13.3	11	19.3	-	-	8	15.4	1	7.7	2	40	-	-	6	12.2	5	20.8
	Correct the wrong	8	18.6	3	10	8	14	3	18.8	8	15.4	2	15.4	1	20	-	-	8	16.3	3	12.5
	Find the right	8	18.6	2	6.7	8	14	2	12.5	8	15.4	1	7.7	1	20	-	-	6	12.2	4	16.7
	Emphasis	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	-	-	1	4.2
	Attractive	-	-	1	3.3	1	1.8	-	-	-	-	-	-	-	-	1	50	1	2	-	-
	Prompt	4	9.3	2	6.7	4	7	2	12.5	4	7.7	2	15.4	-	-	-	-	3	6.1	3	12.5
Clue/ Reinforcement	Clue	8	18.6	2	6.7	9	15.8	1	6.3	9	17.3	1	7.7	-	-	-	-	8	16.3	2	8.3
	Prize	11	25.6	5	16.7	12	21.1	4	25	11	21.2	4	30.8	1	20	-	-	13	26.5	3	12.5
Asking question	Whole process	12	27.9	10	33.3	18	31.6	4	25	14	26.9	5	38.5	3	60	-	-	16	32.7	6	25
	At the beginning of the course	1	2.3	2	6.7	2	3.5	1	6.3	3	5.8	-	-	-	-	-	-	3	6.1	-	-
	During the course	4	9.3	3	10	5	8.8	2	12.5	5	9.6	1	7.7	1	20	-	-	6	12.2	1	4.2
	At the end of the course	1	2.3	1	3.3	1	1.8	1	6.3	1	1.9	1	7.7	-	-	-	-	1	2	1	4.2
Test/ quiz	During the course	4	9.3	3	10	5	8.8	2	12.5	5	9.6	1	7.7	1	20	-	-	6	12.2	1	4.2
	At the end of the course	6	14	2	6.7	7	12.3	1	6.3	5	9.6	2	15.4	-	-	1	50	4	8.2	4	16.7
Empty		4	9.3	1	3.3	3	5.3	2	12.5	5	9.6	-	-	-	-	-	-	3	6.1	2	8.3

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 9, science teachers pay attention to the process of giving feedback about the fourth principle and ask questions in various parts of the course throughout the process. In addition, the teachers used claims and prizes to give feedback. Sample responses of science teachers' practices regarding giving prompt feedback are given.

"I answer the questions according to the readiness of the student. For example, I can get a drama work done right away." ST57 (Different applications- Techniques)

"I first try to make sure that the mistake made is understood and remedied by the student by giving hints. I look at "what he/she has to understand," "what he/she has to understand, " ST22 (Feedback- Show errors and Understanding the wrong)

"I use the question-and-answer method. I give awards to honor students." ST19 (Clue/ Reinforcement- Prize)

"I check what they know before starting my lesson. During the lecture, "What have we learned? "What was this?" "Who remembers this?" I ask questions in the style of." ST13 (Asking question- Whole process, At the beginning of the course and During the course)

"I do small quizzes at the end of the topic. These questions are sometimes open-ended and sometimes multiple-choice. We check the answers together with the students to see the mistakes made. Seeing the correct answers, they become aware of their mistakes." ST4 (Feedback- Show errors; Test/ quiz- At the end of the course)

According to the examples, science teachers use different practices to fulfill the instant feedback principle. They show students their mistakes, give clues, ask questions in the teaching process, and conduct tests and quizzes to determine whether the subjects are understood.

The second part of the question was analyzed using six themes and 17 codes. The science teachers' answers regarding the second part of the fifth question are given in Table 10.

Table 10. Findings about the second part of the fifth question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Different applications		4	9.3	3	10	4	7	3	18.8	4	7.7	3	23.1	-	-	-	-	5	10.2	2	8.3
Feedback	Show errors	3	7	2	6.7	3	5.3	2	12.5	4	7.7	-	-	1	20	-	-	3	6.1	2	8.3
	Understanding the wrong	2	4.7	-	-	2	3.5	-	-	2	3.8	-	-	-	-	-	-	1	2	1	4.2
	Correct the wrong	1	2.3	1	3.3	1	1.8	1	6.3	2	3.8	-	-	-	-	-	-	2	4.1	-	-
	Find the right	1	2.3	2	6.7	3	5.3	-	-	2	3.8	1	7.7	-	-	-	-	3	6.1	-	-
	During the course	4	9.3	1	3.3	4	7	1	6.3	5	9.6	-	-	-	-	-	-	3	6.1	2	8.3
	Language	8	18.6	4	13.3	8	14	4	25	11	21.2	1	7.7	-	-	-	-	10	20.4	2	8.3
	Prompt	2	4.7	6	20	8	14	-	-	4	7.7	4	30.8	-	-	-	-	4	8.2	4	16.7
Clue/ Reinforcement	Clue	1	2.3	1	3.3	2	3.5	-	-	2	3.8	-	-	-	-	-	-	2	4.1	-	-
	Prize	5	11.6	4	13.3	8	14	1	6.3	5	9.6	3	23.1	-	-	1	50	7	14.3	2	8.3
Asking question	Whole process	1	2.3	1	3.3	2	3.5	-	-	1	1.9	1	7.7	-	-	-	-	2	4.1	-	-
	During the course	2	4.7	-	-	2	3.5	-	-	2	3.8	-	-	-	-	-	-	2	4.1	-	-
	At the end of the course	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	-	-	1	4.2
Test/ quiz	At the beginning of the course	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	-	-	1	4.2
	At the end of the course	3	7	1	3.3	3	5.3	1	6.3	2	3.8	2	15.4	-	-	-	-	2	4.1	2	8.3
Communication	Recognition	-	-	1	3.3	-	-	1	6.3	1	1.9	-	-	-	-	-	-	1	2	-	-
	Interaction	5	11.6	4	13.3	7	12.3	2	12.5	7	13.5	1	7.7	1	20	-	-	6	12.2	3	12.5
	To the students	-	-	1	3.3	-	-	1	6.3	1	1.9	-	-	-	-	-	-	1	2	-	-
Empty		12	27.9	8	26.7	16	28.1	4	25	15	28.8	1	7.7	3	60	1	50	12	24.5	8	33.3

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 10, the teachers offered the most suggestions for the feedback processes to give prompt feedback. In addition, suggestions for giving clues/reinforcements, communicating with students, and applying different methods were also determined. Some critical suggestions from science teachers for prompt feedback are given.

"Using the question-answer technique more widely" ST31 (Different applications)

"When giving feedback, it should be given in a softer voice and more understandable way so that the student finds his / her mistake and permanent learning takes place." ST5 (Feedback- Language)

"I think giving the prompt feedback will prevent misperception." ST7 (Feedback- Prompt)

"If the correct answer is given, it should be rewarded with reinforcements, and if the wrong answer is given, the student should be aware of this instead of telling the student that the answer is wrong." ST17 (Feedback - Understanding the wrong; Clue/ Reinforcement- Prize)

"Let the students ask lots of questions so that their wonderful minds work harder." ST56 (Asking the question- During the course)

"We can get feedback on what we have learned at the end of each lesson with the question and answer method, or, as I said before, we can make short scans on the subject." ST11 (Asking the question- At the end of the course; Test/ quiz- At the end of the course)

"It is necessary not to lose eye contact with the student and to focus on the subject by asking questions to distract the instant distraction." ST25 (Feedback- Prompt; Communication- Interaction)

According to the examples, science teachers offer suggestions for effectively using the instant feedback principle, including giving feedback on time, showing students their mistakes, giving clues to find mistakes, interacting with students, and asking questions at the end of the lesson.

Findings Related to the Sixth Question of the QSP

The sixth question in the QSP concerns time on task, which is the fifth principle of the SPGP. In the first part, science teachers were asked what they did to complete time on task, and in the second part, teachers' suggestions were taken on this issue. The first part of the question was analyzed using three themes and 19 codes. Table 11 shows the answers of the science teachers regarding the first part of the sixth question.

Table 11. Findings about the first part of the sixth question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Reinforcement	Prize	21	48.8	8	26.7	26	45.6	3	18.8	21	40.4	4	30.8	3	60	1	50	20	40.8	9	37.5
	Reinforcement	5	11.6	2	6.7	6	10.5	1	6.3	6	11.5	-	-	-	-	1	50	4	8.2	3	12.5
	Punishment	6	14	3	10	7	12.3	2	12.5	7	13.5	2	15.4	-	-	-	-	6	12.2	3	12.5
Task	Tell time	5	11.6	1	3.3	6	10.5	-	-	4	7.7	1	7.7	1	20	-	-	2	4.1	4	16.7
	Complete on time	-	-	2	6.7	1	1.8	1	6.3	1	1.9	1	7.7	-	-	-	-	2	4.1	-	-
	Check in time	5	11.6	5	16.7	9	15.8	1	6.3	5	9.6	4	30.8	1	20	-	-	4	8.2	6	25
	Responsibility (student)	7	16.3	3	10	8	14	2	12.5	9	17.3	-	-	-	-	1	50	8	16.3	2	8.3
	Responsibility (teacher)	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	-	-	1	4.2
	Working schedule	3	7	5	16.7	5	8.8	3	18.8	5	9.6	3	23.1	-	-	-	-	5	10.2	3	12.5
	Criterion	-	-	2	6.7	2	3.5	-	-	-	-	1	7.7	1	20	-	-	2	4.1	-	-
	Results	6	14	4	13.3	8	14	2	12.5	9	17.3	-	-	1	20	-	-	6	12.2	4	16.7
	Flexible time	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	-	-	1	4.2
	Reminding	-	-	3	10	3	5.3	-	-	1	1.9	2	15.4	-	-	-	-	3	6.1	-	-
	Importance of time	-	-	1	3.3	-	-	1	6.3	1	1.9	-	-	-	-	-	-	1	2	-	-
	Note	4	9.3	-	-	4	7	-	-	3	5.8	-	-			1	50	4	8.2	-	-
	To assign a task to those who want	-	-	1	3.3	1	1.8	-	-	-	-	1	7.7	-	-	-	-	1	2	-	-
Communication	Motivation	3	7	2	6.7	4	7	1	6.3	3	5.8	1	7.7	1	20	-	-	5	10.2	-	-
	Guidance	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	-	-	1	4.2
	Parent	1	2.3	1	3.3	1	1.8	1	6.3	2	3.8	-	-	-	-	-	-	2	4.1	-	-

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 11, science teachers give their students the most tasks and reinforcements to ensure they fulfill their tasks on time. In addition, some teachers stated that they emphasize communication with students. Sample responses of science teachers' practices regarding providing time on task are given.

"I give plus and minus in the lesson so that they do the tasks on time. I use the verbal grade for the tasks within certain criteria." ST6 (Reinforcement-Prize and Punishment; Task- Note)

"I use reinforcements" ST42 (Reinforcement- Reinforcement)

"Occasionally, I follow the student. I always keep the time between follow-ups different. Thus, the student thinks there will be an inspection at any time and does his homework and tasks on time." ST40 (Task- Responsibility (student))

"At this point, I give all the situations, such as when my task will be controlled, how I want it to be done, and how I will evaluate it. After all, I continue the process as I mentioned at the beginning. If the homework is not on time, I definitely do not take it. Sometimes, I indicate the date of the assignment at the beginning. I stated that I would score points for homework that was not brought in on time. I use the first method for short-term assignments. For long-term homework, I use the score-breaking method." ST55 (Task- Tell time and Check-in time)

"I award it as a smile, caress your head, or a nice pencil. I think the love we give to children can make them do anything." ST1 (Reinforcement- Prize; Communication- Motivation)

According to the examples given, science teachers use reinforcements to ensure the timely fulfillment of the tasks they assign to their students. They also assign the students responsibility for the task, check the homework on time, and motivate them to perform it.

The second part of the question was analyzed using three themes and 20 codes. Table 12 shows the science teachers' answers regarding the second part of the sixth question.

Table 12. Findings about the second part of the sixth question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Reinforcement	Prize	10	23.2	3	10	10	17.5	3	18.8	11	21.2	1	7.7	-	-	1	50	10	20.4	3	12.5
	Reinforcement	4	9.3	1	3.3	5	8.8	-	-	4	7.7	-	-	1	20	-	-	3	6.1	2	
	Punishment	4	9.3	2	6.7	4	7	2	12.5	5	9.6	1	7.7	-	-	-	-	6	12.2	-	-
Task	Tell time	2	4.7	-	-	2	3.5	-	-	1	1.9	1	7.7	-	-	-	-	-	-	2	8.3
	Complete on time	-	-	1	3.3	-	-	1	6.3	-	-	1	7.7	-	-	-	-	1	2	-	-
	Check in time	-	-	3	10	2	3.5	1	6.3	1	1.9	2	15.4	-	-	-	-	2	4.1	1	4.2
	Responsibility (student)	3	7	4	13.3	6	10.5	1	6.3	5	9.6	2	15.4	-	-	-	-	6	12.2	1	4.2
	Responsibility (teacher)	-	-	2	6.7	1	1.8	1	6.3	1	1.9	1	7.7	-	-	-	-	2	4.1	-	-
	Working schedule	-	-	2	6.7	2	3.5	-	-	1	1.9	-	-	-	-	1	50	2	4.1	-	-
	Criterion	2	4.7	2	6.7	3	5.3	1	6.3	2	3.8	2	15.4	-	-	-	-	3	6.1	1	4.2
	Results	2	4.7	-	-	1	1.8	1	6.3	2	3.8	-	-	-	-	-	-	2	4.1	-	-
	To the student	2	4.7	1	3.3	3	5.3	-	-	2	3.8	1	7.7	-	-	-	-	2	4.1	1	4.2
	Reminding	-	-	1	3.3	1	1.8	-	-	-	-	1	7.7	-	-	-	-	-	-	1	4.2
	Importance of time	5	11.6	4	13.3	6	10.5	3	18.8	6	11.5	2	15.4	-	-	1	50	6	12.2	3	12.5
	Appropriate levels	4	9.3	2	6.7	5	8.8	1	6.3	5	9.6	-	-	1	20	-	-	3	6.1	3	12.5
	Simple to complex	1	2.3	1	3.3	1	1.8	1	6.3	2	3.8	-	-	-	-	-	-	2	4.1	-	-
	To assign a task to those who want	-	-	1	3.3	1	1.8	-	-	-	-	1	7.7	-	-	-	-	1	2	-	-
Communication	Motivation	1	2.3	1	3.3	-	-	2	12.5	2	3.8	-	-	-	-	-	-	2	4.1	-	-
	Guidance	2	4.7	-	-	2	3.5	-	-	2	3.8	-	-	-	-	-	-	2	4.1	-	-
	Parent	1	2.3	1	3.3	1	1.8	1	6.3	1	1.9	1	7.7	-	-	-	-	1	2	1	4.2
Empty		10	23.2	7	23.3	15	26.3	2	12.5	12	23.1	2	15.4	3	60	-	-	9	18.4	8	33.3

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

Considering the teachers' suggestions to ensure that the tasks on time, according to Table 12, the most suggestion was to assign a task to the student was determined. In addition, reinforcement and effective communication are among other essential suggestions. Some crucial suggestions from science teachers about the time spent on tasks are given.

"I think the best way for students to do their assigned tasks on time is rewarding. In this way, the student performs their duties on time and ensures learning." ST11 (Reinforcement- Prize)

"Assigning duties in line with the student's wishes and ensuring the development of a sense of responsibility." ST7 (Task- Responsibility (student))

"I emphasize that a timely task is more permanent than a timelessly perfect one. The teacher's teaching time in the course should be short. A course flow should be arranged based on the active participation of students in equal time intervals. The teacher should not interfere with the student's break time and should use the time allocated for the lesson in a planned way. Moreover, the teacher should emphasize to his/her students that time is precious and that they should act accordingly." ST37 (Task- Importance of time)

"My recommendation is to create a sense of responsibility for the student, to understand the importance of the task, to guide him/her in this process, and to reward him/her. Also, incentives are significant." ST45 (Task- Responsibility (student); Communication – Guidance; Reinforcement- Prize)

According to the examples given, science teachers recommended fulfilling tasks on time, rewarding students who do their duties on time, developing task responsibility in students, understanding the importance of performing tasks on time, and guiding students in the process.

Findings Related to the Seventh Question of the QSP

The seventh question in the QSP aims to respond to high expectations, the sixth principle of the SPGP. In the first part, science teachers were asked what they did to answer high expectations, and in the second part, teachers' suggestions were taken on this issue. The first part of the question was analyzed using six themes and 17 codes. Table 13 shows the answers of the science teachers regarding the first part of the seventh question.

Table 13. Findings about the first part of the seventh question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Individual development (teacher)		9	20.9	11	36.7	10	17.5	10	62.5	14	26.9	5	38.5	1	20	-	-	16	32.7	4	16.7
Communication	Orientation	2	4.7	1	3.3	3	5.3	-	-	3	5.8	-	-	-	-	-	-	1	2	2	8.3
	Encouragement	4	9.3	-	-	3	5.3	1	6.3	3	5.8	1	7.7	-	-	-	-	2	4.1	2	8.3
	Guidance	4	9.3	4	13.3	6	10.5	2	12.5	7	13.5	1	7.7	-	-	-	-	4	8.2	4	16.7
	Listening	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	-	-	1	4.2
	Parent	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
	Recognition	1	2.3	3	10	4	7	-	-	3	5.8	-	-	-	-	1	50	2	4.1	2	8.3
In-class	Student level	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
	Active participation	3	7	-	-	3	5.3	-	-	2	3.8	1	7.7	-	-	-	-	-	-	3	12.5
	Individual differences	-	-	1	3.3	1	1.8	-	-	1	1.9	-	-	-	-	-	-	-	-	1	4.2
	Task	1	2.3	1	3.3	2	3.5	-	-	1	1.9	1	7.7	-	-	-	-	1	2	1	4.2
	Prize	2	4.7	-	-	2	3.5	-	-	1	1.9	1	7.7	-	-	-	-	1	2	1	4.2
	Different activities	2	4.7	5	16.7	7	12.3	-	-	4	7.7	1	7.7	1	20	1	50	6	12.2	1	4.2
	High level activities	3	7	1	3.3	4	7	-	-	1	1.9	-	-	2	40	1	50	3	6.1	1	4.2
Out-of-class	Career choice	-	-	1	3.3	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
	Project etc.	1	2.3	1	3.3	1	1.8	1	6.3	1	1.9	1	7.7	-	-	-	-	1	2	-	-
	Access to resources	1	2.3	1	3.3	2	3.5	-	-	1	1.9	1	7.7	-	-	-	-	1	2	1	4.2
	Announce success	-	-	2	6.7	2	3.5	-	-	1	1.9	1	7.7	-	-	-	-	1	2	1	4.2
I am not doing anything extra.		1	2.3	1	3.3	2	3.5	-	-	1	1.9	1	7.7	-	-	-	-	1	2	1	4.2
Students do not have high expectations.		6	14	2	6.7	7	12.3	1	6.3	4	7.7	3	23.1	1	20	-	-	4	8.2	4	16.7
Empty		3	7	2	6.7	4	7	1	6.3	5	9.6	-	-	-	-	-	-	4	8.2	1	4.2

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 13, science teachers pay attention to communication with students, in-class activities, and their personal development to meet the high expectations of their students. In addition, some teachers say that they apply for extracurricular

activities to increase the high expectations of the students. However, only some teachers state that their students have low expectations. Some of the science teachers' opinions about the practices they make to meet high expectations are given.

"I am trying to update myself to make it more effective in my field. I am trying to follow the development of technology in my field." ST12 (Individual development (teacher))

"First, I get the student to know himself/herself." ST14 (Communication- Recognition)

"Since the expectations of the students are low, I try to make the students love my lesson to maximize their expectations, to gradually taste the sense of success, to show that the student has succeeded, and to help them become aware of their abilities. I set goals with the students and reward them when they succeed. Sometimes a chocolate, sometimes a compliment etc. I reward according to the situation." ST55 (Communication- Guidance, Encouragement; In-class- Active participation, Prize)

"I am giving project assignments." ST51 (Out-of-class- Project etc.)

"I have not yet witnessed that the students have high expectations from me. I guess I generally have high expectations. Students avoid questioning and asking questions; they turn to whatever is easy. They prefer to be given more information that is ready for them. It is difficult to think and comment." ST4 (Students do not have high expectations)

According to the examples, science teachers try to improve themselves to meet their students' high-level expectations, get to know them, encourage them, provide active participation, reward them, and carry out extracurricular activities. However, some teachers state that their students have low expectations.

The second part of the question was analyzed using four themes and 12 codes. Table 14 shows the science teachers' answers regarding the second part of the seventh question.

Table 14. Findings about the second part of the seventh question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Individual development (teacher)		9	20.9	7	23.3	10	17.5	6	37.5	12	23.1	3	23.1	1	20	-	-	13	26.5	3	12.5
Communication	Orientation	1	2.3	2	6.7	3	5.3	-	-	2	3.8	1	7.7	-	-	-	-	2	4.1	1	4.2
	Encouragement	2	4.7	1	3.3	3	5.3	-	-	2	3.8	1	7.7	-	-	-	-	2	4.1	1	4.2
	Guidance	2	4.7	-	-	2	3.5	-	-	1	1.9	1	7.7	-	-	-	-	1	2	1	4.2
	Listening	2	4.7	1	3.3	3	5.3	-	-	3	5.8	-	-	-	-	-	-	1	2	2	8.3
	Parent	1	2.3	-	-	1	1.8	-	-	-	-	-	-	-	-	1	50	1	2	-	-
	Recognition	1	2.3	1	3.3	2	3.5	-	-	2	3.8	-	-	-	-	-	-	2	4.1	-	-
In-class	Student level	1	2.3	-	-	-	-	1	6.3	1	1.9	-	-	-	-	-	-	1	2	-	-
	Task	2	4.7	2	6.7	4	7	-	-	3	5.8	1	7.7	-	-	-	-	4	8.2	-	-
	Different activities	3	7	2	6.7	5	8.8	-	-	2	3.8	1	7.7	1	20	1	50	2	4.1	3	12.5
	High level activities	3	7	3	10	6	10.5	-	-	4	7.7	2	15.4	-	-	-	-	3	6.1	3	12.5
Out-of-class	Physical facilities	-	-	2	6.7	2	3.5	-	-	1	1.9	1	7.7	-	-	-	-	2	4.1	-	-
	Project etc.	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
Empty		17	39.5	12	40	20	35.1	9	56.3	21	40.4	5	38.5	3	60	-	-	18	36.7	11	45.8

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 14, science teachers made suggestions to increase their personal development, give importance to communication with students, and pay attention to some points in in-class activities to meet the high expectations of their students. Some important suggestions given by science teachers for meeting the high expectations of students are given.

"We need to do research and master extracurricular topics." ST5 (Individual development (teacher))

"Every student's expectation should be answered without being seen as worthless or worthless." ST17 (Communication- Listening)

"I think it will contribute to learning if teachers raise their expectations to a higher level by providing learning environments that arouse curiosity in students." ST36 (In-class- Different activities)

"It is necessary to follow the student with studies that can be developed in the short, medium, and long term and to release his/her creativity in controlled areas where he/she can use it." ST19 (In-class- High-level activities)

"Since students are very impressed by the learning environment, the better opportunities are provided, the more expectations we can meet." ST46 (Out-of-class- Physical facilities)

According to the examples given, science teachers make recommendations for the teacher to develop himself/herself, listen to the students, create different learning environments, perform high-level activities, and improve physical conditions to meet the high expectations of their students.

Findings Related to the Eighth Question of the QSP

The eighth question in the QSP is about tolerance towards different learning styles, which is the seventh principle of the SPGP. In the first part, science teachers were asked what they did with tolerance towards different learning styles, and in the second part, teachers' suggestions were taken on this issue. The first part of the question was analyzed in a way that included three themes and 13 codes. Table 15 shows the answers of the science teachers regarding the first part of the eighth question.

Table 15. Findings about the first part of the eighth question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Different methods/ techniques	Methods	20	46.5	17	56.7	33	57.9	4	25	25	48.1	7	53.8	5	100	-	-	24	49	13	54.2
	Techniques	17	39.5	7	23.3	20	35.1	4	25	18	34.6	3	23.1	2	40	1	50	16	32.7	8	33.3
	According to majority	5	11.6	1	3.3	6	10.5	-	-	5	9.6	-	-	-	-	1	50	2	4.1	4	16.7
	Technology	8	18.6	3	10	9	15.8	2	12.5	10	19.2	1	7.7	-	-	-	-	6	12.2	5	20.8
In-class	Audio-visual different activities	9	20.9	3	10	10	17.5	2	12.5	10	19.2	2	15.4	-	-	-	-	5	10.2	7	29.2
	Different examples	2	4.7	1	3.3	2	3.5	1	6.3	2	3.8	1	7.7	-	-	-	-	3	6.1	-	-
	Different tasks	1	2.3	4	13.3	3	5.3	2	12.5	3	5.8	1	7.7	1	20	-	-	4	8.2	1	4.2
	Repeat the subject	1	2.3	2	6.7	2	3.5	1	6.3	1	1.9	2	15.4	-	-	-	-	2	4.1	1	4.2
Process	Learning style	6	14	6	20	8	14	4	25	8	15.4	3	23.1	-	-	1	50	10	20.4	2	8.3
	Simple to complex	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
	Easy to difficult	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
	Know the student	4	9.3	2	6.7	5	8.8	1	6.3	4	7.7	1	7.7	1	20	-	-	3	6.1	3	12.5
	Suitable environment	2	4.7	1	3.3	2	3.5	1	6.3	3	5.8	-	-	-	-	-	-	2	4.1	1	4.2
Empty		2	4.7	-	-	1	1.8	1	6.3	2	3.8	-	-	-	-	-	-	2	4.1	-	-

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 15, most science teachers stated that they mostly used different methods and techniques to help students with different learning styles learn. In addition, some science teachers stated that they pay attention to learning principles in the learning process and try to get to know students. Also, some science teachers pay attention to diversity in in-class activities. Some opinions of science teachers about their practices to tolerate students with different learning styles are given.

"While explaining a subject, I try to address many sensory organs. For example, while explaining the subject of 8th-grade chemical bonds, I make them understand bond formation with the drama technique, I show the bond formation video and visual from the smart board, and I try to explain why the bond should be formed cognitively." ST24 (Different methods/ techniques- Techniques, Technology)

"I mostly use laboratory technique, visuals, video pictures on the smart board, and cooperative learning methods." ST44 (Different methods/ techniques- Methods, Techniques, Technology; In-class- Audiovisual different activities)

"I prepare a learning environment by considering the learning styles of these students. For example, some students learn better when associated with daily life. Some students also learn by experimenting or practicing at school. This way, I try to meet the needs of the students." ST72 (Process- Learning style)

"I must fill out a recognition receipt or form to get to know the students. Then, I design different learning activities suitable for them. I do group, cluster, and workshop work in the classroom and interact with students with different learning abilities." ST45 (Process- Learning style, Know the student)

According to the examples, science teachers use various teaching methods and techniques to reach students with different learning styles, use technology, consider students' learning styles, and try to get to know students.

The second part of the question was analyzed using three themes and 12 codes. Table 16 shows the science teachers' answers to the second part of the eighth question.

Table 16. Findings about the second part of the eighth question in the QSP

Themes and codes*		Gender				Type of School				Experience (Seniority)								Region			
		Women		Men		SS		PS		1-5		6-10		11-15		16-20		E		W	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Different methods/ techniques	Methods	11	25.6	8	26.7	13	22.8	6	37.5	14	26.9	4	30.8	1	20	-	-	16	32.7	3	12.5
	Techniques	12	27.9	7	23.3	13	22.8	6	37.5	15	28.8	3	23.1	1	20	-	-	15	30.6	4	16.7
	Technology	2	4.7	-	-	1	1.8	1	6.3	2	3.8	-	-	-	-	-	-	1	2	1	4.2
In-class	Audio-visual different activities	5	11.6	3	10	7	12.3	1	6.3	7	13.5	1	7.7	-	-	-	-	4	8.2	4	16.7
	Different tasks	1	2.3	1	3.3	2	3.5	-	-	-	-	1	7.7	-	-	1	50	2	4.1	-	-
Process	Learning style	2	4.7	2	6.7	2	3.5	2	12.5	2	3.8	2	15.4	-	-	-	-	2	4.1	2	8.3
	Interest	1	2.3	-	-	1	1.8	-	-	1	1.9	-	-	-	-	-	-	1	2	-	-
	Level	2	4.7	-	-	2	3.5	-	-	2	3.8	-	-	-	-	-	-	2	4.1	-	-
	Types of intelligence	2	4.7	2	6.7	3	5.3	1	6.3	4	7.7	-	-	-	-	-	-	2	4.1	2	8.3
	Individual differences	3	7	7	23.3	9	15.8	1	6.3	6	11.5	3	23.1	-	-	1	50	6	12.2	4	16.7
	Know the student	9	20.9	4	13.3	12	21.1	1	6.3	11	21.2	1	7.7	1	20	-	-	8	16.3	5	20.8
	Suitable environment	4	9.3	5	16.7	8	14	1	6.3	8	15.4	1	7.7	-	-	-	-	5	10.2	3	12.5
Empty		8	18.6	6	20	10	17.5	4	25	10	19.2	1	7.7	2	40	-	-	11	22.4	3	12.5

*Some teachers commented on more than one theme and code. SS: State school, PS: Private school, E: East, W: West

According to Table 16, most science teachers had suggestions for considering various factors, such as recognizing the student, creating an appropriate learning environment in the learning process, and using different methods and techniques in lessons to ensure students with different learning styles learn. Some opinions of science teachers about the applications that can be done for students with different learning styles are given.

"A teacher needs to know alternative learning methods. After gaining this knowledge, he should observe the students, determine a method for the student, and use that method in the lesson." ST65 (Different methods/ techniques- Methods, Techniques)

"If I have students with different learning styles, instead of teaching monotonous lessons in the classroom, I use different methods to help them become activated. For example, I participate in the lesson by asking questions to students who do not attend the lesson. If we are solving a problem, I have a student removed. I can recommend them." ST67 (Different methods/ techniques- Techniques)

"Students can be guided and assigned by considering individual differences. No matter how much you try to do this in the classroom environment, I think a moderate line can be followed." ST7 (In-class- Different tasks; Process- Individual differences)

"Using different teaching methods is not an easy task. Therefore, the factors that hinder learning in the classroom environment should be eliminated. Students with different learning strategies should be determined in advance and planned accordingly.

Activities for each learning area should be selected." ST37 (Process- Individual differences, Know the student, Suitable environment)

According to the examples, science teachers suggest using different teaching methods and techniques to ensure the active participation of students with different learning styles. They should give students different tasks, pay attention to individual differences, and try to recognize students and create appropriate learning environments.

DISCUSSION

In this study, science teachers' level of knowledge about SPGP was low. The majority of the teachers had yet to learn about SPGP. In this context, there was no difference in the teachers' answers according to gender, school type, experience (seniority), and school region. Teachers' lack of theoretical knowledge about the seven principles may be due to the limited number of practical studies on the seven principles. Another factor may be that teachers working in secondary schools need to be made aware of the SPGP since it is emphasized in undergraduate education. However, most teachers reasoned about what SPGP could be and provided partially correct answers. Although the teachers did not know the SPGP by name, they applied it in their lessons. In parallel with this study's results, science teachers' opinions in previous studies on SPGP were at low and medium levels (Koç et al., 2014; Öztürk et al., 2013).

Famale teachers emphasized out-of-class activities and communication to increase student-school interaction (Principle 1). In comparison, male teachers gave more importance to in-class and out-of-class activities. In studies, women have better communication skills (Bugay & Korkut Owen, 2016; Gölönü & Karcı, 2010; Taşkın et al., 2010). Teachers working in public schools paid more attention to in-class and out-of-class activities. In contrast, teachers working in private schools paid particular attention to active participation in the classroom. In private schools, students' success is critical to increase the school's recognition. In this respect, it may be aimed to increase communication with students in classroom practices. When the teachers' responses in terms of experience were analyzed, social activities outside the classroom were used more frequently as experience increased. This situation can be interpreted as teachers develop themselves more socially as their professional experience increases and their interaction with their students' increases. Similarly, the preference for in-class activities to increase student-school interaction generally increases with increasing experience. Here, teachers' getting more accustomed to the profession with increasing experience is adequate. However, all teachers mostly used in-class activities to increase student-school interaction. On the other hand, teachers with 1-5 years of experience were also found to conduct out-of-class activities to increase student-school interaction. This situation can be interpreted as novice teachers being more oriented towards out-of-class activities as they adapt to the school. When teacher responses regarding the region were analyzed, teachers working in the East and West of the country generally gave similar responses.

When we look at the teachers' suggestions to increase student-school interaction, women mostly suggested in-class activities and giving importance to communication, while men suggested giving importance to communication. This situation may be based on teachers knowing that communication is essential in student-school interaction. Teachers working in public and private schools stated that communication should be necessary. In addition, teachers working in public schools stated that in-class activities should be increased. According to these suggestions for increasing student-school interaction, the fact that there are not many environments suitable for out-of-class activities in some public schools may have prompted teachers to spend more productive time with their students in the classroom. While teachers with 1-5 years and 6-10 years of experience emphasized the importance of communication to increase student-school interaction, teachers with 11-15 years and 16-20 years of experience mainly emphasized increasing in-class activities. Teachers with less professional experience tend to increase their communication skills. Teachers working in the East stated that more emphasis should be placed on communication to improve student-school interaction. In contrast, teachers in the West stated that more emphasis should be placed on classroom activities. Since newly appointed teachers usually work in the East of the country, this result is parallel between professional experience and the region of work.

Both male and female teachers mostly used in-class activities to increase student cooperation (Principle 2). Especially male teachers spent more time on group work. According to school type, professional experience, and region of assignment, all teachers did more in-class activities to increase student cooperation. Considering that students spend most of their time in the classroom, the easiest way to increase student interaction and cooperation is to work together in classroom activities. Lalit and Piplani (2019) and Sormunen et al. (2020) emphasized the importance of collaboration to ensure active learning of individuals. They stated that active learning increases the participation of individuals in the learning process in an environment of collaboration.

When the teachers' suggestions regarding cooperation among students were examined, male and female teachers had similar views on increasing communication and conducting in-class activities. Teachers working in public schools suggested cooperative learning and different activities, while teachers working in private schools suggested group work. Regarding professional experience, teachers' responses were similar, and they recommended more in-class activities. Regarding the assignment region, teachers in the East recommended implementing more in-class activities. Considering that the East of the country is less socioeconomically developed and that newly appointed teachers usually work in villages or small settlements in the East, they can provide the most communication with students in school. Because in small settlements, children can work in fields and gardens

to help their families outside of school. In this context, it is natural for teachers to suggest in-class activities to develop cooperation among their students.

Male and female teachers used different techniques to increase active learning and emphasized active participation (Principle 3). Active learning requires the individual to participate in the process and learn by doing and experiencing (Açıkgöz, 2003). In this context, the most appropriate way is to apply different methods and techniques. It is assumed that teachers also think in this way. Teachers working in public schools used different methods and techniques and emphasized communication. Teachers working in private schools give higher importance to learning by doing and experiencing. Learning a subject by doing and experiencing increases the permanence of what is learned (Karaçöp & Doymuş, 2013; Okumuş et al., 2017). In this context, private schools may give more importance to this type of activity to ensure permanent learning. When the data were analyzed regarding experience, the teachers paid attention to similar characteristics. Also, all teachers emphasized using different techniques and learning by doing and experiencing. To ensure active learning, the individual must personally participate in the learning process (Açıkgöz, 2003). Therefore, learning by doing and experiencing is also active learning.

Teachers may use different methods and techniques to reach students with various learning styles. In addition, experienced teachers gave importance to responsibility by providing communication. The more experience one has, the easier it is to know how to behave in the face of different events. In this context, experienced teachers may have thought that communication with students would facilitate active learning. They may also have encouraged them to participate by giving them responsibilities. Teachers working in the western region paid greater attention to learning by doing and experiencing to ensure active learning. Better facilities for schools in the West may effectively address this situation.

Female teachers gave more hints and feedback to their students to give timely feedback (Principle 4). Male teachers, on the other hand, stated that they asked more questions to get feedback from their students. Feedback is critical in understanding a subject correctly, determining whether the student understands the subject, and seeing the student's level. In this context, teachers must give timely and appropriate feedback during the lesson. Providing prompt feedback in lessons has a clear and positive relationship with student achievement and satisfaction (Chickering & Gamson, 1999; Phelps, 2019). Giving hints on the subject that the student does not understand and answering his/her question will motivate him/her more to the lesson. In this context, female teachers may have prioritized student motivation. To get feedback from students, it is usually necessary to ask them questions. With the help of questions, it is revealed what the student knows, what he/she has learned, what he/she has not learned, and what he/she knows wrong. In this framework, male teachers tend to ask questions for feedback. Teachers working in public schools gave more feedback and hints, while teachers working in private schools gave homework. Since private schools usually compete with other schools, teachers may assign homework to increase the level of their students. Teachers generally gave feedback on time for immediate feedback. As the teachers' experience increased, the rate of asking questions for feedback also increased. This situation may be because experienced teachers know their students better or they think that by asking students various questions, they will better reveal what they know and do not know. Teachers working in the East carried out different practices to realize this principle, giving hints, rewards, and asking questions, while teachers in the West mostly gave feedback.

When the teachers' suggestions for giving feedback were examined, female teachers suggested feedback, asking questions, and making tests/quizzes. Male teachers, on the other hand, emphasized communication more. From this point of view, the teachers suggested different practices than what they did. While teachers in public schools suggested using clues/prizes and asking questions more, teachers in private schools suggested using different applications, feedback, and communication more. This situation may be due to the desire of private schools to keep their communication with their students high and be at the forefront in the sector. When the teachers' suggestions in terms of experience were analyzed, teachers with 1-5 years and 6-10 years of experience suggested more feedback. From this, novice teachers recommend more feedback to focus on the process. When teachers' suggestions were analyzed regionally, teachers in the East suggested more prompting, rewarding, asking questions, and communication, while teachers in the West suggested tests/quizzes. Teachers in the West are generally more experienced and know their students better. In this context, they may have suggested taking the opinions of their students about the subject with quizzes, which is different from the applications made in this context.

Female teachers used reinforcers more frequently to ensure that tasks were completed on time, told the due dates of the assignments, and paid more attention to grading and ensuring student responsibility (Principle 6). On the other hand, male teachers paid more attention to completing assignments on time, checking them on time, preparing a schedule, reminding students about the assignment, and mentioning the criteria. The timely completion of assignments depends on the teacher's attitude. Teachers who control their homework on time motivate their students to do their homework on time. Because when students know that their homework will be checked on time, they pay more attention to the homework and do not avoid taking responsibility. In this context, teachers' practices motivate students to do their homework on time. Public school teachers gave more reinforcements to their students to complete the tasks on time, while private school teachers practiced more in creating a work schedule and paying attention to communication. In private schools, student performance is an essential point for the promotion of the school. For this reason, teachers working in private schools pay more attention to their students' individual development. It is thought that teachers create individual study calendars for their students. In terms of experience, teachers have similar practices. However, teachers with 1-5 years of experience paid more attention to communication. The efforts of novice teachers to get to know their students may be influential in the emergence of this situation. Teachers pay more attention to

communication with their students to get to know them better. Regionally, teachers' practices were similar, and they focused more on giving reinforcement. Reinforcements generally increase the frequency of behaviors and positively affect learning. Based on this idea, teachers reinforce students who perform their tasks on time.

When the teachers' suggestions for ensuring that time on tasks were examined, female teachers suggested using reinforcers, while male teachers suggested assigning tasks more. While teachers working in public schools suggested communication, teachers working in private schools suggested tasks. Accordingly, teachers suggested practices other than their own on the subject. When the teachers' suggestions in terms of experience were analyzed, they generally focused on the task. Assigning tasks increases student responsibility (Anderson, 2018). Tasks encourage students to work more systematically (Dessem, 1999). In this respect, tasks are essential for student development. When teachers' suggestions were analyzed regionally, teachers working in the East suggested more reinforcement, tasks, and communication. The high number of new teachers in the East can explain this.

To respond to the high expectations of the students, female teachers gave more importance to communication and conducted in-class activities. From this, female teachers try to reach students by establishing proper communication. Male teachers, on the other hand, spent more time on in-class and out-of-class activities. Male teachers mostly try to develop students' expectations through activities. Teachers working in public schools emphasized communication and in-class and out-of-class activities. On the other hand, teachers working in private schools gave more importance to individual development. Since performance is essential in private schools, teachers encourage their students to set high goals by ensuring their individual development. Looking at the practices of teachers in terms of experience, teachers with 1-5 years of experience gave more importance to communication, teachers with 6-10 years of experience gave more importance to individual development, and teachers with 11-15 years and 16-20 years of experience gave more importance to in-class activities. Novice teachers primarily try to get to know their students and, therefore, give importance to communication. As the experience of the teachers increased, they tried to improve the high-level expectations of their students by making different practices. While teachers working in the East gave more importance to individual development and out-of-class activities, teachers working in the West gave more importance to communication and in-class activities. New teachers in the East tend to focus more on out-of-class activities to ensure their students' individual development. On the other hand, experienced teachers in the West can be inferred that they progress by communicating with their students in the classroom to have high-level attainable expectations.

When the teachers' suggestions for directing teachers to higher-level reachable expectations were analyzed, female and male teachers offered similar suggestions for individual development. However, while female teachers suggested increasing communication, male teachers suggested using in-class activities. Teachers' suggestions are parallel to their practices. While teachers working in public schools suggested communication and in-class and out-of-class activities more, teachers working in private schools focused more on individual development. There is also a harmony between teachers' practices and their suggestions. In terms of professional experience, teachers with 1-5 years of experience suggested considering individual development more, while teachers with 6-10 years of experience suggested using in-class activities more. Teachers with 1-5 years of experience stated that they gave importance to communication, while teachers with 6-10 years of experience stated that they gave importance to individual development. According to this, teachers recommend implementing practices that they do little. From this, teachers have different ideas for improving their students' high-level attainable expectations. Teachers working in the East emphasized individual development and out-of-class activities to meet students' high expectations. In contrast, teachers working in the West suggested more in-class activities. This suggestion is also in line with teachers' practices.

Most male and female teachers stated that they used different methods and techniques to involve students with different learning styles in the learning process (Principle 7). According to the multiple intelligences model, each individual has more than one type of intelligence, and the dominant types of intelligence are effective in learning (Davis et al., 2011; Gardner, 1999). In this context, the fact that students have different learning styles is related to the multiple intelligences model. At this point, it is expected that the practice will use different learning methods and techniques to reach more students. While teachers working in public schools stated that they made different applications more frequently, teachers working in private schools paid more attention to in-class applications—teachers with less experience utilized technology more. Especially in the last 20 years, the rapid technological change has affected education as it has affected all fields. Since young teachers are more familiar with technology-related applications in their daily lives, using more technology in their lessons is normal. In addition, some studies state that senior teachers are inadequate in technological applications (Ardıç, 2020; Cin, 2023). In this study, the use of different methods increased with increasing experience. This situation can be explained by the fact that teachers who are better adapted to the process can make different applications more efficient. Teachers working in the West used different methods and techniques and gave more importance to visual applications. Since the professional experience of teachers working in the West is generally higher, this situation can be related to the previous explanation. On the other hand, teachers working in Eastern cities stated that they did more in-class applications and auditory activities and considered students' learning styles. Since young teachers are in the process of adaptation, they may spend more time on classroom practices. In addition, it is thought that active learning methods suitable for constructivism, which they learned in the pre-service period, are effective in young teachers' considering different learning styles.

When the teachers' suggestions regarding the participation of students with different learning styles in the lesson were examined, female teachers mostly suggested using different methods/techniques and doing practices to get to know the students. Female teachers may think that student recognition is one of the priorities in the education process. Male teachers, on the other

hand, mostly suggested considering individual differences and creating appropriate learning environments. Accordingly, male teachers may have thought that students can be reached more effectively by providing learning environments suitable for student differences. Teachers working in public schools suggested more in-class activities, considering individual differences and recognizing students to involve students with different learning styles in the process. On the other hand, teachers working in private schools suggested using different methods/techniques and considering students' learning styles. From this, teachers working in public and private schools recommend practices different from their practices for effectively teaching students with different learning styles. In terms of experience, the teachers' answers were similar, and they mostly suggested using different learning methods/techniques. From this, there is a similarity between what teachers do and the practices they recommend. Teachers working in the East suggested using different methods/techniques, while teachers in the West suggested audiovisual applications and paying attention to the teaching-learning process. Since teachers in the West are generally more experienced, as their experience increases, they consider different factors.

CONCLUSION AND RECOMMENDATIONS

When the results obtained in the study are analyzed in general, although science teachers are not sufficiently familiar with the term "seven principles for good practice," they do the practices related to each principle. When evaluated in terms of gender, primarily male and female teachers' responses were close to each other, and they made different practices in some principles. When the results were analyzed in terms of school type, although the results were generally similar, the answers, such as giving more importance to individual development and creating a work schedule, were more common in private schools. In contrast, different activities were used in public schools, and feedback and reinforcement were given. When evaluated in terms of seniority, practices such as using different activities, communication, asking questions, and using different methods generally increased as experience increased. When evaluated in terms of the region of assignment, although they generally gave similar answers, teachers in the West emphasized learning by doing, communication, using different methods and techniques, and visualization. In contrast, teachers in the East emphasized hints, reinforcement, individual development, and taking into account learning styles.

For future studies, it would be helpful to provide in-service training to improve the practices of science teachers for each principal. Again, it is predicted that integrating different teaching methods and techniques into the process by evaluating them in the context of the seven principles will improve students' communication with school, teachers, and friends. In this context, considering and integrating the seven principles into the education and training process in all aspects will positively contribute to science learning processes.

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Statements of publication ethics

I hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Ethics Committee Approval Information

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REFERENCES

Açıkgöz, K. (2003). Aktif öğrenme. İzmir: Eğitim Dünyası Yayınları.

Al-Furaih, S.A.A. (2017). Perceptions of pre-service teachers on the design of a learning environment based on the seven principles of good practice. *Educ Inf Technol, 22,* 3187–3205. https://doi.org/10.1007/s10639-017-9580-7

Alyar, M. (2018). *İşbirlikli öğrenme modeli ile birlikte kullanılan model, animasyon ve yedi ilkenin bazı kimya konularının öğrenilmesi üzerine etkisi* (Doktora tezi), Atatürk Üniversitesi, Erzurum.

Alyar, M., & Doymuş, K. (2020). İşbirlikli öğrenme ile birlikte kullanılan modellerin, animasyonların ve yedi ilke'nin kimya başarısına etkisi. Atatürk Üniversitesi *Kazım Karabekir Eğitim Fakültesi Dergisi, 41,* 1-25. https://doi.org/10.33418/ataunikkefd.781598

Anderson, L. W. (2018). Instruction and time-on-task: A review. *Time and School Learning (1984),* 143-164.

Ardıç, M. A. (2020). Ortaöğretim öğretmenlerinin teknolojik pedagojik alan bilgisi özgüvenlerinin incelenmesi. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi, 33*(3), 653-695.

Aydoğdu, S. (2012). *Üniversite öğretim elemanlarının Chickering ve Gamson öğrenme ilkelerini kullanma düzeyleri* (Yüksek lisans tezi). Atatürk Üniversitesi, Erzurum.

Besser, E. D., & Newby, T.J. (2020). Feedback in a digital badge learning experience: Considering the instructor's perspective. *Tech Trends, 64,* 484–497. https://doi.org/10.1007/s11528-020-00485-5

Beydoğan, H.Ö. (2018). Middle school mathematics teachers' opinions on feedback. *International Journal of Assessment Tools in Education, 5*(1), 33-49. https://doi.org/10.21449/ijate.339410

Bishoff, J. P. (2010). *Utilization of the seven principles for good practice in undergraduate education in general chemistry by community college instructors* (Doctoral dissertation). University of West Virginia, Virginia.

Bolliger, D. U., & Martin, F. (2018). Instructor and student perceptions of online student engagement strategies. *Distance Education, 39*(4), 568–583. https://doi.org/10.1080/01587919.2018.1520041

Bugay, A., & Korkut Owen, F. (2016). Predictors of communication skills: Information and communications technology usage, self-esteem, extraversion and gender. *Mersin University Journal of the Faculty of Education, 12*(2), 542-554. DOI:http://dx.doi.org/10.17860/efd.26005

Büyüköztürk, Ş., Kılıç-Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2012). *Bilimsel araştırma yöntemleri* (geliştirilmiş 13. baskı). Pegem Akademi Yayıncılık.

Chickering, A. W., & Ehrmann, S. C. (1996). Implementing the seven principles: technology as lever. *AAHE Bulletin, 49*(2), 3–6.

Chickering, A.W., & Gamson, Z. (1999). Development and adaptations of the seven principles for good practice in undergraduate education. *New Directions for Teaching and Learning, 80,* 75-81.

Chickering, A. W., & Gamson, Z. F. (1987). Seven principles of good practice in undergraduate education. *AAHE Bulletin, 39*(7), 3–7.

Cin, A. (2023). *Ortaokul öğretmenlerinin teknolojik pedagojik alan bilgileri ile bilişim teknolojisi kullanım düzeylerinin incelenmesi Mersin İli Örneği* (Yüksek lisans tezi), Mersin Üniversitesi, Mersin.

Crews, T. B., Wilkinson, K. & Neill, J.K. (20115). Principles for good practice in undergraduate education: Effective online course design to assist students' success. *MERLOT Journal of Online Learning and Teaching, 11*(1), 87-103.

Culver K. C., Bowman, N. A., & Pascarella, E.T. (2021). How students' intellectual orientations and cognitive reasoning abilities and may shape their perceptions of good teaching practices. *Research in Higher Education, 62*(6), 765-788. https://doi.org/10.1007/s11162-021-09625-z

Çavdar, O. (2016). *Fen ve teknoloji dersinin öğretiminde iyi bir eğitim ortamı için yedi ilke ve modellerin işbirlikli öğrenme yöntemiyle uygulanması* (Doktora tezi). Atatürk Üniversitesi, Erzurum.

Dahalan, N., Hasan, H., Hassan, F., Zakaria, Z., & Wan Mohd Noor, W. A. (2013). Engaging students on-line: Does gender matter in adoption of learning material design? *World Journal on Educational Technology, 5*(3), 413-419.

Davis, K., Christodoulou, J., Seider, S., & Gardner, H. E. (2011). The theory of multiple intelligences. In RJ Sternberg & SB Kaufman (Eds.), *Cambridge Handbook of Intelligence*, 485-503.

Demirel, Ö. (Ed.). (2010). *Eğitimde yeni yönelimler.* Pegem Akademi Yayıncılık.

Dessem, R. L. (1999). Principle 5: Good practice emphasizes time on task. *J. Legal Educ., 49,* 430-440.

Duijnhouwer, H., Prins, F. J., & Stokking, K. M. (2012). Feedback providing improvement strategies and reflection on feedback use: effects on students' writing motivation, process and performance. *Learning and Instruction, 22,* 171-184.

Frederickson, J. (2015). Online learning and student engagement: assessing the impact of a collaborative writing requirement. *Academy of Educational Leadership Journal, 19*(3), 127-140.

Gall, M. D., Gall, J. P., & Borg, W. R (2007). *Educational research: an introduction and Applying Educational Research.* Pearson Education.

Gardner, H. (1999). *The disciplined mind: What all students should understand*. Simon & Schuster.

Getzlaf, B., Perry, B., Toffner, G., Lamarche, K., & Edwards, M. (2009). effective instructor feedback: perceptions of online graduate students. *Journal of Educators Online, 6*(2), 1-22.

Gielen, S., Tops, L., Dochy, F., Onghena, P., & Smeets, S. (2010). A comparative study of peer and teacher feedback and of various peer feedback forms in a secondary school writing curriculum. *British Educational Research Journal, 36*(1), 143-162.

Gonda, D. E., Luo, J., Wong, Y. L., & Lei, C. U. (2018, December). *Evaluation of developing educational chatbots based on the seven principles for good teaching.* [Oral presentation]. IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE), Wollongong, NSW, Australia.

Gölönü, S., & Karcı, Y. (2010). İletişim meslek lisesi öğrencilerinin iletişim beceri düzeylerinin incelenmesi (Ankara il örneği). *İletişim Kuram ve Araştırma Dergisi, 31,* 123-140.

Graham, C., Cagiltay, K., Lim, B. R., Craner, J., & Duffy, T. M. (2001). Seven principles of effective teaching: A practical lens for evaluating online courses. *The Technology Source, 30*(5), 50.

Hathaway, K. L. (2014). An application of the seven principles of good practice to online courses. *Research in Higher Education Journal, 22,* 1-12.

Jabar, S. I., & Albion, P. R. (2016). Assessing the reliability of merging Chickering & Gamson's seven principles for good practice with Merrill's different levels of instructional strategy (DLISt7). *Online Learning, 20*(2), 51-74.

Jensen, K., & Bennett, L. (2016). Enhancing teaching and learning through dialogue: A student and staff partnership model. *International Journal for Academic Development, 21*(1), 41–53. https://doi.org/10.1080/1360144X.2015.1113537

Jessup-Anger, J. E. (2012). Examining how residential college environments inspire the life of the mind. *The Review of Higher Education, 35*(3), 431–462.

Johnson, S. (2014). Applying the seven principles of good practice: technology as a lever – in an online research course. *Journal of Interactive Online Learning, 13*(2), 41–50.

Karacop, A., & Doymus, K. (2013). Effects of jigsaw cooperative learning and animation techniques on students' understanding of chemical bonding and their conceptions of the particulate nature of matter. *Journal of Science Education and Technology, 22*(2), 186-203. https://doi.org/10.1007/s10956-012-9385-9

Kocaman Karoğlu, A., Kiraz, E., & Özden, M. Y. (2014). Good practice principles in an undergraduate blended course design. *Education and Science, 39*(173), 249-263.

Koç, Y., Okumuş, S., Öztürk, B., Çavdar, O., & Doymuş, K. (2014). Fen ve teknoloji öğretmenleri ve öğretmen adaylarinin yedi ilkeleri hakkindaki görüşleri. *Dicle Üniversitesi Ziya Gökalp Eğitim Fakültesi Dergisi, 22,* 134-149.

Lalit, M., & Piplani, S. (2019). Active learning methodology–jigsaw technique: An innovative method in learning anatomy. *Journal of the Anatomical Society of India, 68*(2), 147-152. https://doi.org/10.4103/JASI.JASI_57_19

Legg, K., Ellis, R.H., & Hall, C. (2020). Applying the seven principles of good practice: archives in the 21st century university. *Archives and Records, 41*(2), 109-125. https://doi.org/10.1080/23257962.2020.1728525

Loes, C. N., Salisbury, M. H., & Pascarella, E. T. (2014). Student perceptions of effective instruction and the development of critical thinking: A replication and extension. *Higher Education, 69*(5), 1–16.

Martin, F., & Bolliger, D. U. (2018) 'Engagement matters: student perceptions on the importance of engagement strategies in the online learning environment', *Online Learning, 22*(1), 205–222. https://doi.org/10.24059/olj.v22i1.1092

McMillan, J.H., & Schumacher, S. (2010). *Research in education: Evidence-based inquiry.* Pearson.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: an expanded sourcebook.* (Second edition). SAGE Publications.

Musaitif, L. M. (2013). *The utilization of the seven principles for good practices of full-time and adjunct faculty in teaching health & science in community colleges* (Doctoral dissertation), University of La Verne, California.

Okumuş, S. (2017). *"İyi bir eğitim ortamı için yedi ilke"nin işbirlikli öğrenme ve modellerle birlikte uygulanmasının fen bilimleri dersinin anlaşılmasına etkisi* (Doktora tezi). Atatürk Üniversitesi, Erzurum.

Okumuş, S., & Doymuş, K. (2020). İyi bir eğitim ortamı için yedi ilkenin altıncı sınıf maddenin tanecikli yapısı ünitesinde uygulanması. *Kalem Eğitim ve İnsan Bilimleri Dergisi, 10*(1), 87-110. https://doi.org/10.23863/kalem.2020.150

Okumuş, S., Çavdar, O., Alyar, M., & Doymuş, K. (2017). İşbirlikli öğrenme ve modellerin kimyasal reaksiyonlar konusunun anlaşılmasına etkisi. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi, 44*, 358-381. https://doi.org/10.21764/maeuefd.303127

Öztürk, B. (2017). *Maddenin tanecikli yapısının öğretiminde iyi bir eğitim ortamı için yedi ilke ve modellerle desteklenen işbirlikli öğrenme yöntemlerinin uygulanması* (Doktora tezi). Atatürk Üniversitesi, Erzurum.

Öztürk, B., Okumuş, S., Koç, Y., Çavdar, O., & Doymuş, K. (2013). Fen ve teknoloji öğretmenleri ve öğretmen adaylarinin iyi bir eğitim ortami için yedi ilke hakkindaki görüşleri. *Bayburt Üniversitesi Eğitim Fakültesi, 8*(1), 102-115.

Padgett, R. D. (2011). *The effects of the first year of college on undergraduates' development of altruistic and socially responsible behavior* (Doctoral dissertation). Iowa Research Online, Iowa.

Pascarella, E. T., Salisbury, M. H., & Blaich, C. (2011). Exposure to effective instruction and college student persistence: A multi-institutional replication and extension. *Journal of College Student Development, 52*(1), 4–19.

Pascarella, E. T., Cruce, T., Umbach, P., Wolniak, G., Kuh, G. D., & Carini, R. (2006). Institutional selectivity and good practices in undergraduate education: How strong is the link? *Journal of Higher Education, 77*(2), 251–285.

Phelps, R.P. (2019). Test frequency, stakes, and feedback in student achievement: A meta-analysis. *Evaluation Review, 43*(3-4), 111-151. http://dx.doi.org/10.1177/0193841X19865628

Rowe, A. D., & Wood, L. N. (2008). Student perceptions and preferences for feedback. *Asian Social Science, 4*(3), 78-88.

Shoval, E. (2011). Using mindful movement in cooperative learning while learning about angles. *Instructional Science, 39,* 453-466.

Sormunen, K., Juuti, K., & Lavonen, J. (2020). Maker-centered project-based learning in inclusive classes: Supporting students' active participation with teacher-directed reflective discussions. *International Journal of Science and Mathematics Education, 18*(4), 691-712. https://doi.org/10.1007/s10763-019-09998-9

Şimşek, U., Aydoğdu, S., & Doymuş, K. (2012). İyi bir eğitim için yedi ilke ve uygulanması. *Eğitim ve Öğretim Araştırmaları Dergisi, 1*(4), 241-254.

Tanis, C. J. 2020. The seven principles of online learning: Feedback from faculty and alumni on its importance for teaching and learning. *Research in Learning Technology, 28,* 1-25. http://dx.doi.org/10.25304/rlt.v28.2319

Taşkın, A.K., Taşğın, Ö., Başaran, M.H., & Taşkın, C. (2010). Beden Eğitimi ve Spor Yüksekokulu öğrencilerinde duygusal zekâ düzeylerinin bazı değişkenlere göre incelenmesi. *Selçuk Üniversitesi Beden Eğitimi ve Spor Bilim Dergisi, 12*(2), 98-103.

Taylor, R.L. Knorr, K., Ogrodnik, M., & Sinclair, P. (2020). Seven principles for good practice in midterm student feedback. *International Journal for Academic Development,* https://doi.org/10.1080/1360144X.2020.1762086

Tirrell, T. (2009). *Examining the impact of Chickering's seven principles of good practice on student attrition in online courses in the community college* (Doctoral dissertation). Colorado State University, Colorado.

Voerman, L., Meijer, P. C., Korthagen, F. A. J., & Simons, R. J. (2012). Types and frequencies of feedback interventions in classroom interaction in secondary education. *Teaching and Teacher Education, 28*(8), 1107-1115.