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Research Article

Comparison of Pre-Service Teachers' Teaching Experiences in Virtual Classroom and Face-to-Face Teaching Environment[1]

Şerife Ak[2], İbrahim Gökdaş[3]

Abstract

The study was carried out with the aim of evaluating the pre-service teachers' teaching experiences in virtual classroom and face-to-face teaching environment. Complementarity mixed research method was used in the study. The study group was composed of 40 pre-service teachers. Quantitative data was collected through the online teaching experience questionnaire I and II form, immediately after the pre-service teachers experienced the teaching process in two different teaching environments. Following this, semi-structured interviews were conducted with all the pre-service teachers to obtain detailed information regarding their teaching experiences. In the analysis of quantitative data, descriptive statistics and Wilcoxon Signed Rank test was used to compare the perceived anxiety, motivation, performance and efficiency levels of the pre-service teachers while performing the teaching role in virtual classroom and face-to-face teaching environment. In the analysis of qualitative data, descriptive content analyses were used. As a result of the study, it was determined that the majority of the pre-service teachers preferred face-to-face teaching environment for such reasons as teacher-student interaction and eye contact. While there was not a significant difference in terms of the anxiety levels perceived by the pre-service teachers during performing the teaching role in virtual classroom and face-to-face teaching environment, it was determined that there was a significant difference in terms of the perceived motivation, perceived performance and perceived efficiency on behalf of face-to-face teaching experience. Limitations and implications of the findings are discussed, and future directions are provided.

Keywords: *Pre-service teacher, teaching experience, virtual classroom*

[1] The ethical committee permission is not required in this study since the data were gathered before 2020.

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Öğretmen Adaylarının Sanal Sınıf ve Yüz Yüze Öğretim Ortamındaki Öğretme Deneyimlerinin Karşılaştırılması

Öz

Çalışma öğretmen adaylarının sanal sınıf ve yüz yüze öğretme ortamında yaşadıkları öğreticilik deneyimlerinin değerlendirilmesi amacıyla gerçekleştirilmiştir. Çalışmada tamamlayıcı karma araştırma yöntemi kullanılmıştır. Çalışma grubu Bilgisayar ve Öğretim teknolojileri Eğitimi Bölümü 3. sınıfında okuyan ve Özel Öğretim Yöntemleri I ve II derslerini alan 40 öğretmen adayından oluşmaktadır. Çalışmaya katılan öğretmen adaylarının yaşları 21-27 arasında değişmektedir. Öğretmen adaylarının 12'si kadın, 28'i erkektir. Görüşmeler öğretmen adaylarının tamamı ile gerçekleştirilmiştir. Öğretmen adaylarının öğretim sürecini iki farklı öğretim ortamında deneyimlemesinin hemen ardından, çevrimiçi öğretim deneyimi anketi I ve II formu aracılığıyla nicel veriler toplanmıştır. Bunu takiben öğretmen adaylarının öğretmenlik deneyimleri hakkında detaylı bilgi almak için tüm öğretmen adaylarıyla yarı yapılandırılmış görüşmeler yapılmıştır. Nicel verilerin analizinde betimsel istatistikler ve öğrencilerin sanal sınıf ve yüzü yüze öğretme ortamında öğretici rolünü gerçekleştirirken algıladıkları kaygı, motivasyon, performans ve verimlilik düzeylerinin karşılaştırılmasında Wilcoxon İşaretli sıralar testi kullanılmıştır. Nitel verilerin analizinde ise betimsel analizlerden yararlanılmıştır. Çalışma sonunda öğretmen adaylarının büyük çoğunluğunun öğretmen-öğrenci etkileşimi ve göz teması kurma gibi nedenlerle yüz yüze öğretme ortamını tercih ettiği belirlenmiştir. Öğretmen adaylarının sanal sınıf ve yüzü yüze öğretme ortamında öğretici rolünü gerçekleştirirken algıladıkları kaygı düzeyleri açısından anlamlı fark görülmezken; algılanan motivasyon, algılanan performans ve algılanan verimlilik açısından yüz yüze öğretme ortamındaki öğretme deneyimi lehine anlamlı bir fark olduğu belirlenmiştir. Sonuçlar ilgili literatür çerçevesinde tartışılmış ve önerilerde bulunulmuştur.

Anahtar kelimeler: *Öğretmen adayı, öğretme deneyimi, sanal sınıf.*

Introduction

In addition to the rapid change in technology, the emergence of urgent and compulsory distance education experience because coronavirus pandemic has revealed the importance of the design of online teaching-learning environments. In terms of the quality of digital learning and teaching environments, the quality of the teacher who will be teaching and his/her knowledge, skills and experience of e-learning are of great importance (Baker, 2004; Cabı, 2018; Kairu, 2020; Sae-Khow, 2014; Shea, Li and Pickett, 2006; Yılmazsoy, Özdinç & Kahraman, 2018). Shea et al. (2006) indicated that active and strong presence of teachers in online teaching is even more critical for students' sense of learning than the design of online teaching environments. However, the majority of teachers do not feel that they are equipped enough with regard to teaching via online platforms (He, 2014; Sprague, Kopfman & Dorsey, 1998) and they have some negative emotional responses to teaching online such as feeling stressed or restricted through perceptions of teaching performance as an online teacher (Badia, Garcia, & Meneses, 2017; Badia, Garcia, & Meneses, 2019; Naylor & Nyanjom, 2020; Regan et al., 2012).

It is known that emotions effects teachers' perceptions, beliefs and motivation as a critical factor (Chen, 2019; Naylor & Nyanjom, 2020). Therefore, an increased understanding of teachers' emotional responses to teaching online is essential for prepare them to use of online teaching-learning environments effectively (Badia et al, 2017). Trigwell (2012) classified emotions involved in teaching into positive and negative forms of motivation, anxiety, pride, embarrassment and frustration. Badia, Meneses and Monereo (2014) identified a three categories of emotions involved in teaching included teaching motivation, self -evaluation of oneself as a teacher and teaching efficiency. Badia et al. (2019) demonstrated the importance of teachers' relationship with technology on their emotional responses teaching online such as feeling relaxed or stressed.

Teachers should be provided online teaching and interaction opportunities before and after graduation (Anderson, Standerford & Imdieke, 2010) in order to being skilled using technology and pedagogy in both online and face to face teaching and being manage the negative emotional responses to teaching. Besides, being skilled using technology and pedagogy can be used by

teachers as a managing strategy of the negative emotions (Bennett, 2014). According to Ertmer and Ottenbreit-Leftwich (2010), teachers' professional trainings primarily should focused on enhancing teachers' knowledge and skills about using technology in order to help reduce the fear associated with online teaching. For this reason, all pre-service teachers should be given the opportunity to experience online learning during their undergraduate education process (Compton, David & Mackey, 2009; Kennedy & Archambault, 2012; He, 2014; Downing & Dyment, 2013). The findings of the study conducted by Yıldız (2011) revealed that the pre-service teachers who had the opportunity to experience online synchronous course developed a positive attitude towards distance education. A qualitative research was carried out by Cabı (2018) with 12 instructors in order to examine the experiences of the instructors during the distance education process. The findings of the research are deemed important in terms of revealing the advantages of distance education compared to face-to-face education from the perspectives of the instructors and students, and determining the fact that the workloads of the instructors in the distance education process decreased since the distance education process is more planned in terms of the design of the learning environment. A 70-hour training program was designed by Reisoğlu and Çebi (2020), which aimed to improve the digital competences of the pre-service teachers. This training program was applied to 24 pre-service teachers and at the end of the training program, the views of the pre-service teachers regarding their digital competencies were evaluated. The results of the study revealed that the training of the pre-service teachers about how to use digital media in especially designing interactive learning and teaching environments is important in terms of understanding how they can better use digital skills to facilitate teaching.

When the literature was examined, it was found that the researches mostly focused on the students' virtual classroom experiences (Abdous, 2019; Abdous & Yoshimura, 2010; Birişçi, 2013; Jin, 2005; Chen, Ou, Liu & Liu, 2001; Ojo & Olakuluhin, 2006), and that only a few study examined the teachers' teaching experience in virtual classroom environment (Cabı, 2018; Gülbahar & Karataş, 2016; Kalelioğlu, Atan & Çetin, 2016; Woodcock, Sisco & Eady, 2015). On the other hand, few studies have focused on teachers' emotional responses to teaching online (Badia et al, 2017; Badia, et al., 2019; Regan et al., 2012). As a result, it was determined that "learning experiences" in virtual classroom environment were mostly analyzed; and despite the fact that some studies were found to examine the "teaching experience", no studies were found in which face-to-face and online synchronous teaching

experience were discussed and evaluated together. In addition, to our knowledge, no studies compared the teaching experiences of pre-service teachers in terms of perceptions of teaching performance as a teacher and emotional responses for teaching in virtual classroom and for teaching in face to face. Another important contribution of this study to the literature is that it allows making an in-depth investigation of the topic by collecting both quantitative and qualitative data regarding the experiences of the pre-service teachers in both environments. This in-depth investigation may shed light on the understanding of the reasons of pre-service teachers' teaching environment preferences and their emotional responses to teaching, and it can also help to prepare pre-service teachers in order to effective use technology and pedagogy in both online and face to face teaching environments. Based on these discussions, the main purpose of the study was to examine the pre-service teachers' teaching experiences in virtual classroom and face-to-face teaching environment. Within the framework of this general purpose, it was aimed to find answers for the following questions:

1. What are the preferences of the pre-service teachers in terms of the teaching environments they have experienced?
2. What can be the reasons of the teaching environment preferences of the pre-service teachers?
3. Is there a significant difference between the anxiety, motivation, performance and efficiency levels that the pre-service teachers perceive while performing the teaching role in virtual classroom and face-to-face teaching environment?
4. What can be the reasons of the pre-service teachers perceived anxiety, motivation, performance and efficiency levels?

Method

Research Model

In this study, which aimed to evaluate the teaching experiences of the pre-service teachers in virtual classroom and face-to-face teaching environment, complementarity mixed research method was used. In complementarity mixed method, which involves collecting, analyzing and combining quantitative and qualitative data within the research process (Teddlie & Tashakkori, 2009), each type of data analysis complements another (Brannen, 2005). This complementarity, which allows the measurement of both overlapping and diverging points, provides an in-depth

investigation opportunity and a more enriched and detailed understanding (Greene, Caracelli & Graham, 1989; Tondeur, Scherer, Siddiq & Baran, 2020).

Participants

The participants of the research was composed of 40 Pre-Service Teachers (PST) studying in the 3rd grade of the Department of Computer and Instructional Technologies in Aydın Adnan Menderes University and taking the course of Special Teaching Methods I and II in the 2018-2019 academic year. Of the pre-service teachers, 12 (30%) were female, and 28 were (70%) male. The mean age of the participants was 21.05 years (Ranging from 20 to 27 years). The interviews were conducted with all the pre-service teachers. The participants were a convenience sample formed by the pre-service teachers who pass the Special Teaching Methods I course and attend to the Special Teaching Methods II course. All participants had advance computer skills, but they had no previous teaching experiences in virtual classroom.

Procedure of the Study

The participants had two semesters of Special Teaching Methods course (Special Teaching Methods I at the 5th term and Special Teaching Methods II at the 6th term). This study took place at these two courses of the undergraduate program to which the participants were attending. Each participant taught face to face to their classmates (30 minutes) in the Special Teaching Methods I course. Upon completing the practicum, participants were required to evaluate their face-to-face teaching performance by filling out the teaching experience questionnaire I form. During the 6th term, each participant taught virtually their classmates (20 minutes) via ZOOM platform in the Special Teaching Methods II course. Upon completing the virtual classroom practicum, participants were required to evaluate their virtual teaching performance by filling out the teaching experience questionnaire II form. At the end of 6th term semi-structured interviews was conducted with participants in order to obtain detailed information regarding their teaching experiences in the two different teaching environments. The procedure of the study is given in Figure 1.

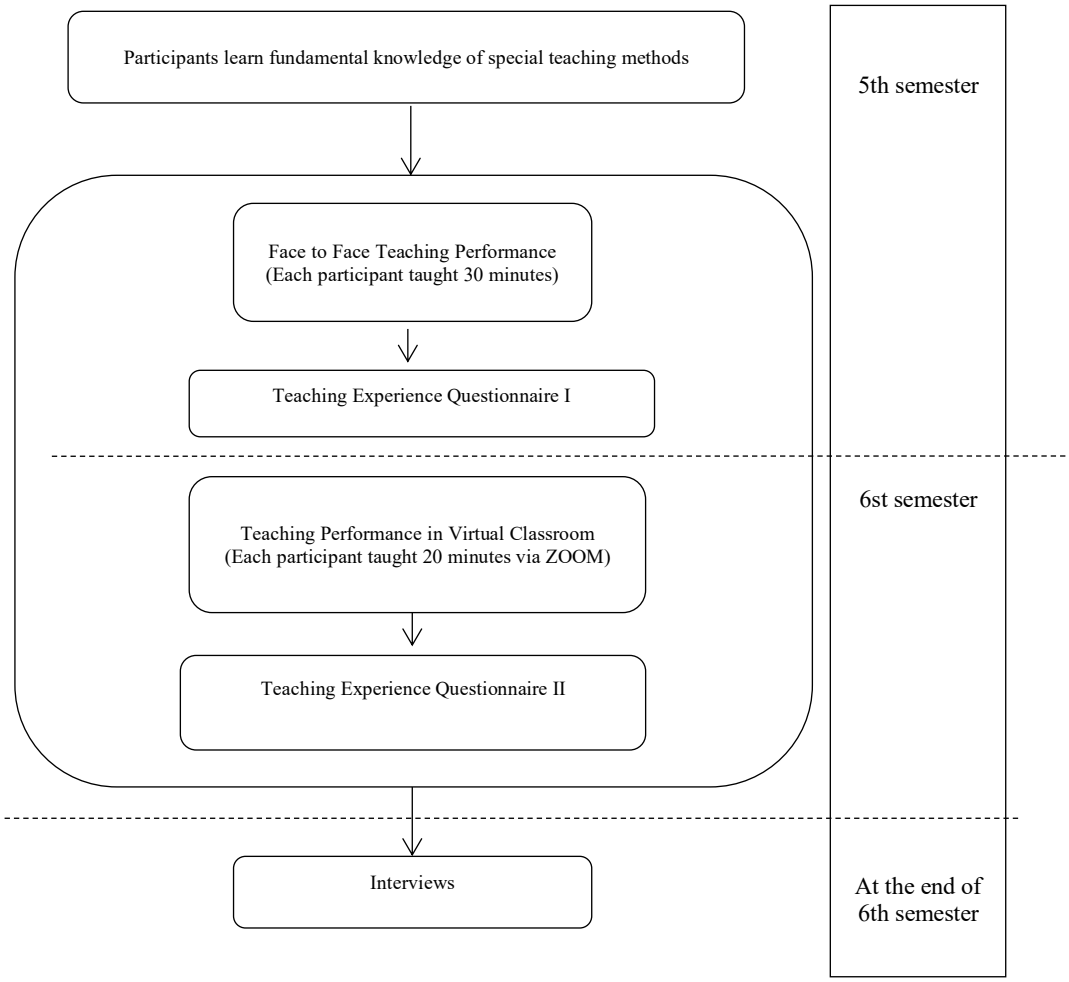

Figure 1. Procedure of the study

Data Collection Tools

Quantitative data were collected using "Teaching Experience Questionnaire I" and "Teaching Experience Questionnaire II", which were developed by the researchers. After the related literature was reviewed (Badia, et al., 2014; Chen, 2016; Trigwell, 2012), the draft questionnaire form was consulted to expert lecturers in order to ascertain the content validity. According to the views of the experts, necessary corrections were made. A pilot study was conducted with 28 pre-service teachers who studying in the 4rd grade of the Department of Computer and Instructional Technologies program to test the intelligibility of the questionnaire forms. After inspecting the reaction in the pilot study, necessary modifications were made. The "Teaching Experience Questionnaire I" comprised six self-evaluation questions about participants' perceived performance and emotion levels while performing the teaching role in

face-to-face teaching environment on a 10-point Likert scale from 1 (extremely low) to 10 (extremely high). "Teaching Experience Questionnaire II" included seven questions about participants' teaching environment preferences, their perceived performance and emotion levels while performing the teaching role in virtual classroom on a 10-point Likert scale from 1 (extremely low) to 10 (extremely high).

Qualitative data was collected through the semi-structured interview form, which was prepared by the researchers. While preparing the semi-structured interview form, the literature was reviewed, and the draft interview form was prepared considering the elements of the teaching performance and the features of teaching environments. The draft semi-structured interview form was consulted to experts and according to the views of the experts, necessary corrections were made. The semi-structured interview form consisted of five open-ended questions. These questions are: When you consider your personal experience as an instructor; 1) which teaching environment (Face to face or virtual classroom) was easier for you? Why? 2) What were the positive features of the teaching environments (Face to face and virtual classroom) that affect you teaching? 3) What were the negative features of the teaching environments (Face to face and virtual classroom) that affect your teaching? 4) Which competencies did you need more in order to increase the quality of the lesson (for face to face and for virtual classroom)? 5) Which teaching environment (face-to-face classroom / virtual classroom) would you prefer as a teacher? Why? All interviews were conducted face to face with each pre-service teacher individually.

Data Analysis

In the analysis of quantitative data, descriptive statistics regarding the pre-service teachers' environment preferences, perceived anxiety, motivation, performance and efficiency levels were used. The comparisons regarding the perceived anxiety, motivation, performance and efficiency levels of the pre-service teachers while performing the teaching role in virtual classroom and face-to-face teaching environment were analyzed by using Wilcoxon Signed Rank test. In the analysis of qualitative data, descriptive analyses were used. Interviews with pre-service teachers were transcribed and they were checked again to ensure their reliability. According to research questions, the codes associated with each other were grouped under specific themes. The descriptive validity of the research was provided by "researcher

diversification". In this regard, the data of the research was analyzed by three different researchers by creating themes and sub-themes. The *formula* was described *by Miles* and *Huberman* (*1994*) *used* to determine the reliability of the study. *According to Miles* and *Huberman* (*1994*), when the consensus level among the reviewers was higher than 90%, expected reliability was ensured. For this study the reliability was determined as 93%. Direct quotations were used to reflect the view of participants (Yıldırım & Şimşek, 2011) in order to transferability was also made possible. In addition, credibility was ensured by the long-term involvement of the researchers with the participants and the research field.

Ethical Issues

All procedures performed in the study involving human participants were in accordance with the ethical standards of the Aydın Adnan menders University Ethics Committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. According to the TR DİZİN Journal Evaluation Criteria updated for 2020, the ethical committee permission is not obligatorily required in this study to be published in a journal indexed by TR DİZİN since the data were gathered before 2020.

Findings

Teaching Environment Preferences

When the preferences of the pre-service teachers regarding the teaching environments they experienced was examined, it was determined that 33 (82.5%) of the pre-service teachers preferred face-to-face teaching environment, whereas 7 (17.5%) of the pre-service teachers preferred virtual classroom environment (Table 1).

Table 1
Teaching Environment Preferences of the Pre-service Teacher.

Teaching Environment Preference	f	%
Virtual Classroom	7	17.5
Face-to-face	33	82.5
Total	40	100

Reasons of the Teaching Environment Preferences

During the interviews conducted with the pre-service teachers, the reasons for the preferences of the pre-service teachers regarding the teaching environments were revealed. It could be said that the majority of the pre-service teachers preferred face-to-face teaching environment for such reasons as teacher-student interaction and eye contact; and that the pre-service teachers who preferred virtual classroom environment, though just a few in number, preferred this type of environment because of the fact that they felt more comfortable in this environment and thought that classroom management was easier. Some of the views of the pre-service teachers on this subject are presented below.

> *"If I had to make a choice, I would prefer face-to-face classroom... As I have to talk to the screen in virtual classroom application, I cannot understand how much interest my students show to the course and how much I can teach…" (PST1).*
>
> *"If I had to choose as a teacher, I would prefer face-to-face classroom because I think that teacher-student interaction is more in face-to-face education and it disciplines students. When I say "discipline", I mean coming to class on time, obeying the classroom rules, being in the classroom during the lesson hours, etc. In addition to this, I also prefer face-to-face classroom so as to be able to observe the students' in-class behaviors as well as their behaviors outside the classroom." (PST3).*
>
> *"I prefer virtual classroom because there is no classroom management stress in virtual classroom. Especially for the teachers who have difficulties to make their voice heard to the students at the backseat in face-to-face classroom, it is much easier to provide communication in virtual classroom." (PST9).*
>
> *"The cost of virtual classroom is low. I feel more comfortable. Preparing the course material is easier. It makes me feel like I am the boss in my job." (PST30).*
>
> *"In face-to-face teaching environment, student-teacher interaction, sharing information and emotions is better. Technical problems are limited." (PST32).*
>
> *"If I had to choose as a teacher, I would prefer face-to-face classroom. The reason for this is certainly the fact that communication is stronger." (PST39).*

Perceived Anxiety, Motivation, Performance and Efficiency Levels

When perceived anxiety, motivation, performance and efficiency scores of the pre-service teachers while performing the teaching role in virtual classroom and face-to-face teaching environment were analyzed (Table 2), it was found that the anxiety level they perceived in face-to-face teaching environment ($\overline{X}$ =5.55) was lower than the anxiety level they perceived in virtual classroom environment ($\overline{X}$ =6.20). It was also determined that the mean scores of motivation ($\overline{X}$ =7.72), performance $\overline{X}$ =7.65) and efficiency ($\overline{X}$ =7.85) they perceived in face-to-face teaching environment was higher than the mean scores of motivation ($\overline{X}$ =5.90), performance ($\overline{X}$ =6.02) and efficiency ($\overline{X}$ =5.07) in virtual classroom environment.

Table 2
Perceived Anxiety, Motivation, Performance and Efficiency Scores of the Pre-service Teachers While Performing the Teaching Role in Virtual Classroom And Face-to-Face Teaching Environment

	Environment	N	$\overline{X}$	SD
Perceived Anxiety	Virtual Classroom	40	6.20	2.27
	Face-to-face		5.55	2.76
Perceived Motivation	Virtual Classroom	40	5.90	1.98
	Face-to-face		7.72	1.55
Perceived Performance	Virtual Classroom	40	6.02	2.08
	Face-to-face		7.65	1.85
Perceived Efficiency	Virtual Classroom	40	5.07	2.21
	Face-to-face		7.85	1.85

The results of Wilcoxon Signed Rank test performed in order to reveal whether there was a statistically significant difference among the perceived anxiety, motivation, performance and efficiency scores of the pre-service teachers while performing the teaching role in these two different teaching environments are presented in Table 3.

Table 3

Comparisons Regarding the Perceived Anxiety, Motivation, Performance and Efficiency Levels of the Pre-service Teachers While Performing the Teaching Role in Virtual Classroom And Face-to-Face Teaching Environment.

	(Face-to-face) – (Virtual Classroom)	N	Mean Rank	Total Rank	z	p
Perceived Anxiety	Negative Ranks	21	21.33	448	-1.46	.143
	Positive Ranks	16	15.94	255		
	Equal	2				
Perceived Motivation	Negative Ranks	8	14.38	115	-3.53	.000
	Positive Ranks	30	20.87	626		
	Equal	2				
Perceived Performance	Negative Ranks	10	11.90	119	-3.73	.000
	Positive Ranks	27	21.63	584		
	Equal	3				
Perceived Efficiency	Negative Ranks	8	7.75	62	-4.38	.000
	Positive Ranks	29	22.10	641		
	Equal	3				

As a result of Wilcoxon Signed Rank test performed in order to reveal whether there was a statistically significant difference among the perceived anxiety, motivation, performance and efficiency scores of the pre-service teachers while performing the teaching role in virtual classroom and face-to-face teaching environment, it was determined that there was not a significant difference in terms of perceived anxiety ($z=-1.46$, $p>.05$); whereas there was a statistically significant difference in terms of perceived motivation ($z=-3.53$, $p<.00$) with a large effect size ($r=-0.55$), perceived performance ($z=-3.73$, $p<.00$) with a large effect size ($r=-0.59$), and perceived efficiency ($z=-4.38$, $p<.00$) with a large effect size ($r=-0.69$) on behalf of the experience in face-to-face teaching environment (positive ranks) (Table 3).

Reasons of the Pre-Service Teachers Perceived Anxiety, Motivation, Performance and Efficiency Levels

During the interviews conducted, the reasons for the anxiety perceived by the pre-service teachers regarding both virtual classroom and face-to-face teaching environments were revealed. It could be said that the pre-service teachers had the anxiety of teaching in front of the class, not being able to use their body language effectively and forget what to tell in face-to-face teaching environment; whereas they had the anxiety of facing technical problems in s virtual classroom environment. Some of the views of the pre-service teachers on this subject are presented below.

> *"…Virtual classroom has been easier for me. As a result, I made a plan in my head and I was not worried about the lectures as I would not be in a scene environment." (PST13).*
>
> *"In synchronous classroom application, the technical problems experienced in the computer and the materials I used panicked me and I could not express myself clearly." (PST14).*
>
> *"Virtual classroom environment is easier due to the convenience of being alone and as the materials are with me because of the fact that I may be concerned about forgetting the things I will teach." (PST19).*
>
> *"In face-to-face environment, the anxiety level is high, and thus, it is required to work harder in order to be able to use body language effectively." (PST22).*

In the interviews conducted, the pre-service teachers expressed that their motivation was low in virtual classroom environment due to such reasons as talking to the camera and being unable to ensure student participation; and that it was also low in face-to-face teaching environment due to such reasons as being excited and not being able to use body language effectively. Some of the views of the pre-service teachers on this subject are presented below.

> *"Talking to the camera in synchronous virtual classroom gave me a strange feeling. Talking in front of the students and getting feedback was important for a more enjoyable and fluent lesson." (PST22).*
>
> *"In virtual classroom, I was tired after a while since I could not provide student participation just because I was teaching on my own, and my voice was thrilling, which was a very tedious situation for me." (PST23).*

"The feeling that I was talking to the camera in synchronous virtual classroom is really boring." (PST38).

"Since I was anxious when I first appeared on stage in face-to-face classroom application, I used the same body language from beginning till the end of the lesson and I could not be very energetic." (PST13).

In the interviews conducted, the pre-service teachers stated that their performance was low in virtual classroom environment due to such reasons as not being able to make eye contact, less interaction and not being able to take individual differences into consideration; and that it was also low in face-to-face teaching environment due to such reasons as being excited and not being able to provide the control of the classroom. Some of the views of the pre-service teachers on this subject are presented below.

"I could not take into account the individual differences of the students in virtual classroom." (PST7).

"Since I made too much effort in order to provide classroom control in face-to-face education, I sometimes went off the subject and spent a certain amount of time for returning back to the subject. During this time, I experienced difficulties in teaching the whole subject and could not get some of the activities done." (PST23).

"Since I was on my own in synchronous virtual classroom, there was not much interaction and I felt like I was shooting videos rather than teaching the lesson. I was overwhelmed by my excitement from time to time in face-to-face classroom and this affected the way I taught quite a lot." (PST31).

"Since I was in front of the computer in synchronous classroom, I could not perform enough teaching because I was just like talking to myself." (PST36).

In the interviews conducted, the pre-service teachers emphasized that the technical problems experienced and not being able to make eye contact in virtual classroom environment decreased the efficiency of the lesson; whereas having the opportunity to interact and make eye contact with the students in face-to-face teaching environment increased the efficiency of the lesson. Below are some of the opinions of pre-service teachers on this subject.

"While I was teaching synchronously in virtual classroom, some of my students could not benefit from the course effectively because they had problems with the speed or quality of their internet connection. Although this situation seemed as a technical problem, it created a remarkable problem in achieving the goal of the course." (PST3).

"The interaction with the students in face-to-face classroom makes the teaching livelier and easier to understand. I also think it also makes the teaching convenient for the teacher." (PST10).

"In face-to-face classroom environment, classroom interaction was extremely high. Therefore, I think the lesson was more efficient. As I had the opportunity to make eye contact with all the students, I could make everyone participate actively. It was easier to motivate the students in terms of participating them in the lesson." (PST19).

Discussion and Conclusion

In this study, it was aimed to evaluate the pre-service teachers' teaching experiences in virtual classroom and face-to-face teaching environment. In accordance with this purpose, the results regarding the pre-service teachers' teaching environment preferences, the anxiety, motivation, performance and efficiency levels they perceived while performing the teaching role in virtual classroom and face-to-face teaching environment, and the reasons for the emotional responses were obtained. As a result of the research, it was determined that the majority of the pre-service teachers preferred face-to-face teaching environment for such reasons as teacher-student interaction and eye contact. This finding coincides with the findings of the researches that revealed such negative views of the students regarding virtual classroom environments as the lack of face-to-face communication and low student-teacher interaction (Berge, 2002; Birişçi, 2013; Jin, 2005; Chen, et al., 2001; Ojo & Olakuluhin, 2006). Within the framework of this study, it was noteworthy that the pre-service teachers preferred face-to-face environment, not as a student but because of the same negative views as a teacher in virtual classroom environment.

While there was not a significant difference in terms of the anxiety levels perceived by the pre-service teachers during performing the teaching role in virtual classroom and face-to-face teaching environment, it was determined that there was a significant difference in terms of the perceived motivation, performance and efficiency on behalf of face-to-face teaching experience. The fact that the anxiety of lecturing in front of the classroom, not being able to using body language effectively and forgetting what to teach in face-to-face teaching environment expressed by the pre-service teacher is balanced with the anxiety of experiencing technical problems in virtual classroom environment can be considered as the reason why there

was not a significant difference in terms of anxiety level for both of the teaching environments. Interestingly, not being on the stage in virtual classroom environment reduces the anxiety level of the pre-service teachers, whereas perceived motivation, perceived performance and perceived efficiency levels regarding virtual classroom experience decreases due to the fact that not being on the stage also yields such consequences as being unable to talk to the camera and being unable to make eye contact. This finding coincides with the findings in the literature revealing that technical problems in distance education negatively affect student motivation (Birişçi, 2013; Gilkes, 2020; Kalelioğlu et al., 2016; Ojo & Olakuluhin, 2006) and teachers' emotional response toward online teaching (Badia et al., 2019; Naylor & Nyanjom, 2020;. The decrease in student motivation can be considered as a factor that reduces perceived performance and perceived efficiency by creating the perception that the teacher is not able to provide student participation sufficiently and that the lesson is not productive. For this reason, as also stated by Yıldız (2011), in order to minimize the technical problems in virtual classroom applications, it is extremely important to eliminate the technical infrastructure deficiencies at the institutional level and provide continuous internet connection. In the relevant literature, the positive impact of institutional support on both preservice and in-service teachers' emotions to teaching online is also recognized (Naylor & Nyanjom, 2020; Nelson, Voithofer & Cheng, 2019). A recent study conducted by Naylor & Nyanjom (2020) reported a significant relationship between teachers' emotional responses type to teaching online and the perceived amount of institutional support.

The results of this study highlight the factors influencing pre-service teachers' teaching environment preferences and their emotional responses toward teaching. These factors are mostly related to the nature of virtual classroom where somewhat limit nonverbal interaction. Actually positive interaction between teachers and students is an important source of positive emotions for teacher (Chen, 2016). In this context, training programs for pre-service teachers aimed at providing knowledge and skills on interaction opportunities in virtual classrooms should be conduct. It was also revealed in this study that the pre-service teachers emphasized "interaction" most. The importance of interaction in online teaching is frequently emphasized in the literature (Moore, 1993; Swan, 2002; Wilson & Stacey, 2004). For this reason, it is important to organize the course activities carried out in virtual classroom environment in such a way that they enable the students to be more active (Kalelioğlu et al., 2016; Sae-Khow, 2014). At this point, it is possible to benefit from the features of current virtual classroom software

that is similar to the one present in real class environment and from the opportunities that will increase interaction (İzmirli & Akyüz, 2017). As well as the availability of these opportunities, the fact that these opportunities are indigenized and used by the teacher is of great importance. According to Song, Kim & Luo (2016), teachers should know different characteristics of online and face to face teaching and being skilled using tailored strategies for increase interaction. Therefore, pre-service teachers should be given the opportunity to experiences of teaching online where they are able to use these software and interaction opportunities.

In conclusion, it was determined in this study that among the reasons why the majority of the pre-service teachers preferred face-to-face teaching environment were such reasons as the anxiety of experiencing technical problems, not being able to use the interaction opportunities offered by virtual classroom environments and not being able to provide student participation. Based on this finding, it is necessary to teach pre-service teachers the technical specifications of virtual classroom environments and the interaction opportunities they offer, as well as training them in terms of the competencies to teach in these environments. In such a time period when digital transformation is experienced so rapidly, it is extremely significant for pre-service teachers to graduate by obtaining the necessary knowledge, skills and experience for virtual classroom environments as well as for face-to-face education environments.

Limitations and future research directions

Although the present findings add to our understanding of the reasons of pre-service teachers' teaching environment preferences and their emotional responses for both teaching in virtual classroom and teaching in face to face, there are several limitations worth noting. First, the results of the study have a limited generalizability. Besides, in this study, the collected data were limited to self-report data in the questionnaires and interviews. Future research may use a scale for collecting quantitative data and integrate observations and peer evaluations of pre-service teachers while they are performing the teaching role. Second, in this study, previous virtual classroom experiences of the pre-service teachers were not considered as a variable. However, some of the findings obtained may be correlated with the fact that the pre-service teachers who participated in the study experienced teaching in virtual classroom for the first time and that they had just a little experience in this subject. It is deemed significant to develop self-efficacy beliefs by pre-service teachers regarding the fact that they can teach the class effectively in virtual classroom environment as well as in face-to-face teaching environment

(Cakiroglu, Cakiroglu & Boone, 2005; Gorrell & Dharmadasa, 1994; Lambe, 2007; Woodcock et al., 2015). For this reason, there is a requirement for the applications that will increase virtual classroom experiences of pre-service teachers and for the studies examining the effects of this experience.

Statements of Ethics and Conflict of Interest

"I, as the Corresponding Author, declare and undertake that in the study titled as "*The Comparison of Pre-Service Teachers' Teaching Experiences in Virtual Classroom and Face-To-Face Teaching Environment*", scientific, ethical and citation rules were followed; Turkish Online Journal of Qualitative Inquiry Journal Editorial Board has no responsibility for all ethical violations to be encountered, that all responsibility belongs to the author/s and that this study has not been sent to any other academic publication platform for evaluation. "

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Research Article

Evaluation of Learning Stations on Earth Science Concepts by Gifted Students: Bursa PUYED Example[1]

Osman Elmas[2], Nermin Bulunuz[3]

Abstract

The purpose of this study is to assess effects of science lessons about earth sciences supported with learning stations on gifted students. The study was conducted in Gifted Children Association (PUYED) with four gifted fifth grade students. The students visited three stations. Semi-structured interviews, science journals and student answers to questions of instructions were used as data collection tools. An action research was used as a research design. Findings gathered from the journals revealed that students had general knowledge about earthquakes, geological faults, and volcanoes prior to station visits. They were observed to explain concepts like tectonic plate movements, how earthquakes occur and mountain-earthquake relationship elaborately. After stations, students were able to make inferences by interpreting data and establish model-reality connection. Students expressed in the interviews their desire to learn scientific concepts with learning stations in their own schools. Using learning stations in their science teaching programs is strongly recommended.

Keywords: *Gifted children, science education, learning stations, earth science.*

[1] The ethical committee permission is not required in this study since the data were gathered before 2020.

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Yer Bilimleri Kavramları Hakkındaki Öğrenme İstasyonlarının Üstün Yetenekli Öğrenciler Açısından Değerlendirilmesi: Bursa PÜYED Örneği

Öz

Bu çalışmanın amacı yer bilimleri kavramları hakkındaki öğrenme istasyonları ile desteklenen fen dersini üstün yetenekli öğrenciler açısından değerlendirmektir. Araştırma, beşinci sınıfta öğrenim gören dört üstün yetenekli öğrenci ile Bursa Potansiyel Üstün Yetenekliler Derneği (PÜYED)'nde gerçekleştirilmiştir. Öğrenme istasyonları ziyareti sonrası öğrencilerle yapılan yarı yapılandırılmış görüşmeler, yer bilimleri günlükleri ve istasyonların yönergelerinde yer alan sorulara verilen cevaplar veri toplama araçları olarak kullanılmış ve veriler betimsel olarak analiz edilmiştir. Araştırma deseni olarak aksiyon araştırması yaklaşım kullanılmıştır. İstasyonları ziyaretleri öncesi öğrencilerin günlüklerinde genel olarak deprem, fay ve yanardağ gibi kavramlardan bahsettikleri görülmüştür. İstasyonları ziyaretler ettikten sonra ise öğrencilerin günlüklerinde levhaların hareketleri, depremlerin nasıl oluştuğu ve dağların oluşumunun depremle ilişkisi gibi kavramlara daha detaylı biçimde değindikleri görülmüştür. Öğrencilerin öğrenme istasyonlarını ziyaretleri sonrasında verileri yorumlayarak sonuç çıkarabildikleri ve model-gerçek ilişkisini kurabildikleri görülmüştür. Yapılan görüşmelerde öğrencilerin istasyonlar hakkındaki görüşlerinin olumlu olduğu tespit edilmiştir. Öğrenciler görüşmelere verdikleri cevaplarda kendi okullarındaki fen derslerinde de kavramları öğrenme istasyonları ile öğrenmek istediklerini ifade etmişlerdir. Öğrenme istasyonlarının üstün yetenekli öğrencilere uygulanacak fen dersi öğretim programlarında etkin olarak kullanılması önerilmektedir.

Anahtar Sözcükler: *Üstün yetenekliler, fen eğitimi, öğrenme istasyonu, yer bilimleri.*

Introduction

When the studies conducted worldwide are examined, it is seen that the concept of giftedness has many definitions. This shows that the concept of "giftedness" does not have a universal definition, but is generally understood worldwide. Renzulli (1978), while defining giftedness, stated three different criteria in talent, creativity and motivation in a general or specific area and stated that they are intertwined. Similarly, Heller (1996) listed the skills that gifted students should have: intelligence, creativity, and social skills. In addition to the definitions of "gifted student" in world this concept is defined in different ways in many studies conducted in this field in our country. For example, when defining gifted individuals private, academic, has meant individuals performing at a high level compared to other individuals in the age groups in some areas such as intelligence and creativity (Bilgiç, Taştan, Kurukaya, Kaya, Avonoğlu, & Topal, 2013). Sak (2014) stated that gifted students learn quickly, their creativity, and imagination are at a high level. Also, according to the directives of Turkish Science and Art Centers (MEB, 2015) intelligence refers to the “student who shows a high level of performance compared to his peers in creativity, art, leadership capacity or special academic fields. In addition, Sternberg and Zhang (1995) developed the Pentagon theory, which states that an individual must meet five criteria such as extraordinary, productivity, value, rarity, and evidence in order to be gifted. According to him, in order to evaluate the individual as gifted; it is much better than its peers in any field (excellence), it has a superior ability, in a rare feature among its peers, it is productive about its goodness, its abilities can be determined by valid tests and its skills in culture it must have criteria (excellence, rarity, productivity, demonstrability, and value criteria). Gagne (2000), on the other hand, in the theory of "Differential Giftedness and Giftedness (DGMT)" says that it comes from birth (it is a gift) and that it expresses mental capacity. According to him, giftedness is the manifestation of this advanced mental capacity in a specific area (cited in Sak, 2017). One of these areas is the field of science. However, regardless of the definition of giftedness, it is a fact that these students should be supported in areas where they are better than their peers. Because gifted students have special needs, and if these needs are not met, they become blind and lose their interest.: Because gifted students need special education support due to the above mentioned characteristics; if they are not supported they may lose their interest (Renzulli & Reis, 1985; Çepni, Gökdere,0 & Küçük, 2002).

There are differentiation strategies in the literature to support gifted students. These are enrichment, acceleration, and grouping strategies. According to Ülger (2020)'s report, differentiation ensures that each student's learning style, interests and abilities are different, and the learning experience is organized according to these characteristics (Tomlinson, 1999). This differentiation can take place in the content, process, environment and product dimensions of the teaching. Among these strategies, especially enrichment and acceleration strategies come to the fore (Türkman, 2017). According to Robert (2005), enrichment is planning education in different ways to meet the educational needs of students. On the other hand, acceleration enables gifted students to receive an education at a higher level than their current education level (Kanlı, 2011). As an educational strategy, enrichment allows gifted students to look at events and concepts from a different perspective, question them (critical thinking); enable them to develop creative solutions to situations or problems and develop skills such as teamwork (VanTassel-Baska & Brown, 2007). Below are the curriculum models using these training strategies. "Curriculum models provide theoretical frameworks that form the basis for the development and planning of learning activities in the education of the gifted." (Sak, 2017: 171).

Many curriculum models have also been developed, which aim to realize the potential of gifted students. Some of these models are: Maker Model, Parallel Curriculum Model, Curriculum Narrowing Model, Integrated Curriculum Model, Grid Model and RAP Curriculum Model. Akkaş and Tortop (2015) compared curriculum differentiation models with each other in their research including the above-mentioned curriculum models. As a result of their research, they determined that acceleration and enrichment strategies can be used alone or together.

The curriculum model used in this research is the Parallel Curriculum Model. Parallel Curriculum Model consists of general curriculum, links curriculum, applications curriculum, and awareness curriculum. This Parallel Curriculum Model curriculum model that provides a framework for the realization of teaching (Tomlinson, Kaplan, Renzulli, Purcell, Leppien, & Burns, 2002). It also enables the education given to gifted students to develop parallel curricula based on the learning objectives included in the national education system (general curriculum) (Sak, 2017). For example; based on the learning objectives of the unit " Sun Earth and Moon " (Ministry of National Education, 2018) in the 5th grade "Earth and the Universe" subject area, students gain experience in the field by making applications on the subject (experimenting,

modeling) with the awareness curriculum and they can be provided with a metacognition about the field. Parallel curriculum components can be used alone or together in Parallel Curriculum Model (Tomlinson, Kaplan, Renzulli, Purcell, Leppien, & Burns, 2002). The reasons behind the emergence of this curriculum model is that it is based on the assumptions that gifted students encounter difficult and complex problems and that they know themselves and specialize in the area they will head towards (Tortop, 2015). In the development of curriculum models, gifted student characteristics are always taken into account.

There are some distinctive features of gifted students in science education. The courses developed within the scope of the research are planned by taking these features into consideration. These features are possible or can be developed in gifted students participating in the study. Some of the features introduced by Stepanek (1999), Gilbert (2002) and Key Stage 3 National Standards (2003a) are given below (as cited in Newberry & Gilbert, 2007):

• They show great interest in discovering scientific facts,
• They have a tendency to observe and ask questions,
• They can easily learn new ideas,
• Quickly establish connections between the facts and concepts they have learned, establish connections between scientific concepts and observed phenomena,
• Go beyond the given knowledge, move ideas from the context they learn to unknown contexts,
• Quickly understand models and theories in new situations and use them to explain facts and,
• Generate models and shape them mathematically.
• They suggest different strategies for testing predictions.
• They can reflect their own thoughts or learning.

Science lesson is a field attracting the interest of gifted students and challenging them to utilize their mind at maximum capacity (VanTassel-Baska, 2006). Science teachers are not only expected to provide appropriate environment for gifted students, but also to construct lessons according to their readiness levels and background knowledge (Tomlinson & Strickland, 2005). In order to develop the needed skills in gifted students, it is of high priority that the activities are meticulously planned, original and extraordinary (White, 2005).

According to VanTassel-Baska and Stambaugh (2006), there should be seven important elements in the education programs to be developed for gifted students. These elements are; 1) developing an understanding of scientific concepts; 2) developing scientific research skills in collaborative environments; 3) developing a knowledge base in the field of science; 4) developing interdisciplinary interactions; 5) developing real-life problem research skills; and 6) scientific to improve thinking skills" (cited in Erdoğan & Kahveci, 2015). Parallel Curriculum Model is one of the curriculum models bearing these elements (Erdoğan & Kahveci, 2015). In this research, based on these factors, the subject of earth sciences, which provides interdisciplinary interaction with real life problems (earthquakes), was selected. In Earth sciences 5th grade Science course, the subject area of "Earth and Universe" is included in the unit of "Getting to Know Our Planet" in our curriculum (MEB, 2018). In this study, the activities were tried to be original and extraordinary with earth sciences dealing with real world problems (Bralower, Feiss, & Manduca, 2008; Michigan State Board of Education, 2006).

According to Manduca (2008), there are some problems awaiting the next century. Global warming caused by greenhouse gases released into the atmosphere, the exhaustion of fossil fuels and water scarcity can be shown at the beginning of these problems (as cited in, Mısır, Muğlaloğlu & Dal, 2017). In order to reduce or eliminate these problems, the students who are given earth science education; The best and in-depth understanding of earth science subjects should be ensured (The Geological Society of America, 2011; Bralower, Feiss, & Manduca, 2008). Because earth sciences are about the layers of the earth, volcanoes, atmosphere, rocks, and etc. (McLelland, 2011). According to Kastens and Manduca (2012), if students learn earth sciences well, they can have an idea in solving possible problems. As these problems gradually increase every day, they can only be solved by understanding earth sciences better. Methods to optimally teach earth sciences to gifted students should be identified as these children are considered to be the future experts of producing and utilizing new technology (Erdoğan & Kahveci, 2017). Viable solutions on such essential matters can only be possible by proper education.

There are interdisciplinary relationships in the content of earth sciences (Clinton, 2010). These disciplines such as physics, chemistry and biology also enable the use of earth sciences in science classes. According to Kastens and Manduca (2012), understanding earth sciences is possible with science literacy (cited in Akçay, 2017). OECD (2019) argues that deal with

scientific issues and scientific literacy is defined as the ability to think on these issues (PISA 2018 Turkey Preliminary Report, 2019). In order for the individual to be a science literate, “explaining the facts scientifically, designing and evaluating a scientific inquiry method; data and interpret scientific findings "(OECD, 2019; cited in Pisa 2018 Turkey Preliminary Report, 2019, pp. 80) are required to carry their skills. MEB (2018) also explains the aim of the science curriculum as raising science literate individuals. In this context, one of the key concepts of raising science literate individuals is "How do we teach?" There are teaching techniques that answer the question. According to Çepni and Çil (2016), teaching techniques are the transformation of the chosen teaching method into practice. Regardless of the curriculum applied, a teaching technique should be chosen in accordance with the teaching objectives to be achieved.

In this current study, the hands-on learning stations technique was used. Benek (2012) defines this method as a technique where children are responsible for their own learning, a technique supporting peer learning through group work, actively engaging students with the help of constructivist approach and the theory of multiple intelligences. To apply this method, the teacher forms accurate learning stations for the given subject in the classroom, laboratory or workshop. These learning areas are called “learning stations” or “station centers” (Fraling, 1982). Students conduct some activities at each station for a specific period of time then proceed to the next one (Jarrett, 2010). Each learning station has a separate purpose which the students try to reach. Students are guided by the instructions of each station (Bulunuz & Jarrett, 2009).

In the learning station method, students take responsibilities, actively participate in the activities and socialize. While facilitating peer learning, this technique also improves communication skills. Moreover, working in small groups at the stations enables positive behaviors such as better learning, a longer span of keeping the knowledge in mind and being more in harmony with the environment (Beckman, 1990; Bulunuz, & Jarrett, 2009; Bulunuz, & Jarrett, 2010; Cohen, 1994). In addition to hands-on learning station technique, modeling is frequently used in science lessons. The aim of teaching through modeling in science is to concretize and demonstrate and explain scientific concepts because they are very abstract or in dimensions that cannot be exhibited in the classroom (Çepni & Çil, 2016).

Modeling technique activates cause-effect relationships and reasoning skills to create a mental model (Gobert & Pallant, 2004; Seel, 2001). In this research, concepts such as earthquakes, volcanoes and layers of the earth, which are among the topics of earth sciences, have been also studied by modeling.

The general purpose of this study is to assess the "science" lesson about earth science concepts applying learning stations for gifted students at the fifth grade registered at "Bursa Gifted Children Association" (PUYED). This research sought answers for the following questions:
1. What knowledge do the gifted students have before and after visiting the learning stations about earth science concepts?
2. What are the answers of the gifted students for the questions in the learning station instructions?
3. What are the views of gifted students regarding the learning stations about earth science concepts?

Methodology

Research Design

Qualitative research method (Creswell, 1994) was used in this research. Specifically, the action research method, which is a method used especially by teachers working in the field, was used (Çepni, 2014). According to Clement and Vandenberghe (2000), this method enables teachers not only to be practitioners but also to switch from passive to active position to innovations in education by making researches (cited in Çepni, 2014). Collins and Spiegel (2001) define this method as the "Researcher Teacher Model"; it examines in four stages: 1) determining the problem, 2) planning for the solution of the problem, 3) implementing the plans, and 4) evaluation (cited in Çepni, 2014). The science teacher, who is the first author of the study, followed the steps put forward by Collins and Spiegel (2001) in this study.

The science teacher working in the field applied and tried to evaluate the problem of "How can they learn better" for his gifted students with a planned study. In this way, the education given to gifted students, the effects of the curriculum models used, when supported by appropriate teaching techniques, were investigated by consulting students' opinions. For this purpose, semi-

structured interviews were used to get the opinions of the students as a result of the application, diaries to evaluate the effectiveness of the study during and after the application, and learning station assessment questions were used.

Gifted Children Association: (PUYED)

This research was conducted in 2017-2018 Fall semester in Bursa at the "Gifted Children Association" (PUYED) where gifted children receive education. This association accepts gifted students from pre-school (age 5) up to 7th grade (age 12). Students who score enough (bright level on the normal distribution curve) from the standardized IQ tests in our country are included in the education program of the association. After a four-week integration process, the students are evaluated in a meeting which PUYED teachers, parents and the student attend. In case the evaluation result is affirmative, the student gets to stay in the program until the end of the semester. All students registered at PUYED take the lessons: 1) Art, 2) Computer, 3) Science and 4) Critical Thinking and lesson content varies based on class level. Each lesson is one hour a week and all lessons are held on Saturdays. This research was conducted in the "Science" lesson.

Participants

The participants were four gifted fifth grade students. The learning stations were organized by the science teacher conducting the "Science" lessons at PUYED. The first author of this paper was also the "science teacher" of the participant students. The researcher (Science Teacher) has been teaching with gifted students by enriching, accelerating, or differentiating the science course at PUYED for a year. This researcher also acted as a "guide" during the students' visits at the stations.

Gifted students

Four gifted fifth grade students participated in this research. Each student was given a code name within the scope of the study and these code names were used in this paper instead of their actual names. General information regarding the participating students is given below:

Eymen is an 11-year-old fifth grader. He was administered WISC-R intelligence test in 2016. He is currently attending a private secondary school in Bursa. He is a reticent, silent person, albeit extremely energetic and physically active. He usually swings while sitting or walks when he is speaking. He is more interested in activity parts of lessons. He has an enthusiastic nature. He uses Turkish properly. While being polite and respectful, he asks a lot of questions. He responds with original answers to the questions he is asked. Experiments make him happy. He likes to be active during the lesson or the experiment. Once the topic in the lesson is not intriguing for him, he starts playing with the materials in the class he deems interesting. He wishes to conduct experiments during entire lessons. He prefers individual work rather than group work.

Berrak is an 11-year-old fifth grader. She was administered CAS intelligence test in 2016. She is currently attending a private secondary school in Bursa. She is a curious, highly concentrated student actively answering questions. Observations showed that she interprets questions in her own way, strictly follows instructions, asks questions when something is not clear and easily expresses herself. She likes to write, uses critical thinking for problem solving. She is actively engaging in individual assignments yet prefers to remain out of the limelight in group work.

Tuğba is an 11-year-old fifth grader. She was administered CAS intelligence test in 2016. She is currently attending a public school in Bursa. She has a good sense of humor. She likes to paint. She has a serene nature easily adapting to different environments. She follows instructions. She likes to ask questions and has good communication with her friends. She participates in the activities in science lessons enthusiastically. She enjoys learning new stuff and reflects these in her daily life. If she thinks it contributes her, she does not refrain from writing.

Deniz is an 11-year-old fifth grader. She was administered WISC-R intelligence test in 2016. She is currently attending a public school. She has a very quiet, calm, naïve nature. She follows instructions. Her communication with her friends is good. It may take her time to mingle with the group though. In case there are friends she gets on well, she engages actively in the group. Being cheerful in science lessons, she enjoys learning new stuff. She does not refrain from expressing her emotions and opinions during class. She actively answers the questions and likes to leave the class with a product.

Table 1 below shows gender, school type and intelligence scales used for diagnosis of the participating students.

Table 1
Student Introduction Summary

Name	Gender	School Type	Intelligence Scale Used for Diagnosis
Eymen	M	Private School	WISC-R
Berrak	F	Private School	CAS
Tuğba	F	Public School	CAS
Deniz	F	Public School	WISC-R

Acquiring Ethical Consent from Parents

A parental consent form was prepared by the Chairwoman of the Board of PUYED and was presented to the parents for approval one week prior to the activity. The ethical consent document included information of the topic of learning stations, purpose of the activity, person or institution to conduct the activity, name of the supervisor, contact address, date and time. Parents signing this document accepted their children to voluntarily take part in the study and that findings would be used for scientific purposes.

According to the TR DİZİN Journal Evaluation Criteria updated for 2020, the ethical committee permission is not obligatorily required in this study to be published in a journal indexed by TR DİZİN since the data were gathered before 2020.

Preparing the Learning Stations

The subject of "Destructive Natural Phenomena" is included in the fifth grade Science Curriculum (MEB, 2017). This is the subject that is intended to be differentiated using the Parallel curriculum model. The reason for choosing this subject is to raise awareness of gifted students due to the increasing global problems. The acquisitions have been taken from the national curriculum on the subject and these gains have been differentiated in a way that

enables students to grapple with difficult problems. This stage constitutes the general curriculum dimension of Parallel Curriculum Model. The fields of earth science, engineering and chemistry were selected for the curriculum of links aimed at establishing a relationship with other disciplines. New achievements are determined by making connections between these disciplines and the subject area. In the next stage, the applications curriculum, gains are written for students to practice similar to the experiences of experts in the specified disciplines. In this way, gifted students will gain familiarity and experience in the specified fields of earth sciences, engineering and chemistry.

After the differentiation of the outcomes, the teaching plan was created by determining how the objectives will be transferred to the students, how much time will be allocated, and what criteria will be evaluated. Scientific process skills, life skills, and engineering design skills in MEB Science Curriculum (2018) in the process of recreating and differentiating the gains; Mentioned in the preamble to distinguish the characteristics of gifted students in science fields (page number) and PISA 2018 Report of Turkey (2019) it has been utilized in areas where science literacy skills. One of the important aspects of the parallel curriculum model is the use of thinking skills and creativity skills in the teaching process (Tortop, 2015)

Three learning stations were designed in this research: 1) How did the mountains form? 2) Let's make a volcano model with soil! and 3) How do earthquakes occur? The first and second stations were adapted from English to Turkish from the doctoral dissertation of the second author. The other learning station used in the study and related to earthquakes was created by the first author. The station about earthquakes was based on related achievements of the curriculum and the "they understand scientific concepts in depth" (Gould, Weeks & Evans, 2003) characteristic of gifted students. In other words, achievements prepared for average students in the curriculum were elaborated for gifted students. After the learning stations and their instructions were prepared, parents of the students were contacted for ethical consent. Students were informed about the activity one week prior to it in order to have them psychologically ready. Within the same week, materials required for the stations were supplied, these were placed together with the instructions on to the tables where the activities were to be conducted and the classroom environment was prepared for the activity.

Application of the Learning Stations

Names and order of the learning stations used in the research are as follows:
1st Station – How did the mountains form?
2nd Station – Let's make a volcano model with soil!
3rd Station – How do earthquakes occur?

Before the activity, teacher gathered to make necessary arrangements and checked the tables of the experiment setups. As four students participated in the research but only three learning stations were available, first and second stations were given two students each. After completing both stations, all students proceeded to the third station and conducted the activity together. Students spent approximately 20 minutes at each station.

Data Collection Tools

Three data collection tools were employed in this research: 1) Post-activity interviews with the students; 2) Earth science journal and 3) Questions of the instructions of learning stations. Detailed information regarding these data collection tools is presented below.

Post-activity interviews with the students

Semi-structured interview technique was used in order to get feedback from the gifted students about the learning stations, to find out their opinions and to determine whether the learning target was reached. This interview, in which students took part individually, was conducted in the meeting room at PUYED immediately after the activity.

The interview questions consist of open ended questions, which were previously used in a study of the second author, prepared for assessing student feelings and opinions after the learning station. The reason for using semi-structured interview questions was to prevent unclear answers or students getting nervous and to obtain more illuminating answers. Each individual interview with four gifted students lasted around 4-7 minutes and was recorded on a mobile phone. Prior to the interview, students were informed on the purpose of the research and how the interview recordings were going to be used.

Computerized interview recordings were reviewed by the first author repeatedly and transferred to a word processor program. Transferred data includes the utterances of both the interviewer and the interviewee. Answers to the interview questions were initially separated with color codes. The color codes were determined according to the properties of the given answers. The third research question was taken into consideration while the student responses were divided into themes. The answers given to the questions aiming to get the students' opinions about the lessons were listed from the most spoken theme to the least spoken theme (Table 6).

Received answers were divided into themes and tabulated. This table presents all answers according to the themes. The "frequency" in Table 6 expresses how many responses received from students regarding the theme in question.

Earth science journal

The earth science journal was prepared so as to reveal what students knew before, what they observed during the activity, what they learned after the activity and to determine their questions in case they had any. Separated in four columns, these one-page journals contain the titles: 1) My Earth Science Vocabulary; 2) My Observations; 3) What I Learned; and 4) My Questions.

This data collection tool was distributed among the students right before the learning station activity started and they were asked to fill in the “My Earth Science Vocabulary” part at first. The teacher asked the students to write everything they know about earth sciences. They were reminded to fill in the other parts during the activity. The purpose in this was to compare what the students knew before with what they learned during the activity.

Answers to the questions of the instructions of learning stations

Three separate instructions were prepared for the three learning stations used in this research and below each instruction a comprehensive question considering the gifted students’ class level was written to determine whether the concept of the station was understood by the

students. The purpose of asking single but comprehensive questions was to occupy the students' minds enough in order to prevent the students from getting bored while answering the questions. The students were reminded to answer the question once the activity in each station was completed. They were given a blank paper and sufficient time.

Findings

Findings Regarding the First Research Question

The first research question of this study is: "What knowledge do the gifted students have before and after visiting the learning stations about earth science concepts?" To answer this question, the students were given earth science journals. The journals have three parts. The students were asked to write: 1) What concepts they know before the activity; 2) Their observation results; and 3) What concepts they learned after the stations. The journal notes of the students are presented below in Table 2.

Table 2
Answers the Students Gave in Earth Science Journals

Students Name	Concepts I Knew Before Stations	My Observations	Concepts I Learned After Stations
Deniz	Fault line, mountains, earth crust, volcanoes	How earthquakes occur	• How earthquakes occur • How earth crust overlaps and how mountains are formed • How volcanoes form in detail
Eymen	Earthquake	People get scared	• Earthquakes occur by tectonic plates overlapping • Mountains form by earthquakes
Tuğba	Lava, earthquake, volcano, temperature, 1999 earthquake	How volcanoes and mountains form	• Volcanoes explode due to earthquake induced lava eruption
Berrak	Seism	People panic. Earth shakes. We may be buried under wreckage	• Earthquakes occur when strata of earth crust rupture

As seen above in Table 2, some students mentioned concepts such as earthquake, fault line and volcano in the "Concepts I Knew Before Stations" part in the journal, whereas they described

concepts such as tectonic plate movements, how earthquakes occur and the relation of mountains and earthquakes in detail in the "Concepts I Learned After Station" part. But not all students gave details. For example, while Deniz and Eymen only said what they learned, Berrak and Tuğba explained what they learned in detail.

For example, Berrak, who only knew the concept "seism" about earthquakes, answered in the concepts I learned after stations part as: "*I learned that earthquakes occur when strata of earth crust rupture*". It was observed that Tuğba, like his other friends, detailed the concepts he had about the concepts of earth sciences after his visit to the stations. After visiting the stations about how mountains and volcanoes were formed, Tuğba was observed to associate the mountain-volcano couple with earthquakes. However, the fact that Deniz and Eymen only said what they learned but did not elaborate on what they learned made us think that they could not reflect their knowledge to YBG or learn the subject. Looking at Table 3, Table 4, and Table 5, it is seen that in the answers given to the station questions, Deniz and Eymen gave more clues and explanations about what they learned.

Findings Regarding the Second Research Question

The second research question in this study is: "What are the answers of the gifted students for the questions in the learning station instructions?" In this context each station instruction included one question which the students answered after completing each station. Questions in the instructions in the given order and students answers are presented below.

Table 3
Answers Given to the Questions in the First Station

Student Name/Question	What kind of relationship is there between the formation of mountains and earthquakes? Please explain.
Deniz	Volcanic eruptions may lead to earthquakes. That is the relationship. Between the mountain-like dough is the fault line.
Eymen	Strata overlap when earthquakes occur and mountains are formed.
Tuğba	Formation of mountains: There is a connection between mountains and earthquakes. When there is an earthquake, mountains move, or even form.
Berrak	Earthquakes cause strata to rupture. These ruptures push the tectonic plates and new plates (strata) appear on the surface.

Table 3, above, shows the question from the learning station named "How did the mountains form?" and corresponding student answers. In this learning station, students pushed two different strata models, which they formed with play dough, towards each other and observed the result. Given answers indicate students establishing model-reality connection. Deniz's answer; *"Volcanic eruptions may lead to earthquakes. That is the relationship."* to the question; "What kind of relationship is there between the formation of mountains and earthquakes? Please explain" is a good example for establishing this connection.

The answers also proclaim that the students are able to realize the connection between earthquakes and mountains. As an example, Berrak explains the formation of mountains with her answer; *"Earthquakes cause strata to rupture. These ruptures push the tectonic plates and new plates (strata) appear on the surface."* Eymen responded with a similar answer to Berrak. Tuğba mentioned that mountains move or form when earthquakes occur, after she expressed that there is a connection between mountains and earthquakes.

Table 4
Answers Given to the Questions in the Second Station

Student Name/Question	Please explain how volcanoes form, based on your observations.
Deniz	I think mountains erupt and become volcanoes.
Eymen	Volcanic eruptions are caused by lava in magma reaching the surface.
Tuğba	Earthquakes cause lava to erupt which leads to volcanoes to form.
Berrak	Acid-like (vinegar) stuff inside the volcano comes together with the magma stratum and erupts.

Table 4, above, shows the question from the learning station named "Let's make a volcano model with soil!" and corresponding student answers. Students observed in this learning station the volcano model they structured with chemical compounds. It was observed that students were able to establish model-reality connection just like in the previous station. As seen from the answers to the question "Please explain how volcanoes form, based on your observations.", students associated volcanoes with magma and explained this concept through earthquakes. For example, with her answer *"Earthquakes cause lava to erupt which leads to volcanoes to form."*, Tuğba deduced that earthquakes cause volcano eruptions.

Table 5
Answers Given to the Questions in the Third Station

Student Name/Question	Please explain how seismic waves form, based on your observations.
Deniz	The ground shaking causes seismic waves. This is the reason of earthquakes.
Eymen	Ground shaking.
Tuğba	Earthquake is two rocks shaking. And then one rock gets on top of the other.
Berrak	Earth shakes due to underground strata rupturing. This is called earthquake.

Table 5, above, shows the question from the learning station named "How do earthquakes occur?" and corresponding student answers. The most comprehensive answer to this question came from Berrak: *"Earth shakes due to underground strata rupturing. This is called earthquake."* The other three students explained seismic waves as a result of ground shaking. For example, Deniz explained the concept as: *"The ground shaking causes seismic waves. This is the reason of earthquakes."*

Findings Regarding the Third Research Question

The third research question in this study is: "What are the views of gifted students regarding the learning stations about earth science concepts?" Data obtained from the interviews with the four students participating in the research was analyzed qualitatively through thematic analysis. Data including sub-themes, frequencies and sample sentences are summarized in Table 6 below. The frequencies were obtained by giving answers to different questions containing the same theme. For example, it is seen that 14 answers were given on the subject of the theme "Lesson with learning stations being entertaining or nice".

Table 6

Thematic Analysis Results of Interview Data

Sub-Theme	Frequency	Sample Sentence
Lesson with learning stations being entertaining or nice	14	"The lesson is more fun." (Eymen) "I can't decide on how to answer the question -Which was the most effective station?- They were all nice." (Deniz) "I liked the volcano activity the most because it was an experiment with eruption." (Tuğba)
Cognitive assessment regarding learning stations	14	"If buildings are built durable, they won't collapse." (Berrak) "The red liquid at the volcano station represented lava." (Deniz) "Volcanic eruptions are caused by lava in magma reaching the surface." (Eymen)
Lesson with learning stations being efficient in learning the topic	9	"The most effective and most informative stations are volcanoes then marshmallows (earthquakes) and lastly mountains." (Tuğba) "Learning stations are effective for me to learn a topic." (Berrak) "We learned and experimented how mountains form." (Deniz)
No or few experiments being conducted in science lessons	9	"I don't need to sit at my desk for forty minutes in this lesson." (Tuğba) "We sit and listen to the teacher at school. We write at school. Half of the lesson is wasted with complaints." (Tuğba) "We don't have a lesson in my school involving learning stations" (Berrak) "They teach us things that we can understand at my school, but here we learn more stuff and more elaborately." (Deniz)
The wish to conduct science lessons with station method	7	"I would never want the lesson to end if they conducted lessons with station activities at my school." (Berrak) "It would be good to conduct science lessons with stations. I would even write a petition to the school principal to have science lessons every day." (Tuğba) "It would be nice to conduct the science lesson with the station method." (Deniz)
School - PUYED comparison	5	"We don't get into detail at school. Earthquake and stuff, usually no details." (Deniz) "When conducting an experiment at school, the teacher never directs us research questions. He only asks questions, never asks us to write." (Berrak) "It is beneficial that they ask us questions and want us to write at PUYED." (Berrak)

Discussion and Conclusion

Discussion and Conclusion Regarding the First Sub-Problem

With the help of learning stations prepared suitable for 5th grade gifted students, earth science concepts in science lesson have been diversified and enriched in this research. Earth science journals were employed to identify background knowledge, observations and newly learned concepts of the students.

After the stations, on the other hand, they wrote sentences with inferences. Berrak, for example, was observed to make inferences from the activity by writing in the "Concepts I Learned After Stations" column of the ESJ: *"I learned that earthquakes occur when strata of earth crust rupture."* One of the skills to develop in gifted students is inference skill (Halkitis, 1990). One of the results obtained from this study is that this skill can be improved provided that an education method is developed according to the characteristics of gifted students. At the same time, it was seen that Tuğba made such an inference by saying, "I learned that volcanoes exploded when the earthquake occurred because the lava inside them exploded". Gifted students making predictions and inferences based on observations or data can be considered as an output of the learning station learning technique. Bekereci, Şimşek, Hamzaoğlu, and Yazıcı (2020), in their study on 7th grade students, concluded that the science lesson taught using the learning station was significantly in favor of the station compared to the lesson taught using the lecture method. The results of criteria such as the use of station technique in the research to facilitate understanding and increase academic success support this study. In addition, from the skills that are aimed to be acquired while organizing learning activities (MEB, 2018; Burns, 1993; OECD, 2019), the skills of seeing relationships (analytical thinking skills; the relationship between earthquake-layers of the earth-volcano), determining the effect-reaction and explaining scientific facts, it is observed that it develops. One of the studies conducted in this context is the study in which Kök and Davaslıgil (2014) examined the effects of differentiated courses on the spatial skills of gifted students with the Parallel curriculum model. The research concluded that spatial thinking skills developed positively. Likewise, the answers given to YBG in this study show that gifted students envision and shape the concepts of earth sciences in their minds.

Examining the concepts the students knew before visiting the stations revealed that they roughly mentioned the concepts, however, were unable to explain them in detail. However, the data obtained from the data collection tools used in other research questions show that students gave more detailed answers.

Discussion and Conclusion Regarding the Second Sub-Problem

So as to determine whether the activities with the learning stations fulfilled the purpose, the questions in the instructions were asked the students. The second research question was answered by the analysis of these answers.

The answers to the question "What kind of relationship is there between the formation of mountains and earthquakes? Please explain." from the instructions of the first learning station "How did mountains form?" were analyzed. This analysis showed that the students were able to explain the relationship correctly and to make inferences by interpreting data. In a study conducted by Güneş (2009), which includes similar results, a positive and significant result was found in the knowledge level of the students by using the station technique. In addition, studies investigating the effect of science lessons taught using station technique on academic achievement show that the academic success criterion has increased positively (Benek, 2012; Çakmak, 2018; Erdağı, 2014; Koca, 2018).

At the second station "Let's make a volcano model with soil!" the question "Please explain how volcanoes form, based on your observations." was asked. Examining the answers revealed that the students were able to explain how volcanoes form and to name the real-world counterparts of the material used in the experiment. At the third learning station "How do earthquakes occur?" the question "Please explain how seismic waves form, based on your observations." was asked. One of the students gave a short answer, whereas the others wrote more comprehensive answers. In one of the detailed answers the student named the tectonic plates rocks and that the earthquake was due to these rocks' movement. Another student stated that the earth was shaking as a result of rupturing strata.

In these results, it can be said that gifted students quickly understand modeling, establish a relationship with real life, and develop previous models in their minds. A similar study in which modeling activities were used and the 6th grade students developed mental models as a result of the research supports this result (Arslan & Doğru, 2014). As mentioned above, the students' responses to the questions at the stations can be among the positive results of science lessons that are differentiated by using learning modeling and station technique, such as the development of their skills such as interpreting data from scientific process skills, reaching results based on data and seeing relationships.

Analysis of the student answers to the questions in the station instructions showed that the gifted students gained more detailed and comprehensive knowledge regarding earthquakes, mountains and volcanoes, after the activity. As the knowledge the students had before the activity and findings from the interviews exhibit, the things they learned at school were very limited and were taught with an unsatisfying education method. The findings Çelikdelen (2010) obtained from her master's thesis study about determining the difficulties students attending BILSEM (Science and Art Education Centers) face in science and technology lessons in their own schools also support the findings of this research.

Discussion and Conclusion Regarding the Third Sub-Problem

Semi-structured interviews were conducted with the students at the end of the activity with the purpose of determining the views of the gifted students about the learning stations. Interview data was analyzed thematically. Table 6, including sub-themes and sample sentences, is presented in the "Findings" section.

Fourteen different answers were received about the sub-theme "Lesson with learning stations being entertaining or nice". The students stated that they enjoyed this lesson because they were able to conduct activities or experiments within the scope of learning stations in science lesson. As a matter of fact, the expression "The lesson is more fun." of a student indicates that students enjoy the lesson more and their enthusiasm for learning increases when they are active instead of passive. Erdağı and Önel's (2015) study, in which the students were found to enjoy station activities and to be successful in group work, supports this result. Another example displaying that they enjoyed science lesson with stations is Deniz's answer *"I can't decide. They were all*

nice. " to the question "Which was the most effective station?" As a result of Benek's (2012) study using learning station technique, the fact that 7th grade students found the lessons enjoyable and beneficial supports the result of this research. Similarly, in the studies of Erdağı (2012), Koca (2018) and Çakmak (2018), it was determined that science lessons taught with the learning station technique caused positive attitude developments on students.

The scientific terminology, Eymen and other students used during the interview for their answers to the questions on the cognitive assessment about the learning stations, proves that they learned the concepts. In addition, Deniz's linking the materials used in the modeling experiment with real life shows that the teaching is effective and Parallel Curriculum Model's links curriculum is linked to different disciplines (earth science and chemistry). Parallel Curriculum Model's links curriculum aims to establish analogies between the contents and to gain the ability to see concepts such as experts in the field. It is understood that the students gained these skills from the answers they gave.

Although they study the same topics at their schools, the scantiness of their notes in the "My Earth Science Vocabulary" section and the common student view regarding insufficient lessons at school revealed that activities such as learning stations help them learn topics better. Berrak's answer *"They only told us about volcanoes at school but didn't mention how mountains form."* from the interview can be given as an example. The sentence makes it clear that they do not get into detail at school and that she learned this topic in depth with the station method.

The sub-theme "Lesson with learning stations being more efficient in learning the topic" shows that students deemed all stations efficient in learning the topic. In addition, Berrak's answer *"Learning stations are effective for me to learn a topic."* is an example for students seeing the station method as an efficient learning technique.

Analyzing pre and post learning station student cognitive levels shows that students generally understood earth science concepts taught through stations. The fifth graders in the research were able to understand without explanation that surfacing lava from magma lead to volcanic eruptions, buildings can resist earthquakes if built strongly, red liquid in the activity represents lava. Apart from establishing relationships with other disciplines, it is observed that Parallel Curriculum Model has acquired the skills required to be acquired within the scope of the

applications curriculum. Because, referring to the effects of earthquakes on buildings, students actually encountered the same problems as field experts and developed awareness of these problems.

When all these results are evaluated together, the following results can be reached based on the science course teaching process, which was developed using Parallel Curriculum Model and includes the learning stations technique:

- It is seen that differentiation with the parallel curriculum model causes students to establish interdisciplinary relationships, to establish relationships between concepts, to develop the scientific language they use (Table 6), to develop a positive attitude towards the course, to develop awareness by facing the same problems as field experts and to develop the thinking skills that are desired to be acquired. There are similar studies supporting these results. With the Conn-CEPT project, gifted students were worked on and differentiation was made using Parallel Curriculum Model. It was concluded that the level of satisfaction with the lessons and the relationship between concepts were positively affected by the students who took differentiated teaching (Erdoğan, 2017: 116). In addition, Erdoğan and Kahveci (2015), Özyaprak and Davaslıgil (2015) concluded that there are positive developments in the attitudes of gifted students towards the lesson with Parallel Curriculum Model, and Kök and Davaslıgil (2014) in spatial thinking (cited in Erdoğan, 2017).
- When looking at the studies referring to student opinions in the use of the learning station technique, the research of Karacalı (2018) compiling the studies conducted in our country stands out; “According to these studies, students; They stated that they were able to express themselves better with activities based on the learning stations technique, the activities increased their desire to participate in the lesson, they were able to look at the lessons more critically and critically, they were able to adapt what they learned to daily life, the lessons were fun and this method should be continued. (Karacalı, 2018). Most of the opinions mentioned in this research were expressed by the students. In this context, it seems positive that the differentiation of lessons by using the learning station technique contributes to gifted students to learn science concepts more effectively.

Suggestions

This research was conducted with four gifted fifth grade students. It may be repeated with the participation of more students to contribute to viewing problems of gifted students from a wider perspective.

Suggestions for Teachers

Teachers with gifted students in their classes can apply more active methods such as demonstration experiments, modeling or learning stations beside plain explanation in order to prevent the students from getting bored and to increase performance. It should be the duty of science teachers to replicate natural events through modeling or different experiments so that the students can experience how these events occur in the nature.

Suggestions for Curriculum Developers

Interviews and earth science journals revealed that the students were not as active as they wanted to be in the lessons at their schools. In addition, concepts which they can actually learn quite easily become boring for them due to inadequate or insufficient teaching methods (such as plain explanation). All these factors result in gifted students seeking education in special institutions focusing on these issues. The main task for curriculum developers is to develop programs which enable students to conduct lessons without getting bored and to actively take part in the process.

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Statements of ethics and conflict of interest

"I, as the Corresponding Author, declare and undertake that in the study titled as "*Evaluation of Learning Stations on Earth Science Concepts by Gifted Students: Bursa PUYED Example*", scientific, ethical and citation rules were followed; Turkish Online Journal of Qualitative Inquiry Journal Editorial Board has no responsibility for all ethical violations to be encountered, that all responsibility belongs to the author/s and that this study has not been sent to any other academic publication platform for evaluation."

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Research Article

Secondary School Students' Views About the Use of Argument-Driven Inquiry in the Science Courses[1,2,3]

Sevinç Kaçar[4], Ali Günay Balım[5]

Abstract

The vision of science teaching is to train individuals who can produce and evaluate scientific knowledge by following the scientific processes like the scientists in order to understand and be able to produce solutions to the problems they encounter in real life. Ensuring this is only possible by using effective teaching methods. One of these methods is the argument-driven inquiry method. In parallel, the purpose of the study is to identify secondary students' views about the use of the argument-driven inquiry in the science courses. In the research, the case study has been adopted. Participants of the study consists of twelve seventh-grade students in a secondary school located in the Aegean region in the 2016-2017 academic year. The research

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was carried out in six weeks. In the research, the 7th grade "Electric" unit was taught with argument-driven inquiry activities. In the research, the participants were given an electrical situation (serial-parallel connected circuits etc.). The research data was collected by a semi-structured interview form regarding the use of argument-driven inquiry method in science classes which is consisting of 18 open-ended questions in order to determine students' opinions. Content analysis method was used for analysis of the data obtained from the research. As a result of the research, it was determined that the participants mostly gave a positive opinion on the use of the argument-driven inquiry in science lessons. Students who gave negative opinions about the argumentation-based inquiry method said that they did not like this model on the grounds that they were afraid to express their own opinions in the lesson and they did not like to talk in the lesson. As a result, it can be said that the literature contributes to the determination of student opinions on the use of the model.

Keywords: *Argument-driven inquiry, science education, views of the students, secondary school student*

Ortaokul Öğrencilerinin Fen Derslerinde Argümantasyona Dayalı Sorgulama Yöntemi Kullanımına İlişkin Görüşleri

Öz

Fen öğretiminin vizyonu, öğrencilerin gerçek yaşamdaki olayları anlamak ya da karşılaştıkları sorunlara çözümler üretebilmek amacıyla bilim insanları gibi bilimsel bilgiyi üretebilen ve değerlendirebilen bireyler yetiştirmektir. Bunu sağlamak ise ancak etkin öğretim yöntemlerini kullanabilmekten geçmektedir. Bu yöntemlerden biri de argümantasyona dayalı sorgulama yöntemidir. Buna paralel olarak, bu çalışmanın amacı Fen Bilimleri dersinde argümantasyona dayalı sorgulama yöntemi kullanımına ilişkin ortaokul öğrencilerinin görüşlerini belirlemektir. Araştırmanın yöntemi olarak, durum araştırması benimsenmiştir. Araştırmanın çalışma grubunu, 2016-2017 öğretim yılında Ege bölgesinde yer alan bir ortaokulda öğrenim görmekte 12 yedinci sınıf öğrencileri oluşturmaktadır. Araştırma 6 hafta sürmüştür. Araştırmada, öğrencilere elektrik konusuyla ilgili bir durum (seri-paralel bağlı devreler vs.) verilmiştir. Bu ünite, çalışma süresince argümantasyona dayalı sorgulama öğrenme yöntemine göre işlenmiştir. Araştırmada veri toplama aracı olarak 18 açık uçlu sorudan oluşan fen derslerinde argümantasyona dayalı sorgulama yöntemi kullanımına ilişkin yarı yapılandırılmış görüşme formu kullanılmıştır. Çalışmadan elde edilen verilerin analizde içerik analizi yöntemi kullanılmıştır. Çalışma sonucunda, öğrencilerin fen derslerinde argümantasyona dayalı sorgulama yöntemi kullanımı hakkında çoğunlukla olumlu görüş bildirdikleri belirlenmiştir. Argümantasyona dayalı sorgulama yöntemi hakkında olumsuz görüş bildiren öğrenciler ise derste kendi fikirlerini belirtmekten çekindikleri, derste konuşmayı pek sevmedikleri gibi gerekçelerle bu modeli sevmediklerini ifade etmişlerdir. Sonuç olarak, bu modelin ortaokul düzeyinde kullanımı sınırlı olup, modelin kullanımına ilişkin öğrenci görüşlerinin belirlenmesi konusunda alanyazına katkı sağladığı söylenebilir.

Anahtar Sözcükler: *Argümantasyona dayalı sorgulama, fen eğitimi, öğrenci görüşleri, ortaokul öğrencileri*

Introduction

The world is changing fast. Change affects not only us but also the whole world. The main reason for this is the rapid change and progress in science and technology. This deeply affects and changes many of our daily life situations, such as the expectations of employers from trained manpower and the expectations of the individuals of the age in terms of business and living standards. This leads to the emergence of new types of professions that we cannot predict at the moment, but that will probably be popular in the future, and the diversification of the competences that people will have to work in these professions, and even the definition of new qualifications is happening. This process of development and change has made education the key to a serious future in terms of ensuring the socio-economic, political and geopolitical balances between countries and other countries they compete with. In other words, it can be stated that the education systems of the country have become a powerful industry that determines their squares. Since it has been observed that countries that do not attach importance to education cannot win every race in the race for rapid development and solid democratization. This has brought the discussion of the question of "what kind of education system and education program should we develop for countries?" It can be said that the science course came first among the courses that were affected by and affected all these discussions. Therefore, it is important to be able to accurately analyze how the current century shaped the world. In line with these analyzes, it is an inevitable necessity for countries to review their science education systems and curricula. Concordantly, our country has implemented serious reform in the 2005 Science and Technology and Science curriculum in 2013 and 2018 (Ministry of National Education [MNE], 2005; 2013; 2018).

In this context, the recent science education reform efforts have been carried out in the 21st century. It has been tried to determine what the characteristics that century individuals should have are. As a result, the vision of the 2018 Science Course Curriculum was emphasized as raising science literate individuals. In this context, it has been stated that in order to be successful in today's and future education and business lives, the science literate individuals produce knowledge and can use it functionally in life, be creative, innovative, critical thinkers, open to cooperation, solve problems, have high communication skills, use and develop entrepreneurial, stable, empathetic technology well, contribute to society and culture, etc. (MNE, 2018; Uluyol & Eryilmaz, 2015). Moreover, a science literacy individual understands

science subjects, scientific processes and the epistemological aspect of science so that he can make personal decisions in the context of related issues in everyday life, participate in the relationship between society and culture, and rush these understandings to work for economic efficiency (National Research Council [NRC], 2005; 2012; 2013; Walker, 2011). In this context, it is seen that science teaching programs in different countries included teaching methods designed to help students grow up as science literate individuals and examples of the application of these methods. It can be said that one of them is a new method of learning, The Argument-Driven Inquiry Method (Grooms, 2011; Sampson, Grooms & Walker, 2011; Walker, 2011). The method of inquiry, which is the closest method of learning to this method, forms the basis of the research of scientists and the development of scientific knowledge; argumentation plays an important role in the 2007 communication of scientists through the scientific facts presented in the process of making science (Anderson, 2007; Duschl & Osborne, 2002; Sampson & et al., 2011). However, even this situation makes us see the shortcomings of research-inquiry and argument-driven learning methods. Because in the research inquiry method, discussion/communication about the scientific process is stored at the end or very little is done. This causes deficiencies/turmoil in the scientific facts of the research process carried out by students in their minds regarding many situations such as the accumulation of science and acceptances of theories and laws. Moreover, in argument-driven learning, sometimes processes such as hypothesis, data collection are not carried out and students are tried to be drawn into scientific debate over claims that are not their own. This prevents students from going through the process of making science and producing information. Here, argument-driven inquiry learning method can be considered to be an effective learning method that enables to eliminate/complete the deficiencies of all these two methods and to combine the good aspects (Walker & Sampson, 2013a; 2013b). In other words, it can be said that the method of learning inquiry based on arguments corrects the deficiencies in the inquiry process in the method of argument and argument-driven learning in the inquiry method.

In the method of argument-driven inquiry; students determine the research problem, decide on the appropriate research method in order to produce a solution to this research problem, decide how to collect the data, carry out the processes of collecting and analyzing the data, then make an argument and participate in the argument process with their peers as a result of this, ultimately reaching and reporting the scientific information that applies (Walker, 2011). In this

context, thanks to this method, students can make sense of many processes of science through real lives, just as scientists do in their research.

Moreover, the method of argument-driven inquiry is a laboratory-based method that involves research and inquiry that contributes to the importance of argument in science education (Walker, Sampson, Grooms, Anderson & Zimmerman, 2012). The method of learning argument-driven inquiry attaches great importance not only to the experimental characteristics of laboratories (questioning, method development) but also to the presentation of scientific claims (argumentation, writing) in improving students' science literacy (Cetin & Eymur, 2018). In other words, this learning method combines argumentation with laboratory-based teaching to offer a broad perspective (Walker & Sampson, 2013a; 2013b). This method of learning is designed as a more original (authentic) or at least more realistic and educational learning that gives students the opportunity to design their own research, participate in argumentation, write scientific articles for a critical and knowledgeable audience, participate in the peer review process, and review their own articles in response to criticism brought to the article (Sampson & Walker, 2012; Walker, Sampson, Grooms, Anderson & Zimmerman, 2010; 2012). It can be stated that such a method of teaching teaches students to make science in a way that is consistent with the scientific research process, that is, scientific explanations of the events that exist in nature beyond learning about scientific facts, laws, theories and models. Moreover, the method of argument-driven inquiry encourages students to develop and use conceptual models, design and conduct research, develop explanations, share ideas and criticize, all of which allow students to develop the knowledge and skills they need to become science literate individuals (Sampson, Hutner, FitzPatrick, LaMee & Grooms, 2017). In this context, when the literature is examined, studies have been conducted with students from primary schools (Chen, Wang, Lu & Hong, 2019; Chen, Wang, Lu, Lin & Hong, 2016), secondary school (Aktas, 2017; Aktas & Dogan, 2018), high school (Amielia, Suciati & Maridi, 2018; Cetin, Eymur, Southerland, Walker & Whittington, 2018; Eymur & Cetin, 2017; Eymur, 2018; 2019; Kim & Hannafin, 2016) and also prospective teachers (Altun & Özsevgeç, 2016; Cetin & Eymur, 2018; Erenler, 2017; Eymur & Cetin, 2017). It can be said that these studies are mostly conducted with high school students and prospective teachers. For this reason, it can be considered that studies involving the applications of the argument-driven inquiry method at the level of secondary school students are needed. At the same time, when we examined the topics on which the method of learning based on argument was studied, the method in question was used to provide

academic achievements/conceptual understandings of the students or teacher candidates (Aktas, 2017; Aktaş & Dogan, 2018; Cetin, Eymur, Southerland, Walker & Whittington, 2018), their participation in science learning (Chen, Wang, Lu & Hong, 2019), their level of argument and their desire to participate in the discussion (Aktas, 2017; Aktaş & Dogan; Amielia, Suciati & Maridi, 2018; Chen, Wang, Lu & Hong, 2019; Chen, Wang, Lu, Lin & Hong, 2016; Cetin, Eymur, Southerland, Walker & Whittington, 2018), cognitive and affective expectations (Cetin & Eymur, 2018), views on the nature of science (Eymur, 2019), their self-reliability (Eymur, 2018; Research examining the impact of Eymur & Cetin, 2017), scientific writing skills (Cetin & Eymur, 2018) and metacognitive awareness (Erenler, 2017) has been reached. As a result of these studies, quantitative findings have been obtained that this method positively improves the learning output of students or prospective teachers. Moreover, the majority of these studies were carried out in the form of quantitative studies (experimental research). However, it can be said that these studies are not intended to explain how the above-mentioned method of learning based on argument develops or changes academic achievement, upper bilingual skills, etc. Therefore, in this research, it is aimed to investigate the possible effects of this method on students in more detail by determining the opinions of secondary school students on the method of argument-driven inquiry. Accordingly, the problem of the research was determined as "What are the opinions of secondary school students regarding the use of argument-driven inquiry method in science course?"

Methodology

In this study, the case study was adopted as a research method. A case study is a research method used to understand, identify and describe the reasons, causes and consequences of a certain situation related to an event, person or group (Cepni, 2018). In this study, case study is considered to be suitable as it is aimed to examine in depth the student opinions on the use of the argument-driven inquiry method in science courses in depth.

Participants

The sample of this study consists of students studying in the 7th grade in a secondary school affiliated with the National Education Directorate of Usak Province. Within the scope of the study, research permission no. 29425508-605.01-E7688270 was obtained. When determining

the students who make up the research group, the purpose sampling method was preferred. Therefore, in the process of identifying participants within the scope of the study; First of all, a way was taken to identify and educate the teachers of science courses, and then to determine one of the 7 classes in the school where one of these teachers was working. Within the scope of the study, teacher selection and education have an important place. Since the process of applying the argument-driven inquiry in question in science course was carried out by the teacher of the related course. For this reason, in the selection of teachers, first of all central secondary schools in Usak were determined and a list was created. Then, 4 different secondary schools representing public schools of different socio-economic levels were selected. In determining these schools, interactive board, internet access, active laboratory classes, student-parent socio-economic status and status are moderate, the number of immigrants (Syrian, Iraqi immigrants and Turkish non-mastery) students in the school is considered as small or none at all. In the next stage, four science course teachers (2 females and 2 men) were started to work, one teacher from each school. In determining these teachers, it was seen to that each teacher enters two seventh grade classes, the average academic achievement and socio-economic status of the classes are equivalent to each other. At the same time, in the selection of these teachers, it was emphasized that teachers are open, volunteering and willing to learn new teaching approaches and methods in science and to apply them in their courses. In addition, it has been taken care that teachers have sufficient pedagogical field knowledge of laboratory materials (e.g. simple electrical circuit installation, amperemeter-voltmeter use, etc.) and teaching technologies that help science teaching (e.g. smart board, simulation, video, etc.). For this, a one-question interview form was applied to the teachers. In this interview form, they were asked to briefly describe how they processed a week of science courses. Considering these responses from teachers, teachers who are thought to be able to perform this study have been preferred.

After the determination of the teachers, they were given practical trainings on theoretical and teaching materials that lasted 1 month on the method argument-driven inquiry. These trainings were held in one of the schools where teachers took part and during the seminar period with all the teachers coming together. In these trainings, first of all, information was given about the method of argument-driven inquiry learning aimed at carrying out within the scope of the research. Then, teachers were given theoretical information about the method of argument-driven inquiry. This information was carried out in a practical way using the argument-driven

inquiry in accordance with the nature of the research subject. In other words, detailed information about what is the method of argument-driven inquiry by the researcher and advisor and how its stages are carried out has given the teachers practical trainings. Following the theoretical training presented about the method in question, practical trainings were carried out on how to apply the developed teaching materials in the science course. In this applied training, the general structure of the teaching material is introduced first and what to do during the use of the material is explained at the relevant stage of this method. Afterwards, macro teaching practices were carried out with each teacher within the scope of the research, covering four hours related to a teaching material selected by the teachers themselves. During these practices, the comments and comments from teachers were discussed. In this process, it was consensus that teachers should not inform students at the beginning, that they should try to question and direct students to argument as much as possible, and that they should always ask open-end questions for this. At the same time, teachers have been given hands-on training on how to use simulations that will be used during the summary or evaluation phase of the course.

However, 1 science teacher (female) was chosen to perform the experimental practice, as it was decided that the experimental practice should be carried out only in one secondary school. The designated science teacher has 20 years of professional experience and has been working at this school for the last 6 years. At the same time, he was a researcher (teacher) in many secondary schools supported by TUBITAK (4004, 4006, etc.) and also participated as a researcher (teacher) in TUBITAK 1001 Scientific and Technological Research Project. However, the designated science teacher has shown great dedication in participating in trainings on the method of argument-driven inquiry learning.

One of the 7th grades entered by this designated teacher was designated as a group of participants of this research. When we looked at the students who participated in the study, a total of 31 students, including 13 girls and 17 male students, participated in the study. In the study, science courses were processed using the argument-driven inquiry method for a period of 9 weeks. As a result of the process, students were selected for interviews among 31 students in order to determine their opinions regarding the argument-driven inquiry method. At this point, students' argumentation skills and academic achievements to be poor, medium and good and their willingness to participate was taken into consideration. Moreover, in determining the students, the grades that the researchers kept about the students were considered in the class

observations. In these grades, it was tried to interview the most mentioned students about student development. At the same time, student activity pages were applied to determine the interview students. In these active pages, the responses of the students to the sections such as "What is our Research Question?", "Let's Design Our Application!!!", "What Data Did I Collect in My Research?", "Electrical circuit system I established in my research", "My Claim-My Evidence-Justification" were taken into account. Moreover, the selection of the students was carried out considering the information they wrote in the "RESEARCH REPORT" section, where they reported all the parts related to the experiments or research carried out by the students. In parallel, 12 students were interviewed.

Data Collection Instruments

In the study, semi-structured interview protocol was used to get the opinions of students regarding the use of argument-driven inquiry learning method in science course. In the study, when preparing a semi-structured interview form, the literature on learning primarily by argument-driven learning and argument-driven inquiry was examined. As a result of the literature review, a general framework has been established regarding what is the method of learning inquiry based on argument and what its characteristics are. Within this framework, 18 open-ended opinion questions were written in the science course regarding the use of the argument-driven inquiry learning method and the learning, skills and sensory characteristics of the students. It was then presented to the opinion of three academicians who conducted research on the method of learning based on argument and the method of learning based on research and inquiry in the science course for content and scope validity. In line with expert recommendations, the necessary simplifications have been revised to interview questions after studies such as extracting contradictory statements, removing and adding some questions. Then, interview questions were applied to five students with parallel features to the study group. According to the statements from the students, minor corrections were made to the interview questions and the final semi-structured interview protocol consisting of 18 open-end questions was developed.

Data Collection and Analysis

This study is a case study in which student opinions on the use of the argument-driven inquiry method in science courses are tried to be determined. Therefore, before the students were interviewed about the argument-driven inquiry method, an application was carried out on this method. The process for how this application is performed is details in an exemplary lesson plan given in ANNEX-1.

Interviews were conducted with 12 students who participated in the application after the practices based on the argument-driven inquiry method in question. However, the interview process varies from person to person, but lasted an average of 25 minutes with each student. The data obtained from these interviews were analyzed by content analysis method. Before going into analysis, all of the interview data collected from the students through the audio recording was transcribed and made into a written document. Then, student statements were examined and those suitable for the purpose of research were tried to be gathered under certain codes, categories and themes. In this context, approximately 20% of the data collected in order to ensure the confidence of the analysis results were analyzed by 3 independent researchers and the percentage of inter-encoder numbness was calculated as 83%. This suggests that the findings presented as a result of the analysis are highly reliable.

Findings

In this study, interviews were conducted in order to determine the opinions of secondary school students regarding the use of argument-driven inquiry method in science course. The data obtained from these interviews were analyzed by content analysis method.

Table 1 contains the percentage-frequency values of the students' answers to the question "What similarity or difference do you think there is when you compare the process of the Electrical Energy unit where the argument-driven inquiry method is applied in science class to the process of other units?"

Table 1

Student Opinions and Percentage Frequency Values

Theme	Categories	Codes	f	%	f	%
It was similar. Because.. (n=9)	Properties that relate to the process of the course	Learning new information	9	4.79	21	11.17
		Using an interactive board	5	2.66		
		Writing	5	2.66		
		Doing experiment	2	1.06		
It was different. Because...(n=12)	Features of the course	Using concept caricature/scenarios, etc.	10	5.32	84	44.68
		Using simulation	10	5.32		
		Having a group and class discussion	9	4.79		
		Doing group work	9	4.79		
		Doing research	9	4.79		
		Using a video/documentary	8	4.26		
		Using an event booklet	7	3.72		
		Determining/solving research questions	6	3.19		
		Experimenting/observing	5	2.66		
		Talking about science and scientists	4	2.13		
		Using more interactive boards	2	1.06		
		Hypothesis developmenting	2	1.06		
		Encouraging think more	1	0.53		
		Writing a journal	1	0.53		
		Evaluating own and peer's research reports	1	0.53		
	Regarding the characteristics of the process based on the argument-driven inquiry	Determinig a research question	9	4.79	31	16.49
		Experimenting/observing	6	3.19		
		Claim-counter-claim	5	2.66		
		Evidence/promoters	5	2.66		
		Collect-save-analyze data	2	1.06		
		Hypothesis	1	0.53		
		Justifications	1	0.53		
		Rebuttals	1	0.53		
		Bounding	1	0.53		
	Features of the learning process	Fun	8	4.26	28	14.89
		Meaningful and lasting learning	6	3.19		
		Getting/sharing ideas	5	2.66		
		Doing Experiment	4	2.13		
		A better / different method	2	1.06		
		Understand in a shorter time	2	1.06		
		Easy learning	1	0.53		
	Teacher's role	Not directly giving information/encouraging thinking	5	2.66	13	6.91
		Listening to and caring about students' opinions	3	1.60		
		Encouraging students the the course	2	1.06		
		Giving effective and re-feedback	1	0.53		
		Having a strong communication skills	1	0.53		

Theme	Categories	Codes	f	%	f	%
		Drawing attention to places that have been wronged	1	0.53		
	Student's role	Having a scientific discussion with a band friend	5	2.66	11	5.85
		Listening to a banding friend	4	2.13		
		Valuing a band friend's opinion	1	0.53		
		Learning information from a groupmate	1	0.53		
Total			188	100	188	100

As seen in Table 1, students have expressed an 11.17% frequent similarity and 88.83% frequent difference to the question "What similarity or difference do you think is when you compare the process of the Electrical Energy unit where the argument-driven inquiry method is applied in science class to the process of other units?" 11.17% of the students presented reasons for the similarity between the electrical unit where the argument-driven inquiry method was applied and the course's courses. In this regard, 4.79% often stated that there is a similarity in the direction of learning new information, 2.66% frequently using interactive boards and 2.66% frequently writing. They said that there is a difference between the process of other science courses and the process of electrical unit courses in terms of 44.68% frequent courses, 16.49% characteristics of the inquiry process based on argument, 14.89% frequent learning process characteristics, 6.91% frequent teacher roles and 5.85% frequent student roles. At the point of the characteristics of the course, 5.32% frequently used concept caricatures, scenarios, etc., 5.32% frequent simulations, 4.79% frequent research were expressed as reasons for difference. In the characteristics of the argument-driven inquiry process, 4.79% frequently stating research questions, 3.19% frequently conducting experiments and observations, 2.66% frequently presenting claims and 2.66% frequently presenting evidence and support as differences. In terms of features related to the learning process, they indicated that electrical unit courses are 4.26% frequently fun, 3.19% often provide meaningful and lasting learning, and 2.66% often differentiate from other science courses in terms of receiving/sharing ideas. Another difference is that in teacher roles, 2.66% often make the teacher not give direct information/think, and 1.60% often listen to and value the opinions of students; In student roles, 2.66% often said to have scientific discussions with their groupmates and 2.13% frequently listen to their bandmates as a reason for the difference between the electrical unit and other science courses. Below are some student statements explaining this situation.

> *"...Everyone was working individually. For instance, when our teacher had an assignment, we said we wanted to be a group, but our teacher would not let us. It*

was just a class. We were inactive. For instance, we were not experimenting.... I understand better by feeling things by touch. But we did not do that in normal science classes.... But in the electrical unit, we made very good applications on the smart board. We practiced... So, we had an argument. We have formed groups. The best part was that we formed bands. I love group events... Not a single person in the groups has decided on one issue. One person said, for example, do you think about it? And he said yes or no. If he said no, he said his opinion and a joint decision was taken and written as such... There were events, we were all doing them. In my group, they were treated equally, treated fairly... (DG-Ö02)"

"I think there are differences. Because we have been doing classes abstractly before. I mean, he was verbal. He was doing it more like that. But we have taught concrete lessons in the electrical unit... We have done experiments... We understood the issue better with the electrical circuits we established ours in the electrical unit. We have set up a lot of electrical circuits ourselves. Because in the booklets given to us, we interpreted the topics ourselves with our group friends. We have experienced it ourselves here... Our band members did research. To learn about electricity. But in other science classes, our teacher was verbally telling us... We were not doing events or experiments. He was telling us about it. Here, most of our friends did not interpret what we learned. However, when we look at the circuit established in the experiments, you can interpret... The brightness of this is different, you might say... But provided we had processed the electrical unit as it used to be, we might not have been able to interpret the brightness of the lamp. Experiments made it easier for us to do experiments. I used to have trouble with electricity. I did not really understand electricity in sixth grade. However, I think I understand better the electricity we are currently processing... I set up a serial connected circuit and a parallel connected circuit. Or rather, my other friends set up the parallel connected circuit. We compared the two circuits. We have had that experience with electricity. Moreover, we have established various circuit mechanisms, whether it is related to voltage, whether it is about current, whether it is about creating simple electrical circuits... In normal science class, i.e. in previous science classes, we weren't interacting like this with our other friends. We were in a normal friendship, in class. However, when the electrical unit was processed, it was like this. Our friends, who did not attend many classes before, attended the class. My friend A, for example, is not a girl who expresses many ideas, but a successful girl. But when we formed a band, especially in our booklet 5, my friend A had a very say in our group. He expressed his opinions... I thought we were just interacting. I really liked this environment.... In other units our teacher is trying to give us instructions on the subject, but this experiment is not about observation. It is mostly about comments or abstract subjects. For example, he is just teaching the class. He expects us to run tests and do a re-run. It is very rare that we experiment in class... In the electrical unit, we have done as many experiments as we can. We collected data... We were giving it to evidence... Our friends had different claims. We were discussing why these allegations are not true... Or sometimes in the electrical unit, our teacher was setting up experiment mechanisms that were not right, but here, for example, our teacher was showing us concretely why the circuit was not working and making us discuss it. Here we were learning the electrical circuit concretely. I think we can interpret something that is concrete better. Because in science class, as our teacher told us in other units, we did not understand much there... However, since we learned by collecting and proofing

data by seeing electrical circuits in the electrical unit, we understood more easily and our teacher was more understandable and we interact more with our teacher. What's more, in the electrical unit, our teacher didn't give us the right answers directly. But in previous units, our teacher was giving us the answer when we answered directly and asked questions... However, in the electrical unit, we were more in dialogue with our friends, ingring ourselves to the information so that we could obtain information with our own experience just like scientists... (DG-Ö05)"

In Table 2, students are stating, "What do you think about the concept caricature, scenario, etc. activities used in electrical energy unit courses that we process with the method of argument-driven inquiry? What good did they do you? For what purpose could it be used? Why?" are included in the percentage-frequency values of their answers.

Table 2
Student Opinions and Percentage Frequency Values

	Categories	Codes	f	%	f	%
n=12	Properties	Beautiful/good/fun/remarkable	10	14.08	27	65.85
		Easy and understandable	8	11.27		
		Informative about topics	7	9.86		
		Events taken from daily life	2	2.82		
	Benefits	Making the course fun and fun	11	15.49	28	39.44
		Determinig easly the research question	9	12.68		
		Providing a review of previous information	5	7.04		
		Being able to see different views	2	2.82		
		Getting a discussion on the topic in a booklet	1	1.41		
	Purpose	Determining the research question	9	12.68	16	22.54
		Determining a research subject	5	7.04		
		Determining hypothesis	2	2.82		
Total			71	100	71	100

As seen in Table 2, students say, "What do you think about the concept caricature, scenario, etc. activities used in electrical energy unit courses that we process through argument-driven inquiry? What good did they do you? For what purpose could it be used? Why?" was answered by 65.85% of the concept caricatures, scenarios, etc. in the course for their purposes, 39.44% frequently for their benefits and 22.54% for their purposes. Students have stated that 14.08% of the introducing activities such as concept caricature, script, etc. are beautiful, good, tasted and remarkable, and 11.27% often have features that are easy and understandable. As for the benefits of concept caricature, scenario, etc., students often cited 15.49% to make the course fun and enjoyable, 12.68% often to be able to easily determine the research question and 7.04% often to review their previous knowledge of electricity. Regarding the purposes of concept caricature, scenario, etc., students often expressed their opinions at the point where they

provided 12.68% frequent research questions, 7.04% frequent research topics and 2.82% hypothesis. Below are some student statements explaining this situation.

> *"It starts with the first step research question in the booklets we use. To create our research question, I think we're given a concept caricature or a script. So I think we can understand the issue and figure out what to investigate... (DG-Ö08)"*
> *"... In our previous lessons, I was mixing up some information. In sixth grade, for example, I was mixing things up with keys and hear conductors. But now I learned better when we did experiments in the electrical unit.... These cartoons made me remember what I learned about electricity in the sixth grade... I thought, what do I know? Whatever we were going to learn in that class, the cartoons were giving us information about him. We were also asking our research question... We were guessing what to find out.... I know how to connect the amperemeter voltmeter. It's more on the mind. For example, the amperemeter was serially connected to the commission. For example, let's say we connected the amperemeter in parallel, then our circuit was not used to the light bulb did not give light. That's how it stayed more in mind... We learned that there are different theories and different results can be achieved. That's how scientists achieve different conclusions, which is what we've learned... The lessons were more fun so... For example, my friend H didn't like to read much, but when there were caricatures, it was fun for him, and I think he started attending classes because I agree with his opinion or something... So, I think the caricatures made the lesson fun I had fun... (DG-Ö23)"*

In Table 3, students are stating, "What steps have you followed in the Electrical Energy unit that you have processed through argument-driven inquiry? Why did you follow these steps? Can you give me examples? How did you process the lesson? What have you done?"

Table 3
Student Opinions and Percentage Frequency Values

	Codes	f	%
n=12	Reading the topic written in the introduction event such as script/concept caricature, etc.	12	15.79
	Making an argument	12	15.79
	Experimenting/setting up circuits	10	13.16
	Determining the research question	9	11.84
	Argument developmenting	8	10.53
	Make an opposing argument	6	7.89
	Drawing a circuit diagram of argument (providing evidence)	5	6.58
	Determining variables	3	3.95
	Determining security measures	3	3.95
	Analyzing data	3	3.95
	Collecting and saving data	2	2.63
	Peer review	2	2.63

Codes	f	%
Hypothesis developmenting	1	1.32
Total	76	100

As seen in Table 3, students say, "What steps did you follow in the Electrical Energy unit that you processed through argument-driven inquiry? Why did you follow these steps? Can you give me examples? How did you process the lesson? What have you done?" 15.79% frequently read the subject written in the introduction event such as script/concept caricature, etc., 15.79% frequently making arguments, 13.16% experimenting and installing electrical circuits, 11.84% frequently determining the research question, 10.53% frequently developing arguments. Below are some student statements explaining this situation.

> *"...We read the concept caricature event first... Then we put forward our research question. For example, our research question was: is the current the same everywhere in an innings? We found this question by arguing with our friends. It is one of those caricatures. And then in our hypothesis, we thought the current was the same everywhere. We experimented with the materials given by our teacher. Then we collected data from these experiments. We have published this data to that booklet... Then we connected the circuit, experimented, collected the data, and created evidence. We had an argument. That the current is the same everywhere.... After discussing this claim with other friends, the peer and we made our own assessment. This peer and my self-assessment has improved my ability to bring criticism to events... (DG-Ö33)."*
>
> *"... we were choosing ideas from cartoons... Then we picked one. We were hypothesizing. Or we were creating another hypothesis ourselves. So, we had an estimate of the outcome of the incident there. Then we were setting up an electrical circuit with our band members. We were turning the data we collected from this circuit into evidence. But when collecting data, it was required to take notes. For example, let's say we measure the voltage in the circuit, we measure it at regular intervals, or we measure the voltage between different points. For example, we were attaching voltmeters between the two ends of the A bulb and we were attaching voltmeters to both ends of the B lamp... But there were rules to be careful when installing electrical circuits. For example, we were writing about them, such as not biting the battery, not touching the tongue... We were competing our theories... Each group made different claims as a result of its experiment and we were discussing them... Finally, there was a theory that was true. Then he would explain to the whole class the theory that he could light that light bulb and, in the right conclusion, defended his circuit to us and was accepted... (DG-Ö29)"*

In Table 4, students are stating, "What do you think of the processing of the electrical energy unit through argument-driven inquiry? What benefits/benefits have they had for you?"

Table 4.
Student Opinions and Percentage Frequency Values

	Theme	Categories	Codes	f	%	f	%
n=12	Advantages for developing cognitive, affected and psychomotor traits	Advantages of the learning process	Making the course more fun/beautiful/efficient	11	6.47	52	30.59
			Participating actively in the course/being able to explain thoughts	10	5.88		
			Having an argument environment	9	5.29		
			Groupworking by and sharing tasks	7	4.12		
			Respecting different ideas	6	3.53		
			Seeing different ideas	6	3.53		
			Being able to do peer teaching and reach a common view with their peers	3	1.76		
		Advantages of learning	More meaningful and lasting learning	9	5.29	26	15.29
			Asserting different claims/ideas	8	4.71		
			Reducing/removing concept misconceptions	3	1.76		
			Ensuring that you learn/understand the subject effectively	2	1.18		
			Recalling knowledge	2	1.18		
			Consolidating learn information	1	0.59		
			Associating information with daily life	1	0.59		
	Advantages of developing some skills	Life skills	Working with group/team	9	5.29	47	27.65
			Getting to contact	8	4.71		
			Developing sensory characteristics (interest, attitude, motivation, etc.) related to science course	6	3.53		
			Deciding	6	3.53		
			Being able to express oneself effectively	5	2.94		
			Self-confidence skills	5	2.95		
			Self-efficacy skills	3	1.16		
			Being able to explain/present thoughts in front of the public	2	1.18		
			Analytical thinking	1	0.59		
			Self and peer evaluationing	1	0.59		
			Critical thinking	1	0.59		
		Scientific process skills	Experimenting or observing/setting up a circuit setup	9	5.29	40	23.53
			Determining research questions	8	4.71		
			Being able to make a claim	6	3.53		
			Determining variables	5	2.94		
			Collecting-saving-analyzing to data	4	2.35		
			Being ability to refute the counter-claim	4	2.35		
			Being able to report scientific study	3	1.16		
			Being able to put forward hypothesis	1	0.59		
		Skills related to science	Accessing to information	3	1.16	5	2.94
			Sharing and discussing thoughts on science (history of science, development of science, scientific knowledge, etc.)	1	0.59		
			Being able to produce scientific knowledge	1	0.59		
	Total			170	100	170	100

As seen in Table 4, students say, "What do you think about the processing of the electrical energy unit through argument-driven inquiry? What benefits/benefits did they have for you?" Students stated that they developed some cognitive, affected and psychomotor traits related to 30.59% frequent learning process and 15.29% frequent learning. In this context, students offered reasons such as 6.47% frequently, the course became more fun, tasteful, beautiful and efficient, and 5.88% were able to easily explain their active participation and thoughts. Regarding learning, students expressed opinions as 5.29% often provided more meaningful and lasting learning, and 4.71% often made different claims/ideas. In the theme of the advantages of processing the electrical energy unit with argument-driven inquiry method, 27.65% often expressed opinions about life skills, 23.53% often scientific process skills and 2.94% frequently developed science-related skills. In the life skills category, students often mentioned that they developed skills such as group/teamwork and 4.71% frequent communication. In the category of scientific process skills, students stated that there is a development in the scientific process skills category, such as 5.29% frequently experimenting and observing, in other words, being able to set up experiments, and 4.71% frequently determining the research question. At the point of science-related skills, students emphasized that 1.16% often developed skills such as access to information, 0.59% frequently being able to share and discuss their thoughts on science (history of science, development of science, scientific knowledge, etc.). Below are some student statements explaining this situation.

> *"...I wouldn't understand if our teacher told us about the electrical unit just by printing it. In the sixth grade, our teacher just printed and told us the information without much experimenting. I didn't understand much at the time. But with the booklets you give, you know, creating questions, not writing like him, but writing boringly. You know, the electric circuit, the lamp, writing like this. Here are the features of the electrical circuit or the descriptions of its elements that would not in any way enter my head. But there have been places I've coded. Amperemeter ampere, longer than volts. I thought it was diagonal, and the amperemeter is serially connected, and I've done coding like this in my own way, shorter than the series parallel. Then I understood the properties of the circuits. Why, because I experimented more with my band friends or on my own throughout the electrical unit. I've set up a circuit. If we didn't work like this and say this is the series parallel and draw it and write it down, I wouldn't understand anything... My theory, for example, has been debunked in many places. And I've been looking into my friends' theories. Why is this the case... I asked my friends why they thought so... In fact, my friends in the other group told me why their theories were true during recess or something. I discussed with myself why their theories were true, and I set up their circuit setups and tried what they did. I thought the theory of their thoughts was correct. For example, but our argument in the last lesson was also my theory correct... We worked with different groups in the electrical unit. There's a lot of*

different ideas when you work with the group. And we're getting it out of those ideas. We're telling you why we removed it. We're experimenting on this, we're observing, and we're reaching one as a result of all of them, and that's when the people who stayed with me helped me... It's fun for me to do the lesson like this. So, it was fun... We were investigating why a knowledge might be true... (DG-Ö05)"
"... There were different ideas coming out of each person, and we paid attention to which one was more reliable when each person had a different idea in mind. Here we understood how scientific knowledge was created and how this information was proven in the process of creating it... these affected my perspective on science more closely. I mean, I felt like I was closer to science because we were experimenting. We've provided science closer. We're getting closer to science. It made me love science... It didn't hurt me to do this to the class, it made me better. Because we made some mistakes in the electrical circuit when we were installing electrical circuits. Sometimes we couldn't light our light bulb, sometimes we could light the light bulb. That's why he taught us the truth. What's more, my interaction with my band friends has evolved throughout this class. Then he took the ideas of my band friends and let me see that there was more ideas about one... (DG-Ö18)."

In Table 5, students were told, "What was the most challenging thing for you in science class, where the argument-driven inquiry method was used in the electrical energy unit? Why?" are included in the percentage-frequency values of their answers.

Table 5
Student Opinions and Percentage Frequency Values

Themes		Categories	Codes	f	%	f	%
n=12	Difficulties/insufficiencies regarding argumentation skills	Difficulties arising from personal characteristics	Inability to present their ideas in public	9	14.29	22	30.92
			Lack of self-confidence	5	7.94		
			Accepting an opinion of a friend who is thought to be more knowledgeable	4	6.35		
			Not having enough information on the subject	2	3.17		
			Not knowing manners to (sometimes being unnecessesary opposition or having a fixed mindset)	2	3.17		
		Difficulties arising from working with the group	Inability to put forward a joint claim with groupmates	5	7.94	9	14.29
			Inability to reach a common research question with groupmates	2	3.17		
			Inability to decide on a common circuit arrangement with groupmates	2	3.17		
	Difficulties/ insufficiencies in the	Difficulties with the research process	Raising more than one research question	6	9.52	18	28.57
			Not saving data	4	6.35		
			Inability to identify variables in research	3	4.76		
			Suggesting more than one hypothesis	2	3.17		
			Inability to set up the electrical circuit	2	3.17		
			Inability analyze data	1	1.59		

Themes	Categories	Codes	f	%	f	%
	Difficulties with the argument process	Inability to make a claim based on the data collected	5	7.94	9	14.29
		Inability to put forward opposing arguments	2	3.17		
		Inability to refute opposing arguments	1	1.59		
		Not supporting argument	1	1.59		
	Difficulties with the evaluation process	Inability to peer evaluate	1	1.59	3	4.76
		Inability to critically evaluate oneself	1	1.59		
		Not being able to correct his report according to criticism	1	1.59		
	Difficulties before research	Inability to u nderstand the topic in the introductory activity, such as a scenario, concept cartoon	1	1.59	2	3.17
		Inability to determine the research question	1	1.59		
Total			63	100	63	100

As seen in Table 5, students say, "What was the most challenging thing for you in science class, where the argument-driven inquiry method was used in the electrical energy unit? Why?" 45.21% frequently expressed an opinion that they experienced difficulty/inability to question based on their argument skills and 54.79% often based on the questioning process based on the argument. In the theme of difficulties/inadequacies related to their argument skills, students said that 30.92% often had difficulty working with the group because of their personal characteristics and 14.29% often because of their personal characteristics. In the category of difficulties/inadequacies due to personal characteristics, students often presented their opinions about themselves as reasons such as inability to present their opinions in public and 7.94% frequently due to lack of self-confidence. In the category of difficulties/inadequacies caused by working with the group, students often said 7.94% of the working electrical unit with their groupmates as a reason for not being unable to make a common claim and 3.17% often not being unable to create a common research question. In the theme of difficulties/inadequacies related to the questioning process based on argumentation, students said that 28.57% often experienced difficulties in the research process and 14.29% often in the argument process. In the category of difficulties related to the research process, students stated that they faced difficulties such as 9.52% frequently suggesting multiple research questions and 6.35% frequently recording data. In the category of difficulties related to the argument process, students 7.94% often said that there were difficulties such as not making a claim based on the data they collected and 3.17% often not making opposing arguments. Below are some student statements explaining this situation.

"...The thing that pushed me the most was answering some questions. We had some questions in our modules. Like the connection of the amperemeter. I made mistakes in some questions like that, and I developed them after a while. In other words, I had difficulty establishing a circuit layout and determining the research question on the circuit setup... there was no other stage where I had difficulty... (DG-Ö15)."
"... We were throwing out a theory as a group. But when some friends thought differently that theory changed. That's why we were having trouble finding a common theory with our band friends. Then we all sometimes put-up different research questions. Because sometimes we understood different things from the caricature or script which we were given... Then we were trying to show each other evidence. On that evidence, we were trying to make a claim. We were having a hard time there... D's in the band I'm in with my friend. That friend of mine wasn't saying his ideas... he didn't want to talk... He kept saying he couldn't do it... It forced me to be a band with him. It was lowering our motivation... Then, at first, some of our friends argued that their claims were true during the class discussion... Our group was proving that most of the time our claim was true, but he was still unconvinced... sometimes he was arguing in vain... it was hard to work with him... (DG-Ö11)."
"... What I had the most difficulty with was finding the problem with that cartoon. So are my friends... I had a hard time hypothesizing about that. You know how we're trying to say something about the answer to your question before we're experimenting yet, and that's where I had a hard time... (DG-Ö10)."

In Table 6, students are stating, "What are the situations that you consider the most successful in science class where the argument-driven inquiry method is used in the electrical energy unit? Why?" are included in the percentage-frequency values of their answers.

Table 6
Student Opinions and Percentage Frequency Values

	Categories	Codes	f	%	f	%
n=12	Work with a group	Being able to express opinions comfortably	9	9.78	40	43.48
		Fulfilling duties and responsibilities	8	8.70		
		Questioning and criticizing the arguments of their peers	7	7.61		
		Being able to appeal to the community	5	5.43		
		Being able to conduct research on the subject	5	5.43		
		Being able to make constructive and positive criticisms	4	4.35		
		Encouraging peers to work	2	2.17		
		Sharing duties and responsibilities	2	2.17		
	To be able to do research	Determining the research question	10	16.13	36	39.13
		Being able to predict the subject of research	7	7.61		
		Being able to determine the materials to be used in the electrical circuit	7	7.61		
		Being able to set up and operation to electrical circuit	6	6.52		
		Data collecting and saving	4	4.35		
		Converting data to evidence	2	2.17		

Categories	Codes	f	%	f	%
To be able to make an argument	Asserting a data-driven argument	5	5.43	9	9.78
	Being able to refute your friends' argument	3	3.26		
	Being able to defend your argument	1	1.09		
Ability to evaluate the research report	Being able to recognize the deficiencies and errors in the research report he has written	3	3.26	7	7.61
	Being open to criticism from peers	3	3.26		
	Being ability to evaluate their peers' reports	1	1.09		
Total		92	100	92	100

As seen in Table 6, students say, "What are the situations that you consider the most successful in science class where the argument-driven inquiry method is used in the electrical energy unit? Why?" students said that they saw themselves as successful in working with the group 43.48% frequently, conducting research with 39.13% frequently, making arguments 9.78% frequently, and evaluating research reports 7.61% frequently. In the category of working with the group, students see themselves as successful in 9.78% frequently expressing their opinions comfortably and fulfilling their duties and responsibilities 8.70%. In the category of research, students evaluate themselves as successful in terms of features such as 16.13% frequently identifying the research question and 7.61% frequently predicting the research subject. In the category of being able to make an argument, students can make an argument based on data with 5.43%, 3.26% often refute their friends' argument; In the category of being able to evaluate the research report, 3.26% often write in the research report to notice the deficiencies and errors, 3.26% often consider themselves successful in cases such as being open to criticism from their peers. Below are some student statements explaining this situation.

> *"...I consider myself most successful in the process of collecting data and creating evidence. When I'm most difficult, don't turn my evidence to the other side, so don't express myself. In fact, it's not hard either, but it was hard in booklet 5. In general, the creation of research questions was very simple. It was very simple in data collection and electrical setup. It was very simple in creating evidence. My favorite of these stages is evidence creation. Data collection. Because when I'm on the board, based on that data and my evidence, I can explain things to my friends in the other group. If I hadn't done this, my friends wouldn't have trusted me, they wouldn't have believed my claims. Or they couldn't admit it was true. That's more of a plus for me when it comes to increasing credibility. That's why I like and like it better. So, I like to observe the data there by setting up a circuit and argue about it with my friends and make our claim to create my evidence... (DG-Ö02)"*
> *"... I think I've succeeded at all stages. But I think the most successful stage is interpretation. Because, for example, I like to talk more than I like to write. That's why it's more interesting to me to say an image or a post I saw there after I've filtered it in my head. So, I'm more interested in discussing my thoughts with my friends or why their opinion is right or wrong. I think I'm successful here... What I*

saw as the most successful point in this class discussion process was telling the other side of my thoughts and persuading them to do so. Because I can clearly express my own thoughts... (DG-Ö07)"
"... I think the work is very good, we see that we can produce something together. We learned to make a common decision and, for example, to make a common decision, not the opinion of a single person, and to present that decision to the class and discuss it. He was filling out the booklets he distributed to our teacher together. At the end of the week, we were evaluating our own booklets and our friends' booklets. I consider myself successful in this regard... (DG-Ö17)"

In Table 7, students are told, "What do you think about working in groups with your friends in science class where the argument-driven inquiry method is used in the electrical energy unit? What did working as a group contribute to you? Why?" are included in the percentage-frequency values of their answers.

Table 7
Student Opinions and Percentage Frequency Values

	Categories	Codes	f	%	f	%
n=12	Student change-development	Being able to look at things critically	9	13.04	33	47.83
		Making learn easier	5	7.25		
		Being able to collaborate with groupmates on a topic	5	7.25		
		Respecting different ideas	3	4.35		
		Ability to establish effective communication/dialogues	3	4.35		
		Being able to participate in scientific discussion	3	4.35		
		Testing your own knowledge and the knowledge of the peer	2	2.90		
		Taking responsibility	1	1.45		
		Be a good listener	1	1.45		
		Being open to change and improvement	1	1.45		
	Benefits to the learning process	Providing learning	8	11.59	30	43.48
		Learning-loving working with a group	8	11.59		
		Exchanging ideas with friends	5	7.25		
		Learning information from a groupmate	4	5.80		
		Coming to reach a common decision	2	2.90		
		Seeing that you have different thoughts	2	2.90		
		Getting the most accurate and valid information together	1	1.45		
	Negative effects on the learning process	The lack of contribution of the peer to the group	6	8.70	9	13.04
		Peer's lack of knowledge	2	2.90		
		Not wanting to share your peer's thoughts	1	1.45		
Total			69	100	69	100

As seen in Table 7, students say, "What do you think about working in groups with your friends in science class where the argument-driven inquiry method is used in the electrical energy unit?

What did working as a group contribute to you? Why?" students said that working with the group often creates some changes and developments in them, 43.48% often has benefits for learning and 13.04% often has negative effects on the learning process. In the category of change and development, students have stated that working with the group in the category of change and development makes it 13.04% often to look critically at events, 7.25% to learn frequently, and 7.25% often to collaborate with groupmates on a subject. In the category of benefits of working with the group to the learning process, students said they had benefits in situations such as 11.59% frequently providing learning, 11.59% frequently learning and loving working with the group. In the category of negative effects on the learning process, students stated that 8.70% often have negative effects of working with the group on issues such as the lack of contribution of their peers to the group and 2.90% frequently the lack of knowledge of their peers. Below are some student statements explaining this situation.

> *"...Now some of the circuits I set up didn't burn. That's why we didn't collect much data. When our other friends went up to the board to tell us their theories, we found that sometimes they couldn't collect the data. Here's what we can do. I just thought about it. We can all sort the data one by one. We changed the wire, and in 2011, we could have said that our problems were our mistakes. It'd be more scientific. I think we could have made more scientific statements.... It happened while defending my own opinion during the debunking of my theory. Because I used all my defensive things and there was nothing left. There they disproved my theory, and I had a hard time... this usually happened at all events. But at the third event, I defended the thoughts of us two children. You know those kids talking, cartoons? We defended two of them in the first place. I defended one of my band friends and the other boy. Then we thought that both might be true, and we set up a circuit for these two views... We didn't know at the beginning which one would be true when I interpreted the data we collected in the circuit and I saw that his claim was true... I wanted to defend theirs there too... and mine... When we got to the board, my friend said that our group was thinking about it first, but then we found this... I liked that he explained my initial thoughts as well... Because it was group work... Other groups, for example, disproved that theory. Again, yes, my theory proved correct, but I was sad that a theory with our band friends had been disproved... but I thought it was fun working with the band... we could learn a lot of things at the same time..."(DG-Ö31)."*
>
> *"...My group friends didn't usually agree with the research question. There were only two groups I was in. My friend A, B and the group I'm in. My friend C, D, E and the group I am. My friend A didn't agree at all. My friend B was trying to join again.... Because most of my band friends didn' ...(DG-19)."*

In Table 8, students were stating, "Did you not like or see anything missing from the method of learning based on arguments when the Electrical Energy unit was processed? What were those? Why?" are included in the percentage-frequency values of their answers.

Table 8

Student Opinions and Percentage Frequency Values

Categories		Codes	f	%	f	%
n=5	Yes	More documentaries and science stories on the subject should be included	3	25.00	5	41.67
		More simulations should be included	1	8.33		
		More scientific discussions must be held	1	8.33		
n=7	No		7	58.33	7	58.33
Total			12	100	12	100

As seen in Table 8, students to the question "Did you not like or lack the method of learning based on arguments when the Electrical Energy unit was processed? What were those? Why?" 58.33% frequently answered no and 41.67% often answered yes. Students have often said that more documentaries and science stories on the subject should be included and 8.33% should often be included in more simulations about what they do not like or see missing in the method of learning based on arguments when the Electrical Energy unit is processed. Below are some student statements explaining this situation.

"...I don't think there's anything to fix... (DG-Ö01)"
"... I liked them all, so I liked it because we were doing group work, experiments and stuff... (DG-Ö17)"
"... I think more documentaries or animations can be featured... (DG-Ö31)"
"... You know those Tesla videos that we watched in class, I think there could be more room for things like that... I thought it was a lot of fun... (DG-Ö17)"

In Table 9, students were told, "Would you like the argument-driven inquiry method to be used in other units of science? Why?" are included in the percentage-frequency values of their answers to the question and some student statements.

Table 9

Student Opinions and Percentage Frequency Values

Categories			Codes	f	%	f	%
Yes. There must be room. n=10	Regarding the functioning		Fun and fun	10	15.87	34	53.97
			Tutorial and tutorial	10	15.87		
			Self-learning	9	14.29		
			Learning with a group	5	7.94		
	Regarding its benefits		Making learn easier	8	12.70	24	38.10
			Providing the opportunity to conduct research (experiments)	6	9.52		
			Permanent and meaningful learning	6	9.52		

Categories	Codes	f	%	f	%
	Expressing and defending our own ideas	2	3.17		
	Learning the opinions of your friends	2	3.17		
No, there should not be n=2	Writing is boring	2	3.17		
	I don't like to talk	2	3.17	5	7.94
	I don't like your opinions being questioned.	1	1.59		
Total		63	100	63	100

As seen in Table 9, students said, "Would you like the argument-driven inquiry method to be used in other units of science? Why?" 92.06% frequently answered yes and 7.94% often answered no. In other science courses, students expressed opinions on the functioning of the argument-driven inquiry method with 53.97% and the benefits of 38.10%. In the category related to the functioning of this method, students expressed positive opinions such as 15.87% frequently fun and tasted courses and 15.87% frequently educational and instructive. In the category regarding the benefits of the argument-driven inquiry method, students made it 12.70% often easier to learn and 9.52% often provided the opportunity to conduct research (experiments). In other science courses, students who expressed a negative opinion about the use of argument-driven inquiry method stated that writing is boring with 3.17% and 3.17% often do not like to speak. Below are some student statements explaining this situation.

> *"...I'm because I'm more interested in science. For experimenting, doing group work in class. Our conversations in group work increased more information for me. I feel confident. Because I wasn't participating in group work more, but I did after that because I came up with my opinion because we presented everyone's opinion. It was nice to be able to say my opinions, even though it was wrong. What is more, I don't have much trouble setting up experimental setups. I did what I did with how the amperemeter was connected to the commission, how the voltmeter was connected to the commission. Then I found out what happened when we removed or added a light bulb in the serial connected circuit and then removed a light bulb in the parallel connected circuit. I've never been scared, but I've been excited. Because I was excited to respond to some of our friends when they went up to the board and said, "This is not the case... (DG-Ö11)"*
>
> *"...I don't like writing, so I don't like a lot of them. If it was all about the conversation or if I was asked questions about the events, I would love it... Let's not write it down. Ask me these questions by talking. It's more fun to do things, experiment, set up circuits ourselves and collect data by arguing with our friends in this way rather than just writing or doing boring things, as we do in normal science class. That's how it should be done in other science classes. Our friends who didn't attend the class started to attend the class. Normally my friend A attends class, she's a successful girl. But he's shy and he doesn't make much noise. But he tried to defend the idea of the room. Other than that, my friend B is a very successful girl. But he's so shy. Again, he offered his opinion. So it's better for each of us to attend class. Because together we can argue more with more ideas and get better results. But my friend F still doesn't like these events because he doesn't like to talk, he doesn't want to do it... (DG-Ö10)"*

Discussion and Conclusion

In this study, semi-structured interviews were conducted in order to determine the opinions of their students regarding the method of questioning learning based on argument. The data obtained from these interviews were analyzed by content analysis. As a result of the analysis, students emphasized that there is a similarity in terms of learning new information, using interactive boards and writing when they compare the process of the Electrical Energy unit where the argument-driven inquiry learning method is applied in the Science course and the process of other units. However, they said that there is a difference between the Electrical Energy unit and other units in terms of the course's process (concept caricature, scenario, simulation, group and class discussion, etc.), the characteristics of the inquiry learning process based on argument (research question determination, experiment-observation, evidence and supporting, etc.), the characteristics of the learning process (fun, meaningful and permanent learning, etc.), teacher roles (referral to thinking, etc.), and student roles (scientific discussion with friends, etc.). Based on these views of the students, it can be said that the method of learning argument-driven inquiry is a student-centered learning method. This brought to the agenda the requirements of teachers to design-execute-terminate the research method of a science problem and to develop arguments in this process and to new teaching methods that allow them to discuss and criticize it with their peers (Kaçar & Balım, 2018; Sampson, Grooms & Walker, 2009a; 2009b). It can be said that the inquiry method based on argument is an effective method that can meet this requirement. The method of learning inquiry based on argumentation is a method in which students identify their own research question, design-conduct-end the most appropriate method to solve this question and conduct all stages of this process by discussing them with their peers (Kaçar & Balım, 2018; Sampson and Gleim, 2009). In this context, it can be said that the findings obtained from these studies show parallels with the literature. In this case, it can be stated that students are aware of the similarity or difference between the nature of the questioning learning method based on argument and the process of other science courses.

As a result of this research, students responded to the concept caricature, scenario, etc. activities used in electrical energy unit courses processed by argument-driven inquiry learning method for their benefits and purposes. Students have stated that introducing activities such as concept caricature, script, etc. are beautiful, good, tasteful and remarkable, easy and understandable,

and informative about the subject. It can be said that this result is in compliance with the literature (Evrekli, 2010; 2016; Evrekli & Balım, 2015; Evrekli, Inel & Balım, 2009; Inel, 2012; Forester, 2018). In the studies of İnel, Balım & Evrekli (2009), they have concluded that students offer opinions about concept caricatures that are fun, fun and increase their interest in the course. As for the benefits of concept caricature, script, etc., students cited making the course fun and fun, being able to easily determine the research question and reviewing their previous knowledge of electricity. In the literature, Başarmak and Mahiroğlu (2015) found that thanks to cartoon animations, students are able to think more comprehensively, interpret the message they want to be given and connect to the subject. Moreover, in this research, students expressed their opinions on the purposes of concept caricature, scenario, etc. at the point where they were able to determine the research question, research topic and hypothesis. As a result of a study conducted by Bilir in 2015, students related to science courses processed with research and questioning approach said that they learned the course better by trying, their hand skills improved, the knowledge obtained in the course was more permanent, they were more active in the course and learned by having fun. In 2012, in the findings obtained as a result of a study conducted by İnel, he emphasized that the students processed the course with caricatures and stories the most, experimented in lessons, answered questions, identified and solved problems, conducted research, worked collaboratively. Evrekli and Balım (2015) studies have stated that students develop their questioning learning as a result of concept caricatures. In the light of all these results, the concept caricatures and scenarios preferred as input activities in the questioning learning method based on argument can be interpreted as effective in attracting students' attention to the subject, informing them about the subject and directing them to research.

As a result of the research carried out, students expressed the opinion that the processing of the electrical energy unit by argument-driven inquiry learning method improved cognitive, sensory and psychomotor characteristics and some skills. In this context, students have given reasons for the advantages of the learning process, where the course becomes more fun, tasteful, beautiful and efficient, they can easily explain their active participation and thoughts in the course, the argument environment is formed, they can work as a group and share tasks within the group. Regarding learning, students have expressed opinions such as providing more meaningful and lasting learning, making different claims/ideas, decreasing or eliminating concept misconceptions. When the literature is examined, it can be said that the studies carried

out on the method of learning based on argument and research inquiry are in parallel with the findings obtained from this study (Alouf & Bentley, 2003; Arslan, Ogan Bekiroglu, Süzük & Gürel, 2014; Berg, Bergendahl, Lundberg & Tibell, 2003; Bliss & other, 2007; Booth, 2001; Bozkurt, Ay & Fansa, 2013; Duran, 2015; Gibson and Chase, 2002; Jakupcak, Rushton, Jakupcak & Lundt, 1996; Kilic, 2007; Red Crescent, 2013; Longo, 2011; Piper and Hough, 1979; Rakow, 1986; Von Secker, 2002; Yasar & Duban, 2009). Ozdem (2009) and Jiménez-Aleixandre (2007) emphasized that collaboration and interactive contexts were directed to discuss students. Şen, Yilmaz and Erdogan (2016) of the laboratories based on questioning; motivation, active participation in courses, positive opinions for laboratories, self-reassion, learning desire, student-student interaction and teacher-student interaction. In the studies conducted by Duran (2015) and Longo (2011), students have obtained the result that the activities developed based on questioning are fun, that the lessons are more fun, that they like to conduct experiments and activities, and that their interest in the course increases. As a result of Köksal (2008) and Wu and Hsieh (2006) research, they stated that the guided questioning research method was particularly effective in students' development of positive attitudes towards science and technology course, especially in academic, self-suffredness, anxiety, interest, career, pleasure and usefulness. Moreover, studies have been found in the relevant literature that emphasize the result that the method of learning based on argument and research-inquiry is effective in the meaningful and permanent learning of students (Alkan-Dilbaz, 2013; Bozkurt, Ay & Fansa, 2013; Hardworking, 2008; Kilic, 2007; Sağlamer-Yazgan, 2013; Tashkoyan, 2008; Tatar, 2006). In this context, it can be said that the findings obtained from this research are in parallel with the literature.

In this study, students expressed opinions about the advantages that processing an electrical energy unit using an argument-driven inquiry method improves some skills in them, while life skills, scientific process skills, and science-related skills develop. In the life skills category, students mentioned that they have developed skills such as Group/teamwork, communication, affective characteristics related to the science course, and decision making. In the study of the relevant literature, studies have been found that argumentation-based learning and research query-based learning methods improve the affective characteristics of students (Bliss & et al., 2007; Blumenfeld & et al., 1991; Can, 2012; Calıskan, 2008; Eilam, 2002; Genctürk & Türkmen, 2007; Lord & Orkwiszewski, 2006; Polman, 2000; Sen, Yilmaz & Erdogan, 2016; Taskoyan, 2008; Tatar, 2012; Tuan, Chin, Tsai & Cheng, 2005). Sen, Yilmaz and Erdogan

(2016) stated in their study that query-based laboratory activities enable the development of positive attitudes towards biology course. Hofstein, Navon, Kipnis and Mamlok-Naaman (2005) and Friel, Marawi and Albaugh (2005) as a result of research studies and inquiry-based laboratories responsibilities of the students by learning more in the course of participation, the learning process is more effective, the students develop their ability to ask better questions and to ask questions on the subject are more motivated, self-confidence and an improved ability to reported that there is an increase in the scientific process. As a result of the Bilir (2015) study, the research stated that students learned by having fun and effectively in the sense of learning, learned based on experimentation and observation, learned that their knowledge is permanent and participated effectively in the lesson; motivation in the affective sense and positive attitude towards the lesson, learned by doing group work in the sense of social impact. At the same time, as a result of this study, it can be said that the method of learning arguments-driven inquirys parallels the views expressed by students about the development of skills such as communication and decision-making in themselves with literature. In this context, studies have been found that research-inquiry-based learning improves problem-solving skills, in-depth thinking, conceptual understanding and creativity in students (Bilir & Özkan, 2018; Bliss & et al., 2007; Duban, 2008; Yasar & Duban, 2009; Wu & Hsieh, 2006; Wallace & Kang, 2004). As a result of the study of Bilir ve Özkan (2018), students ' feelings of help and sharing in terms of social impact increased, their self-confidence improved, their responsibility consciousness and communication skills improved, they learned with their peers, they were interested in the environment and lesson in affective sense. Norma (2001) concluded that research-inquiry-based activities help students shape ways to find answers to their questions through work and communication with their peers. In this context, it can be said that the results obtained from this research are parallel to the literature.

In the category of scientific process skills, students have stated that there is a development in skills such as being able to conduct experiments and observations, to determine the research question, to make claims, to determine variables. When the relevant literature is examined, the research of the inquiry-based learning method (Arslan, 2013; Aydogdu & Ergin, 2008; Demircioglu, 2011; Güney, 2015; Kocagül, 2013; Koray, Köksal, Ozdemir & Presley, 2007; Myers & Dyer, 2005; Roth & Roychoudhury, 1992; Ulu, 2011) and the method of learning based on argument (Demircioglu, 2011) have been found to improve the scientific process skills of students. In his study, Demircioglu (2011) found that the method of questioning based

on arguments improved the scientific process skills of his students and that there was a significant difference in the favor of the experimental group in terms of scientific process skills. In the study by Ulu (2011), he found that the use of research inquiry-based writing activity improved the scientific process skills of secondary school students. As a result of the Güney (2015) study, research has stated that the inquiry learning method has an effect on the ability to hypothesize, variable determination, conclusion, and predict. However, Erdogan (2005) stated in his study that research-inquiry-based learning is not effective in improving students' scientific process skills. Roychoudhury and Roth (1992) emphasized that interrogation-type laboratory applications develop higher scientific process skills with non-traditional laboratory experiments in which students are given the freedom to experiment. In the study by Bilir (2015), students' observations about social and sensory processes prior to implementation in the process; after the application, it stated that it included observations about social, sensory and cognitive processes. In his study, Orcutt (1997) revealed that questioning-based science learning improved the basic process skills of its students. Beishuizen, Wilhelm and Schimmel (2004) found that computer and internet-aided interrogation-based learning activities improve students' scientific process skills such as hypothesis, controlling variables, planning experiments, and interpreting results. In the laboratory and learning process category based on questioning in the studies of Şen, Yilmaz and Erdogan (2016), the teacher candidates; they explained their general views on the laboratory environment based on questioning and emphasized that they have expressed views on problem determination, experiment design and learning together. At the same time, studies have been found that research inquiry-based learning method improves students' critical thinking skills (Evren, 2012; Tatar, 2006). In the Universe (2012) study, it was found that there is a relationship between students' questioning learning skills, critical thinking tendencies and attitudes. Moreover, in this study, students emphasized that their ability to access knowledge, share and discuss their thoughts about science (history of science, the development of science, the ability to produce scientific knowledge, etc.) and produce scientific knowledge has improved at the point of science-related skills. In the study by Yasar and Duban (2009), it was determined that the laboratory courses based on questioning were more fun and that the positive opinions of the students towards science and scientists were formed. In this context, it can be said that this method is an effective method for improving the scientific process skills of students based on data obtained from student opinions on the method of questioning learning based on argument.

In other science courses, students who expressed a negative opinion about the method of questioning based on arguments stated that writing is boring, not like to talk and not to like the questioning of their ideas. When the relevant literature was examined, Bilir (2015) emphasized that as a result of his observations, students expressed negative opinions about the method of research inquiry due to not loving the course, boredness and not finding it fun, reluctance to teach, finding himself inadequate and passive. In his study, Hofstein and Lunetta (1982) reported that students enjoyed laboratory work and that these laboratory experiences resulted in positive and improved attitudes and interest in science. Marlow and Ellen (1999), Keefer (2002) and Freedman (1997) stated that students' interest and success in the course increased in research-inquiry science courses. In the study by Kizilaslan (2013), teacher candidates expressed positive opinions about laboratory activities based on questioning and reached the conclusion that subsequent laboratory activities were conducted based on questioning. In this context, it can be said that the opinions of the students on the processing of science courses by argument-based interrogation method coincide with the literature.

Suggestions

Given that the argument-driven inquiry learning method tested in the study has many positive effects on students, it can be said that it will be useful to prepare and implement activities related to this method for other units in Science Education. At this point, it is also thought that it is necessary to focus on issues in which students experience more problems. In the study, students who reported negative opinions often expressed dissatisfaction with situations such as writing and questioning their opinions. In this context, it can be stated that the transmission of argument-driven inquiry method is supported by digital (online-offline) and face-to-face learning environments will solve this problem.

Statements of ethics and conflict of interest

“I, as the Corresponding Author, declare and undertake that in the study titled as “*Secondary School Students’ Views About the Use of Argument-Driven Inquiry in the Science Courses*”, scientific, ethical and citation rules were followed; Turkish Online Journal of Qualitative Inquiry Journal Editorial Board has no responsibility for all ethical violations to be encountered, that all responsibility belongs to the author/s and that this study has not been sent to any other academic publication platform for evaluation.”

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ANNEX 1. EXAMPLE FROM COURSE PLANS

CHAPTER 1

Name Course	SCIENCES
Class	7st
Unit Name	PHYSICAL EVENTS/ELECTRİCAL ENERGY
Subject	SERIES and PARALLEL CONNECTED LAMPS
Recommended Learning Time	4*40’

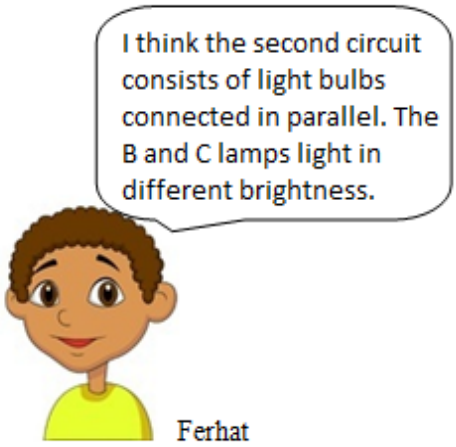
CHAPTER 2

Purpose	In this event, it is aimed for students to learn the difference between the serial and bonding patterns of the bulbs and the brightness of the serial and parallel connected lamps.
Relevant Science Acquisitions	7.6.1.1. Discovers what serial and parallel bonding is like, draws a circuit diagram consisting of series and parallel connected bulbs. 7.6.1.2. Observes brightness differences on the circuit and interprets the result in cases where bulbs are connected serially and parallelly.
Prior Knowledge	
Materials and Preparation	-Large number of batteries at different volts (1.5V; 3V, etc.) -Large number of bulbs at different volts (1.5V; 2 V; 3V, etc.) -Connecting cables -Hears -Battery bearings -Keys
Bilimin doğası ve bilimsel araştırma teması	What is experiment?
Crosscutting concept	

CHAPTER 3:Teaching-Learning Activities

IMPLEMENTATION of the ACTIVITY: **ARGUMENTATION-BASED TEACHING METHOD**
Step 1: Introducing the task Teacher hands out “Worksheet-3: I am connecting the bulbs in different ways!!!” activity to students. Then, the teacher first asked the students to read the scenario of the three different electrical circuits that Arzu teacher brought to the class and then examine the electrical circuits that Arzu brought with the teacher. The teacher asks the students to determine the research question about what they are asked to investigate in this event based on the circuits brought by Arzu teacher and what the students named Hilal, Yavuz, Ferhat, Simge and Alp in the concept caricature of these circuits say. In this process, students individually determine the research questions and write them in the "**1st Research Question"** section of the worksheet. Then, as a result of this research, they predict the results and reasons they foresead to reach. Some of the results that students aim to achieve as a result of the

research question are included in the speech bubbles of concept caricatures consisting of students named Hilal, Yavuz, Ferhat, Simge and Alp. In the speech bubbles in this concept.
For example;
"My Research Question: What is the circuit consisting of light bulbs connected in series and parallel? What can be said about the brightness of the light bulbs connected in series and in parallel?
I guess:



Because:
The current passing through the B and C lamps is different from each other.
B and C lamps have different resistances."
This is how students fill out the relevant sections in worksheet 3.
For this stage, students are given 20 minutes.

Step 2: Designing the method and the data to be collected

The important thing at this stage is that small groups of 3-4 students decide with their friends how to follow a way/method in order to find answers to research questions, develop their methods and apply them.
For this reason, the teacher visited the groups of students and told the students,*"What is a circuit consisting of serial and parallel connected bulbs? What can be said about the brightness of the series and parallel connected bulbs?"* "What method/path should you follow?" It asks, "What can we do, we can find answers to our research question?" Students who have no thoughts about what to do can be guided by the teacher on what kind of process they should follow using different tools related to the issue of electricity on the table.
At this point, the teacher asked the students, "Which of the circuits that Arzu teacher brings, which series can be an example of parallel connected bulbs?" "What do you think parallel means?" It encourages us to think about what kind of research method they should use by asking questions such as "Can you give an example of parallel connected things in our daily lives?"
At this stage, after deciding how to follow the process to answer research questions, students are asked to write the materials they will use in the research sections in the section "2nd Let's Design Our Application!" in the second part of the worksheet, "Materials to Use", "Security Procedure you will follow in our study", "How did I follow my research question?" and "Why did I follow this method?"
At this stage, small groups of students are expected to set up a circuit consisting of serial and parallel connected bulbs and set up an experimental system to compare their brightness and use amperemeters in it. In the application process, students are directed to take notes and do experimental work. The important thing at this stage is to allow students to discover that the direction of the current is from the plus pole to the minus pole of the battery and that the amperemeter must be serially connected to the battery to measure the severity of the current. Therefore, students are asked to note and observe how they install a circuit consisting of serial and parallel connected bulbs and the data on the change in brightness of the serial and parallel connected bulbs when they open the switch. At this point, the teacher guides students to take notes and do experimental work.

Students can often direct various questions to the teacher during the application because they encounter a method, they are not familiar with. The teacher should refrain from answering these questions directly and ask, "Why do you think that?", "Shouldn't we measure the severity of the current in this study?" It should give the student thought-provoking clues, such as "How do you think we can measure the current on the circuit?" Where groups produce improper solutions, the teacher should encourage students to consider different aspects of the research with guiding questions.
For this stage, students are given 35 minutes.

Step 3: Analysis of data and development of temporary arguments

This stage allows students to say, *"What is the circuit consisting of serial and parallel connected bulbs? What can be said about the brightness of the series and parallel connected bulbs?"* the temporary arguments that they think are the answer to the research question are the stage in which they produce. At this stage, first of all, each group of students will be 2nd. They analyze the data they collect as a result of the experimental research process they conduct at the stage. As a result of their analysis, each group presents their temporary arguments. In this, they can also benefit from students named Hilal, Yavuz, Ferhat, Simge and Alp or make a new claim themselves. Each group determines their evidence and evidence-based justification for supporting their claim. At this stage, students can also produce evidence and justification based on the data they collect. At this point, the teacher drawes from the table in figure 1 to the board as much as the number of small groups in the class and the number of different arguments.

Research Problem	
Your Claim	
Your Proof	Your Justification

Figure 1. Student temporary arguments

Here, the claim is the answer to the research question. The evidence is based on the collected data and is formed as a result of analyzing the collected data and interpreting it through the brain filter. The justification is the statement explaining why students chose this evidence. Thus, students relate evidence to justification by making assumptions and comments that guide the analysis and interpretation of the data they collect. At this point, the teacher walks between the rows and fills the table in figure 1 with student expressions, based on what the students write in their research reports. The number of small groups in the class and the number of different arguments is generated from the table in figure 1. Thanks to this table, different claims, evidence and reasons regarding the direction and severity of electric current are written on the board and shared with other groups.
If there are groups of students who are struggling to make a claim regarding data collection and data, the teacher should make students think about why they are doing this work and why they are following such a method/path. For this, students are asked "what are you trying to understand in your research?", "Why is it important that you collect this data in your study?" "What do we know about the concept of serial and parallel depending?" Encourage students with questions such as "In what way are serial connected bulbs included?" and direct them to collect data.
At this stage, students were asked if the worksheet was "3. What data did I collect in my study? What have I done to make sure the data I collect is reliable? What have I done to reduce the error in the data collection process?", "How did I analyze the data I collected? Why did I decide to analyze it this way?" and "As a hero with super abilities, I am going to walk around the conductor cable. According to the data I have, I will draw on why the lamps give light of the same or different brightness in the electrical circuit I have agreed with." and "My 6th Claim and Proof", "7. My reasoning" sections.
For this stage, students are given 20 minutes.

Step 4 and 5: Argumentation process and Direct reflective discussion process
At this stage, each group presents its own claims, evidence and justifications to other groups. They also evaluate the alternative arguments produced by other groups regarding the electrical circuit consisting of serial and parallel connected bulbs and the brightness of the bulbs. Students participate in the class scientific discussion in order to refute the evidence and justifications and other alternative claims, evidence and justifications that defend their claims in order to reach the most general and valid opinion on the brightness of the B and C and D and E bulbs in the circuit consisting of serial and parallel connected bulbs. This is the stage where class discussion is held. At this stage, students explain the implementation process they have designed and their own data collection processes. They will tell you why your friends' claims are invalid. For this, the teacher should encourage students to be able to speak their own mind and ask the students, "How did you analyze their data?" "Could it be that the data you collected does not support your claim?" "And what do you think of what your friend said?" He should direct them to the scientific debate process by asking questions such as "Why do you think so?" In this way, students learn to critical the opinions of others. After the entire class discussion is over, the teacher makes statements that he considers necessary. For this stage, students are given 40 minutes. In this section, the students are also asked, "What kind of work have you done by you?" "What do you think experimental work is?" is asked, emphasizing that there is intervention in experimental work and variables should be mentioned in order for a study to become an experimental study. For this, students are given 30 minutes.
Step 6: Writing the research report
This stage can be carried out together with the first four stages or independently of them. Students can be given time after a class discussion. However, in this study, 5. Take the stage to the top 4. We tried to complete it simultaneously with the stage. At this stage, if there is a similarity or difference between the general claim reached after the class discussion from the students and the initial claims of the students, they should think about it as "8. Changing Ideas" sections. For this part, students are given 10 minutes. That way, I am going to go to the 4th. It will be the end of class.

CHAPTER 4: ASSESSMENT AND EVALUATION

Homework
7th and 8th. Stages are given to students as homework.
Step 7: Double-sided blind peer rating
At the beginning of the first lesson of the ongoing week, the research proposal and report are distributed to the students in the peer (referee) evaluation guide and the worksheet belonging to another group. For example: The study report belonging to a student named Ayşe in group A is given to the student named Mehmet in group B for evaluating. The persons evaluating and evaluating this process are carried out blindly on both sides without being known. The worksheets given for evaluation in the first lesson of next week are collected from the students and delivered to the relevant work leaf owner. This process is managed by the teacher.
Step 8: Correction of the report by return
Students make the necessary corrections to their worksheets in line with the evaluations of the peers and deliver them to their teachers.

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Review Article

The Role of Cultural Awareness in the EFL Classroom[1]

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Abstract

Language learning involves four skills named as reading, listening, writing, and speaking for learners to practice both in and outside the classroom. Interaction in the class may be limited to the backgrounds and common values of its members, but once learners are outside the class, pragmatic skills are required to engage in social and cultural aspects. This study aims to examine the qualitative and quantitative studies about cultural awareness in EFL classrooms in a systematic way. Therefore, the meta-synthesis procedure is used as a research design. After applying four specified criteria, 50 studies about cultural and intercultural awareness in EFL classrooms were included to meet the aim of this meta-synthesis. There are two main themes called *foundations* and *acquirements* that emerged as a result of the analysis of the studies about cultural and intercultural awareness. Foundations of cultural awareness have four codes named *lesson components, interaction, dynamic and personal connection.* Furthermore, acquirements of cultural awareness have four codes as *conversational competency, cognitive competency, cultural competency,* and *global involvement.*

Keywords: *Intercultural awareness, English as a foreign language, multicultural education, qualitative research*

[1] The ethical committee permission is not required in this research since this is a review study.

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İngilizce Sınıflarında Kültürel Farkındalığın Rolü

Öz

Dil öğrenimi öğrencilerin hem sınıf içi hem de sınıf dışında pratik yapmaları için okuma, dinleme, yazma ve konuşma olmak üzere dört beceri içerir. Sınıf içi iletişim bireylerin geçmişleri ve ortak değerleriyle sınırlanmış olabilir, ancak öğrenciler sınıf dışına çıktıklarında, pragmatik becerilerinin sosyal ve kültürel özelliklerle bütünleşmesi gerekmektedir. Bu çalışma yabancı veya ikinci dil olarak İngilizce öğrenimi sınıflarında kültürel farkındalık üzerine yapılmış nicel ve nitel araştırmaları sistematik açıdan incelemeyi amaçlamıştır. Bu yüzden, araştırma yöntemi olarak meta-sentez yöntemi kullanılmıştır. Bu amacı karşılamak üzere İngilizce derslerinde kültürel ve kültürlerarası farkındalıkla ilgili 50 araştırma, belirlenmiş dört kriterden sonra bu meta-senteze dahil edilmiştir. Kültürel ve kültürlerarası farkındalık araştırmalarının analizinin sonucunda *temeller* ve *edinimler* olmak üzere iki ana tema ortaya çıkmıştır. Kültürel farkındalığın temelleri *ders bileşenleri, etkileşim, dinamik ve kişisel bağlantı* olmak üzere dört koda sahiptir. Ayrıca, kültürel farkındalığın edinimleri *konuşma yeterliği, bilişsel yeterlik, kültürel yeterlik* ve *küresel ilgi* olmak üzere dört koda sahiptir.

Anahtar Sözcükler: *Kültürlerarası farkındalık, yabancı dil olarak İngilizce, çok kültürlü eğitim, nitel araştırma*

Introduction

Collaboration, communication, critical thinking, and creativity are listed as important four C's in 21st-century teaching classrooms (National Education Association, 2010). There is a constant change in knowledge and students need to be prepared for this change with learning these crucial C's. These can be achieved by knowing others, accepting, and respecting their culture while developing awareness. English language learning as a second (ESL) or foreign language (EFL) brings along the familiarization with the culture of another community or country. While second language learners are usually within the environment of their target language, foreign language learners train themselves to be proficient in the target language settings. Whether second or foreign, language learning requires an understanding of cultural elements. Nowadays with the use of technology and rapid globalization, culture has become an essential part of language classrooms, and learners are expected to converse through cultures and beyond borders (Byram, 1997a). Learning a language through intercultural understanding means "the awareness and acceptance of one's own world and the perception and acceptance of the foreign world." (Neuner, 2003, p.49). Therefore, interaction in the language classrooms becomes cross or intercultural as it inevitably includes an integration of the target culture and native cultures of any individual. Knowing culture undergoes a process of knowing differences, similarities, or uniqueness of any cultural element which discloses itself as cultural awareness.

Getting to know cultures is not an easy task for the language learner. It does not happen rapidly over studying a single coursebook, doing repetitive tasks, or getting limited opportunities of communication with target language speakers, especially during foreign language learning. Studies have shown that cultural awareness needs to be integrated into teacher education (Atay, 2005; Byram, 2012; Hişmanoğlu, 2013), curriculum and coursebook designs need to be done accordingly (Beresova, 2015; McConachy, 2008; Lo Bianco, Crozet & Liddicoat, 1999; Pulverness & Tomlinson, 2013), and students should be in a conscious process of growth in their target language (Agudelo, 2007; Prodromou, 1992; Dasli, 2011; Ware & Kramsch, 2005).

Literature Review

Four language skills are the main essentials of a language classroom and we also construct a healthy communication with them outside the classroom. Learners need to go beyond familiar

elements like backgrounds and values of peers and need pragmatic skills to be in cultural interaction. Culture is regarded as the fifth skill of the language class reminding itself through interactions that can be troubling even for a proficient language speaker (Kramsch, 1993). Therefore, formal teaching of culture within the language classroom might be helpful for learners. Byram (1986) states that culture teaching introduces students to the lifestyles of the places that target language is spoken. Getting to know target language culture helps feeling comfortable in authentic situations when learners step out into the target language world. Learning a foreign language pushes the students out of their comfort zone and makes them gain new perspectives (Byram, 1988). Integrating cultural knowledge with language skills helps learners become better interactors. Cultural adaptation into the target language is crucial for second language learners, and the culture shock experienced by these learners should be regarded as a positive aspect in the way to raise cultural awareness (Irving, 1984). On the other hand, foreign language learners are less likely to find themselves in a culturally diverse environment as much of the practice happens in the classroom. Yet, materials and interactions can be designed to increase exposure to raise awareness.

Kramsch (1995) emphasizes the importance of culture by indicating "Teaching culture means, therefore, teaching not only how things are and have been, but how they could have been or how else they could be" (p.85). Interactions enriched in cultural contexts present invisible communication elements such as interlocutors' behaviors, emotions, and speech acts. With the age of technology and globalization, the boundaries of different cultures have become even more blurred. Learners outreach various sorts of media to engage in cultural interaction. Kramsch (2014) highlights that the styles and conditions in which foreign languages are taught have shifted and the methods instructors used for teaching cultural norms are now about to be outdated. Local cultures of the learners are now undeniably influencing the flow of interaction. Moving from your own country to another for business, study or other reasons, and being multicultural make culture rather unfit to clarify manners and acts (Kramsch, 2011). Not focusing on one culture but putting the perspectives of many into communication has become the key point in culture teaching and cultural communication in ESL / EFL classrooms. Being considerate towards other cultures, knowing their lifestyles no matter how different they are from yours is also crucial in recognizing and enriching your own culture (Byram, Lloyd & Schneider, 1995). The importance of understanding other cultures puts forward the idea of intercultural (communicative) competence and cultural awareness (Byram, Holmes & Savvides, 2013). According to Irving (1984), people are likely to overlook how their cultures

affect their own values; however, educators should realize the importance of their native culture before working with the learners to make them culturally attentive. Only then, speakers can understand and get into a compromise in case of any misunderstandings, leaving any kind of judgments behind.

Byram (1989) merges the concepts of language awareness and cultural awareness. He indicates that when language as a form involving competences is combined with its sociocultural character, it brings out the concept of language awareness. Then, language is connected to culture by adding elements of the students' native languages or cultures and by confronting such sociocultural factors with the values of target language speakers. Therefore he forms a model of intercultural communicative competence by proposing the concepts of *saviors*: skills (*savoir comprendre*), knowledge *(savoir être),* education (*savoir s'engager*), attitudes (*savoir être*), and skills *(savoir apprendre/faire*). Byram (1997b) explains the model by stating that "... it demonstrates how closely the two phrases, 'cultural awareness' and 'language awareness', are related, and more importantly because it demonstrates that language and culture cannot be treated separately in the discussion of language teaching theory and practice." (p.51). People might be expected to form a connection between their social identity and interacting speakers' identity, and at the same time be a negotiator among cultures in diversity (Byram, 1997a). He emphasizes this issue as "It is this function of establishing relationships, managing dysfunctions and mediating which distinguishes an 'intercultural speaker', and makes them different from a native speaker." (p.38). Language speakers with the idea of awareness can engage in well-formed conversations with proper meaning and negotiation.

The Emphasis of Cultural Awareness in the European Framework

The idea that language education needs to integrate cultures has emerged itself in the curriculums, plans, materials designed in many countries. Kramsch (2011) states that "The adjective 'intercultural' has been applied to competences, speakers, learning, pedagogy, stances." (p.308). She also indicates that the aim of intercultural communication is to ease the interaction in the European Union and countries support each other within Europe. Adopting the intercultural way of language teaching has helped to reach out to many learners and with cultural awareness; their identities have not been disregarded. That is one of the language learning and teaching aspects that the Council of Europe included in the Common European Framework of Reference for Languages (CEFR) in 2001. Having been used as a source to

develop and design nationwide curriculums in language teaching by European countries and countries such as Mexico, Canada and Japan, CEFR states that "It describes in a comprehensive way what language learners have to learn to do in order to use a language for communication and what knowledge and skills they have to develop so as to be able to act effectively." (Council of Europe, 2001, p.1). To promote culturally enriched language learning, the terms plurilingualism and pluriculturalism were introduced and expanded as the repertoires needed while developing linguistic and cultural communication (Council of Europe, 2018). Both of these terms imply that language learning has an active nature and plurilingualism involves participating in the language starting from one's own social circle and expanding that involvement into the society. As attitudes beyond linguistic skills take part in communication such as gestures, tones, body language, or other interaction mediators like understanding social and cultural cues, the learner develops pluricultural awareness and does not just practice the four skills of language classroom.

Since its launch, CEFR has been used in thirty languages not specifically restricted to the European area, and European organizations have been using its six common reference levels in language measurement (Little, 2012). Little (2012) also indicates that one of the aims of CEFR is to raise intercultural and pluricultural awareness and help learners monitor their own competences while learning languages. Within the perspective of CEFR, language learners are regarded as 'social agents' who are active both in language learning and contributing to their community to develop language awareness (Council of Europe, 2001). CEFR adopts an action-oriented approach to guide the social agents, so that the learners would be able to act within their social environment through their plurilingual and pluricultural competences. Moreover, general and communicative language competences are emphasized as the essentials to improve this social agency. Therefore, while students become socially and linguistically attentive participants of language environments with the help of intercultural awareness, they can organize their own language learning process.

In CEFR, the learner in a cultural environment is culturally aware and can construct cooperative skills. "Seeing learners as plurilingual, pluricultural beings means allowing them to use all their linguistic resources when necessary, encouraging them to see similarities and regularities as well as differences between languages and cultures." (Council of Europe, 2018, p.27). Learners have social and cultural skills that help them reconcile through cultural distinctions within their own community or across multiple regions. North and Piccardo (2017) describe cultural

mediation of CEFR as an aspect happening for a language or for many languages along with an inclusion of cultural differences of communities, and social mediation as a bridge between speakers who would face difficulties during interactions. Through the guidance of CEFR on social and cultural use of language, language materials and syllabi are designed with the intention to improve pluricultural and plurilingual competences. Moreover, CEFR has become influential in curriculum design and teaching perspectives (Byram & Parmenter, 2012) such as valuing students' social cultural backgrounds and organizing authentic materials to promote pluriculturalism and plurilingualism. In addition to taking learners' cultural diversities into consideration, teachers have become aware of arranging tasks and putting more action oriented approach into language planning. Adequate education should be delivered to teachers so that plurilingualism and pluriculturalism values of CEFR can be applied accurately (Diez-Bedmar & Byram, 2019) . Hence, every individual in the classroom can be a part of a thorough CEFR cycle when appropriate design and teaching which address the needs, levels and background of the learners are done.

Studies on Cultural Awareness

How cultural awareness affects language teaching or how much the learners are really aware of the culture is among the current issues of foreign or second language teaching. Beyond personal concerns, the design and planning of materials are among the issues of culture-related discussions. Beresova (2015) argues that using authentic materials improves the intercultural understandings of English language learners. Through the principles of CEFR in enhancing cultural awareness, authentic materials act as a connection to cultures of the language being learned or even to the international cultures. It is stated that by using such materials in the class, educators may also get a chance to actively participate in the material arrangement and monitor their students (Beresova, 2015). Agudelo (2007) states that communicative language teaching activities ease the dialogue to improve intercultural communication. Engaging in intercultural communication consisting of national and international values is a great way to develop awareness. In his study, prospective language teachers watched language classes as a group, conducted interviews, and made lesson plans with cultural integration. Having intercultural values in lesson material makes students realize both their native culture and other cultures (Agudelo, 2007).

Sometimes, students' already existing perspectives affect the attitude toward the language being learned. These perspectives, however, are prone to change with the influence of teachers or materials. In a survey about the cultural awareness of language teachers in Greece, Prodromou (1992) states that students think EFL teachers should be bicultural. Students emphasized that teachers should be competent both in native and target languages and cultures. In a study conducted with university students in target language environment, İşcan, Karagöz, and Konyar (2017) declare the importance of knowing the values of target culture while learning a language. It is pointed out that when students are in the target language environment, they want an introduction to the cultural elements and teacher support as earlier as possible. However, through critical cultural awareness, they want to evaluate aspects of their own culture and target culture so as not to feel assimilated. To lessen the sense of being belittled compared to target language culture, recognizing your own culture, and comparing and feeling empathetic towards other cultures is essential in intercultural awareness (Byram et al., 2013). It is important that while teaching culture, teachers should give the students a sense of trust by referring to students' cultures occasionally so that they can participate more. Therefore teacher education and development in terms of cultural awareness are important steps in pre and in-service teaching.

Prodromou (1992) indicates that teachers need to adopt a learner-based approach to use dynamic activities to improve cultural understanding. In Murray and Bolinger's (2001) research, activities such as e-mail interactions with the speakers of the target language, interviewing people from target cultures, video projects and internet research helped students get to know target language cultures and compare them with the values of their own to reach intercultural awareness. The design and nature of materials are also important. McConachy (2008) stresses the importance of designing culturally enhancing language coursebooks. He states that educators need to improve their own awareness and contribute to the flow of communicative activities to go beyond what is presented in the books. "In this case, the aim is not to elicit some kind of predetermined 'correct' answer but rather to develop meta-awareness concerning the fact that sociocultural context is important in language use." (McConachy, 2008, p.124). Thus, students need to understand this sociocultural context to communicate effectively as well that is not given in the course books. If some activities with a good potential for discussion go unnoticed during class time, students may feel alienated or sense a lack of interest which would end up failing to promote cultural awareness. According to Lo Bianco, Crozet, and Liddicoat (1999), language teachers can promote students to interact and ask

questions about the context and the language used while discussing both written or oral texts in the target language in order to take both cultural and the personal variables into consideration). Pushing the borders of coursebook design by directing questions and bringing in more authentic materials makes teachers' jobs easier in raising cultural awareness (Pulverness & Tomlinson, 2013). For that reason, it is one of the tasks of the language teacher to enrich what is presented as the classroom material.

Atay (2005) highlights the importance of educating teachers on cultural awareness and states that pre-service teachers are aware of the importance of culture in language teaching, yet most of them feel inadequate in the amount of information they have and they are unsure about how they are going to transfer cultural skills to the students. While Atay (2005) proposes that teachers should improve reading and involve in dialogues on culture, Kambutu and Nganga (2008) argue that visiting foreign cultures and spending time in that environment definitely contribute to cultural awareness and remove any existing prejudices. Even when teachers do not have a chance to travel to other cultures, they should look for engagement in the target language culture through self-education. Byram (2012) emphasizes the importance of language and culture education and citizenship education. He states that "Combining these two perspectives ensures that the 'here' is not just 'our community and country' but intercultural, and that the focus is on language and culture learning for 'now', and not just for some future application in the so-called real world." (Byram, 2012, p.11). The essential aspect of learning about intercultural values is researching them and engaging through different mediations even when there is no proximity.

Cultural awareness becomes an inevitable part of the English learning process (Byram 1997a; Byram, 2012; Kramsch, 2011). There are many studies emphasizing the importance of cultural awareness in EFL / ESL classrooms (Atay, 2005; Agudelo, 2007; İşcan, Karagöz & Konyar, 2017) and offer classroom applications for teachers (McConachy, 2008; Prodromou, 1992; Pulverness & Tomlinson, 2013). This study aims to examine both qualitative and quantitative studies about cultural awareness in EFL classrooms in a systematic way. Therefore, it is intended to gather influential and efficient practices and create a guide for EFL teachers.

Methodology

Research Design and Research Process

This study aims to examine the qualitative and quantitative studies about cultural awareness in EFL / ESL classrooms in a systematic way. Therefore, the meta-synthesis procedure is used as a research design (Lachal, Revah- Levy, Orri & Moro, 2017). Meta-synthesis is defined as the gathering of a group of studies to understand the vital components of a particular subject and present these studies with original review results by stating new conceptualizations (Schreiber, Crooks & Stern, 1997). This technique helps the researchers to get information from different studies and discover a particular topic from different points of view. Thus, it affords assistance to develop recommendations (Tong, Flemming, McInnes, Oliver & Craig, 2012).

Electronic search is conducted with the following databases; EBSCO, Eric, Sagepub, Scopus, Proquest, Google Scholar, Taylor & Francis, and Jstor. The keywords as (inter)cultural awareness & ELT & EFL", "awareness & ELT", "(inter)cultural awareness & ELT & EFL & implementation & application" were used during the search process. The words of "cultural awareness" and "intercultural awareness" were used for each combination not to miss any related study which can be included in this review. Furthermore, four criteria are identified for deciding on the studies. According to these criteria;

Criteria 1: Studies related to the cultural and intercultural awareness published in and after 2002, since the Common European Framework (CEFR) which contains cultural awareness issues was published in 2002,

Criteria 2: Studies that are published in peer-reviewed journals,

Criteria 3: Studies written in English or Turkish languages,

Criteria 4: Studies including cultural/ multicultural awareness issues in EFL classrooms are included in this study.

After searching stated databases, the acquired studies are included by applying the specified criteria indicated above. As a result of adopting the relevant key terms, 19300 studies were found about cultural and intercultural awareness in EFL / ESL classrooms. Thereafter, 50 studies were found in total by restricting the studies according to the relevant years (criteria 1), restricting language (criteria 2), including studies published in peer-reviewed journals (criteria

3), and considering the aim of the study (criteria 4). Therefore, 50 studies are included in this meta-synthesis about the cultural and intercultural awareness of EFL classrooms.

Each article is read by the researchers in the beginning. Afterwards, every researcher creates her own codes and themes. These themes and codes are discussed and finalized after reaching a consensus. Codes are the short phrases that are assigned to explain and summarize the language-based data (Saldana, 2008). After the coding process, patterns of codes are considered and these repetitive patterns are created the 'theme' for the recurring issue. However, there are some differences and variations occur under the same theme but these differences are not the patterns that can create a theme or subtheme during the data analysis. Therefore, these variations are indicated under the related theme as codes.

Trustworthiness and Transferability

Triangulation process in qualitative research provides a deeper understanding of the phenomena and paves the way for handling the data from different perspectives. There are four types of triangulation; methods triangulation, triangulation of sources, analyst triangulation and theory/ perspective triangulation (Denzin, 1978; Patton, 1999). Analyst triangulation method was used to employ the validity of the data in this research. This process is conducted by two academics from the Faculty of Education. 25 selected studies shared with each academic and their own themes and codes were taken into consideration. Suggestions about themes and codes of the data were evaluated and the consensus was reached (Creswell, 1998). Periodical help from the academics were received during the analysis to provide trustworthiness. Moreover, brief explanations about each theme and code were given in the result section to ensure transferability.

Results

This study aims to prepare a guide for EFL / ESL teachers to develop more effective practices to develop cultural awareness in their classrooms. There are 50 studies that included cultural and intercultural awareness in EFL classrooms in this meta-synthesis in order to meet this aim after applying the specified criteria stated in the previous section. In this section, themes and general information about the studies included in this meta-synthesis are given in a systematic

way. Table 1 shows information such as authors, year, research design, research type, and keywords of the included studies about cultural and intercultural awareness in EFL classrooms.

Table 1
Summary of the Studies Included in Meta-synthesis

Author(s)	Year	Research Design	Research Type	Keyword(s)
Aguilar	2008	Descriptive	Deductive Research	Intercultural Communicative Competence
Ahmed and Mohammed	2014	Quantitative	Survey	Teachers' role in developing cultural awareness
Alptekin	2002	Descriptive	Deductive Research	The concept of 'native speaker'
Altay	2005	Descriptive	Deductive Research	Cultural awareness
Angelova and Zhao	2014	Qualitative	Case Study	Computer technology and cultural awareness
Arcagok and Yılmaz	2020	Mixed-Method	Survey and Interview	Intercultural sensitivity of pre-service EFL teachers
Atasever Belli	2018	Quantitative	Survey	EFL students' cultural awareness and attitudes
Baker	2009	Qualitative	Interview	Cultural globalization
Baker	2008	Descriptive	Deductive Research	Cultural awareness in Thailand
Baker	2012	Descriptive	Deductive Research	Key components of intercultural awareness
Baker	2015	Descriptive	Review	Research on cultural and intercultural awareness
Bayyurt	2006	Qualitative	Case Study	Non- native English language teachers' cultural awareness
Bloom	2008	Qualitative	Case Study	Developing cultural awareness for students in service-learning
Borghetti	2013	Descriptive	Deductive Research	Integrating two models for ELT classrooms to develop intercultural awareness
Byram and Feng	2004	Descriptive	Review	Culture and language learning

Author(s)	Year	Research Design	Research Type	Keyword(s)
Campos	2009	Descriptive	Deductive Reasoning	Activities to raise cultural awareness in ELT classroom
Çakır	2006	Descriptive	Deductive Reasoning	Cultural awareness
Dema and Moeller	2012	Descriptive	Deductive Reasoning	Teaching culture in EFL classrooms with digital sources
El- Hussari	2007	Qualitative	Case Study	Cultural awareness in Lebanese EFL classrooms
Escudero	2013	Quantitative	Experimental	Teaching intercultural awareness in EFL classrooms
Fay, Lytra and Ntavaliagkou	2010	Descriptive	Deductive Reasoning	Multicultural awareness in Greek schools
Galante	2014	Quantitative	Experimental	Developing intercultural sensitivity through digital sources in Canada
Genç and Bada	2005	Quantitative	Survey	Role of culture for students of EFL
Heliot and Young	2006	Quantitative	Experimental	Language and cultural awareness at primary level in France
Ho	2009	Descriptive	Review	Teaching and learning culture through EFL textbooks in Vietnam
Kim	2002	Descriptive	Review	Teaching culture in EFL classrooms and designing culture-based lessons
Kiss and Weninger	2017	Qualitative	Survey	Teaching culture through the use of visuals in multicultural EFL classroom
Knutson	2006	Descriptive	Deductive Reasoning	Learning and teaching culture in ESL / EFL classroom
Kramsch	2013	Descriptive	Deductive Reasoning	Changing the perspective of culture teaching in language learning
Lee	2015	Qualitative	Case Study	Race in intercultural communication in ESL classroom
Lenchuk and Ahmed	2014	Descriptive	Deductive Reasoning	Importance of teaching pragmatics in ESL cultural awareness
Liang	2014	Descriptive	Deductive Reasoning	Culture teaching in EFL classroom
Moecharam &	2014	Quantitative	Experimental	Use of Literature in Indonesian EFL

Author(s)	Year	Research Design	Research Type	Keyword(s)
Kartika Sari				classes to raise awareness
Moeller & Nugent	2014	Descriptive	Review	Intercultural communication models and activities for EFL classroom
Monfared, Mozaheb & Shahiditabar	2016	Mixed Method	Survey	Teaching culture and culture in textbooks through the perspectives of teachers from multiple backgrounds
Nugent & Catalano	2015	Descriptive	Review	Critical cultural awareness
Önalan	2005	Mixed-Method	Survey, Interview	Turkish EFL teachers' perspective and use of culture in tertiary level classes
Porto	2010	Descriptive	Deductive Reasoning	Culture, identity and classroom practices
Razı & Tekin	2017	Quantitative	Experimental	Intercultural competence perspectives of Turkish trainee teachers
Shahed	2013	Qualitative	İnterview	EFL teachers' cultural sensitivity and awareness in Bangladesh
Su	2008	Mixed-Method	A questionnaire, written oral reports, interview	Cross-cultural awareness in Taiwanese EFL college classes
Svalberg	2007	Descriptive	Review	Language awareness
Toyoda	2016	Qualitative	Observation	Intercultural learning and awareness
Tsuda, Shigemitsu & Murata	2007	Qualitative	Interview	Intercultural communication between Japanese and American speakers, cultural awareness
Vourdanou	2017	Mixed-Method	The survey, interview, journals	Content and Language Integrated Learning, The use of literature and wikis in EFL classroom in Greece
Wu, Marek & Chen	2013	Qualitative	Critical Text Analysis	Computer-Mediated Communication, cultural awareness
Young & Sachdev	2011	Mixed-Method	Diary, Survey, Focus group interview	Intercultural communicative competence perspectives of English language teachers

There are two main themes that emerged as a result of the analysis of the studies about cultural and intercultural awareness. They were named as *foundations* and *acquirements*. Each theme has four codes. There are codes named as *lesson components, interaction, the dynamic and personal connection* under the theme called as foundations of cultural awareness. Furthermore,

there are four codes named as *conversational competency, cognitive competency, cultural competency,* and *global involvement* coded under the theme called acquirements of cultural awareness. In this section, themes and codes that appeared as a result of the analysis are explained in a detailed way.

Foundations of cultural awareness

The first theme referred to as *foundations* explain the components of the EFL classroom that fosters cultural and intercultural awareness. Each code of this theme discloses one assisting aspect for EFL classrooms. The first code named as *lesson components* includes the studies about the importance of teachers and activities' on cultural and intercultural awareness. Young and Sachdev (2011) stated in their study that intercultural communicative competence is a vital component and teachers are the inseparable part of this process. Teachers who identify themselves as intercultural speakers become good learning models for their students. As Heliot and Young (2006) stated, teachers are important components inside the classroom to integrate culture and language.

Activities and practices inside the EFL classroom are significant parts for both language teaching and developing cultural awareness. Furthermore, Vourdanou (2017) notified that cultural elements in EFL classrooms make students question their own attitudes and work on feeling empathetic for cultural differences. Teachers should be aware of the cultural elements and use those elements while working with students to develop cultural communication (Önalan, 2005; Svalberg, 2007). Such elements may lean towards culturally sensitive issues such as diversity, discrimination, equality and so on (Compos, 2009; Frank, 2013; Porto, 2010) , so that the students can express themselves better in their target language community. Such issues could be integrated within the lesson components by tasks designed by the teachers. For example, teachers might use task-based cultural classroom activities (Shaded, 2013) and help students to identify cultural issues through some authentic tasks. The aim should be to evoke students' curiosity and help them to learn about different cultures (Çakır, 2006). In this way, students will be more mindful about how they can use their language skills no matter how they experience cultural issues.

Second code named as *interaction* refers to the students' interaction with people from different cultures. According to Toyoda (2016), when students work with peers in a culturally diverse

setting, they can enrich their cultural awareness and high- order thinking skills. This intercultural interaction paves the way for effective interaction, makes students active participants of the target culture, and teaches sharing social values and personal problems (Kourova & Modianos, 2013; Moecharam & Kartikasari, 2014; Moeller & Nugent, 2014; Tsuda, Shigemitsu & Murata, 2007). When students have direct contact with the people from their target culture, they are able to do positive shifts to increase cultural sensitivity and promote cultural awareness (Bloom, 2008).

The third code stated as *dynamic* explains the dynamic structure of the intercultural and cultural awareness. In the 21st century, communication has become both more intercultural and dynamic with the use of technology. Therefore, culture should be considered from the global perspective while historical roots are taken into consideration (Kramsch, 2013). As Knutson (2006) stated, culture has a dynamic nature. Therefore, learners should be equipped with awareness and understanding of different cultural components.

The fourth and last code of the foundations' theme stated *personal connection*. Teachers should understand the relationship between culture and language in a specific country to provide cultural awareness skills and materials in ELT classrooms (Baker, 2008). Thus, they can develop skills to make individual orientations (Baker, 2009). Students can develop cultural and intercultural awareness while making personal connections with the target culture's values, traditions, and beliefs. Furthermore, literature tells us that students who share social values and personal problems tend to become culturally aware and be knowledgeable about cultural awareness (Moecharam & Kartikasari, 2014).

Acquirements of cultural awareness

The second theme of this review is called *acquirements* since this theme includes the studies emphasizing the benefits of the different aspects of cultural and intercultural awareness. The first acquirement coded under this theme is *conversational competency*. Tsuda, Shigemitsu, and Murata (2007) stated that strategies and activities using intercultural interaction help students to carry out an effective interaction. Building intercultural competence strengthens students' language abilities (Sowden, 2007).

The second code named as *cultural competency* refers to the cultural learning outcomes of intercultural and cultural awareness. It is found that video-conferences carried out with native speakers to improve cultural awareness help students to improve confidence perspectives on different cultures (Wu, Marek & Chen, 2013). Intercultural communication strategies with the aim of developing intercultural awareness emphasize cognitive components as well (Baker, 2008; Ho, 2009). Therefore, Byram and Feng (2004) asserted that the cultural dimension of intercultural awareness should be taken into consideration in EFL classrooms. Students who are introduced to cultural knowledge by teachers through EFL course books and materials develop positive attitudes towards cultural knowledge in the language learning process, enhance cultural awareness by expanding their knowledge of cultural values, beliefs, and behaviors (Atasever Belli, 2018).

The third code-named *cognitive competency* contains the utilities of intercultural awareness on the cognitive aspect of the students. Cognitive competency includes cognitive skills such as reflective thinking, conflict resolution skills, and empathy. Toyoda (2016) stated that the students who are studying a culturally diverse setting can enrich their cultural awareness and high- order thinking skills. Furthermore, interacting with native speakers assists students to develop empathy, cultural awareness, and conflict resolution skills in communication. Realizing that language is used within a culturally diverse environment helps students to improve their confidence and motivation (Baker, 2015; Su, 2008). In addition, Nugent and Catalano (2015) asserted that critical cultural awareness activities and strategies help students to develop communicative competence and critical thinking skills.

The fourth code referred to as *global involvement* includes the studies discussing intercultural awareness from an international point of view. Monfred, Mozaheb, and Shahiditabar (2016) indicated that global and local "glocal" way of teaching has been adopted in EFL/ESL culture teaching. Teachers believe that lessons should include cultural elements and students' own culture should be integrated with the target culture. The emphasis should be on not only target but international culture for cultural awareness. In addition, students educated within the critical cultural awareness perspective of language learning become globally aware and interculturally competent learners (Moeller & Nugent, 2014; Nugent & Catalano, 2015). Alptekin (2002) asserted that since English became an international language, the concept of 'native speaker' vanished. Rather than a dominant native speaker culture, an interlanguage which includes the culture of second and foreign speakers should be adopted by language

teachers or institutions. Thus, language teaching textbooks and materials should involve both local and international contexts to develop local and international interaction, develop cultural awareness and awareness of differences.

Eventually, as a result of the analysis of 50 selected studies about cultural and intercultural awareness, two main themes emerged as foundations and acquirements. Each theme has four codes. There are codes named as lesson components, interaction, the dynamic and personal connection under the theme called as foundations of cultural awareness which emphasize the role of the EFL classroom in fostering cultural awareness. Furthermore, there are four codes named as conversational competency, cognitive competency, cultural competency, and global involvement coded under the theme called acquirements of cultural awareness which includes studies indicating different aspects of the benefits of cultural awareness.

Discussion and Conclusion

This study aims to examine the studies about cultural and intercultural awareness to help EFL / ESL teachers to improve efficient practices in their classrooms to develop cultural and intercultural awareness. There are 50 studies examined in order to meet this aim. Certain criteria were followed while studies are included in this meta-synthesis. As a result of the analysis, there are two main themes that emerged as *foundations* and *acquirements*. Each theme has four codes. There are codes named as *lesson components, interaction, the dynamic and personal connection* under the theme called as foundations of cultural awareness. Furthermore, components named *conversational competency, cognitive competency, cultural competency,* and *global involvement* coded under the theme called acquirements of cultural awareness.

Cultural awareness is an inseparable part of the language learning process. Ware and Kramsch (2005) integrate language awareness with cultural awareness. Studies presented that cultural awareness paves the way for the integration of cultures and a better understanding of one another. Learning a new language while learning its culture may not be an easy process for language learners. There are implications by CEFR about the importance of language learning curriculum on developing cultural awareness, such as widening the views on language learning and accepting and appreciating cultural variety. However, improving cultural awareness skills may not happen rapidly over studying a single coursebook, repetitive tasks or limited opportunities of communication with target language speakers especially during foreign

language learning. Studies have shown that cultural awareness needs to be integrated into teacher education by putting emphasis on a global presence of teachers with adequate competence and skills (Atay, 2005; Byram, 2012; Hişmanoğlu, 2013), and curriculum and coursebook designs need to be done accordingly by implementing authentic communicative tasks embracing cultural awareness (Beresova, 2015; McConachy, 2008; Lo Bianco, Crozet & Liddicoat, 1999; Pulverness & Tomlinson, 2013), and students should be in a conscious process of growth in their target language (Agudelo, 2007; Prodromou, 1992; Dasli, 2011; Ware & Kramsch, 2005). Within the light of such studies, suggestions regarding the result of this research that might help EFL teachers are given in the next section.

Suggestions

There are some suggestions and implications presented as a result of this study to help English language teachers to develop more effective practices in order to integrate cultural awareness in their classroom. Sometimes culture-based lessons are affected by the prejudices or perceptions of the teachers. Therefore, teachers need to be self- aware of their assumptions and prejudices. School counselors may help with this issue by conducting seminars and workshops for teachers to get to know themselves better. In addition, bonding target and learner cultures is an important step in teaching culture. Teachers need to adopt culturally enriched practices. This can be achieved by creating an equal class environment, respecting diversity, accepting differences (Porto, 2010). Teachers should use democratic education components like encouragement and giving feedback. They should be careful while making confrontations and not to use criticizing language for the students' personalities. They need to emphasize the students' behavior while giving feedback and making confrontations. Basically, teachers should respect the students' individuality and personality.

As Kim (2002) stated, using portfolios and making students discuss equally would provide ideal intercultural learning. EFL teachers may learn about different cultural backgrounds of their students and help them to prepare portfolios to describe the differences and similarities of their culture to their peers. Application of analysis of the critical texts and discourses in EFL classrooms contributes to developing intercultural awareness and a new form of consciousness for the language learning process (Escudero, 2013). Therefore, teachers should conduct a discussion about different cultures and cultural awareness inside the classroom. This method should be adapted to the education level of children. However, teachers can start the discussion

and help students to express themselves at all levels.

The integration of cultural learning with EFL classrooms does not ensure to develop intercultural sensitivity, but it helps to pave the way for exploring diversity and cultural awareness in multicultural communities (Fay, Lytra & Ntavaliagkou, 2010; Galante, 2014; Kourova & Modianos, 2013). Thus, teachers should be aware of their work in EFL classrooms about cultural awareness and help their students to develop this sensitivity and respect for every unique individual. The most important limitation of this study is that there is not any application and implication process for the classroom environment in the examined studies. Furthermore, this study analyzes a limited number of studies about cultural awareness. There is crucial work about cultural and intercultural awareness which paves the way for CEFR and intercultural, pluricultural and plurilingual curriculum in EFL classrooms. Furthermore, cultural awareness is not limited to developing awareness about cultural components in the EFL classroom. However, there are other components while developing cultural awareness such as critical thinking, collaboration, and empathy. Therefore, further research should be done in the field while integrating other components of cultural awareness in order to improve students' and teachers' cultural awareness skills.

Statements of ethics and conflict of interest

"I, as the Corresponding Author, declare and undertake that in the study titled as *"The Role of Cultural Awareness in EFL Classroom"*, scientific, ethical and citation rules were followed; Turkish Online Journal of Qualitative Inquiry Journal Editorial Board has no responsibility for all ethical violations to be encountered, that all responsibility belongs to the author/s and that this study has not been sent to any other academic publication platform for evaluation. "

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Appendix A

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