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## THE EFFECT OF THE DISCUSSION METHOD ON THE "CONDUCTION OF ELECTRICITY" UNIT ON THE ACADEMIC ACHIEVEMENT OF 6<sup>TH</sup> GRADE STUDENTS<sup>1</sup>

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### ABSTRACT

This study was carried out to examine the effect of teaching supported by discussion method on the academic achievement of 6<sup>th</sup> grade science students in the "Conduction of Electricity" unit. The study was prepared in a quasi-experimental model with pretest-posttest control group. The research was conducted in a public village secondary school in Kumlu district of Hatay province in the 2017-2018 academic year. The study was conducted with 35 6<sup>th</sup> grade students, taking into account the convenience sampling method. Experimental and control groups were randomly selected and formed. The conduction unit of electricity was taught with learning methods supported by discussion method in the experimental group and with ordinary teaching in the control group in line with the current curriculum. The application was completed by the researcher in 16 lesson hours. As a data collection tool, the "Conduction of Electricity Achievement Test", for which a validity and reliability study was conducted, was applied to both groups as pre-test and post-test before and after the application. SPSS 25 program was used for data analysis. While analyzing the data, standard deviation, mean, frequency, dependent and independent groups t-tests were analyzed. The findings reveal that the students in the experimental group showed higher academic achievement than those in the control group, and the discussion method contributed to their better understanding of science subjects. In addition, it was observed that the interaction and participation among students increased. These results show that the discussion method can be an effective tool in teaching and enrich science education. This study contributes to research on developing more effective strategies in science teaching.

**Keywords:** Science teaching, discussion method, science achievement.

<sup>1</sup> This article was produced from the first author's master's thesis.

## INTRODUCTION

Education has been the center of attention of societies for centuries. Education is a lifelong process that starts from the moment a person is born and continues until death (Ekiz & Durukan, 2006). The aim of education is to overcome the problems faced by the individual in a logical and rational way and prepare him/her for life (Serin, 2001). Societies modernize over time thanks to education and modern societies emerge. While the indicator of development of societies was industry before, today the indicator of development is information. In other words, when the transition from an industrial society to an information society is made; the need for individuals who are inquiring, creative, curious, innovative, looking for more than one solution to solve a problem has increased. Thus, since the level of development of societies is information, the importance of the development of science and science has increased even more (Türker, 2011).

Education is one of the most important ways to keep up with the changes and innovations that occur with our developing age for the development of the country. Well-educated people who can keep up with the age create the information society (Özden, 2003). Nowadays, students are oriented towards the subjects they consider important for themselves and they are interested in those subjects. Therefore, instead of the traditional teaching approach in which students are static, teaching methods in which students are mobile and active should be used. The role of teachers in the learning process is to guide their students. Students should find the information by researching it themselves, share the information they find with their friends, express their opinions about the accuracy of the information and interact with their friends by taking the opinions of their friends.

Karacaoğlu (2020) grouped teaching methods and techniques into three groups. He gave the name "didactics" to the methods in which students must definitely learn what the teacher conveys and then show all of this knowledge in the exam papers. Methods that improve problem-solving or decision-making skills by asking questions step by step in the learning process, such as discussion methods, are called "Socratic". He called the ways in which the learner takes a lot of responsibility for his own learning "facilitator" methods. Those who plan and design curriculum need to make teachers aware of teaching methods and carefully select those that will benefit student learning outcomes without restricting teacher choice. Teachers are responsible for the effective implementation of teaching and learning ways for best effect. As seen in this grouping, discussion is among the Socratic methods and allows the learner to think, talk, interact and question. The discussion method is a method in which students can learn the information that they have learned incompletely, that they cannot comprehend and understand better by interacting with each other. According to Binbaşıoğlu (1994), the discussion method enables students to comprehend the subjects better, understand them better and interpret them differently.

Discussion is defined in the dictionary as: "Mutual defense of opposing ideas", "To carry out mutually favorable and unfavorable opinions on a subject" (TDK, 2015; Oğuzkan, 1970). In teaching methods, discussion is defined as at least two or more people making inquiries about a specific subject, interacting mutually and expressing their opinions about the subject they question and discuss in order to improve their learning and understanding

(Hess 2004; Dillon, 1995). In the discussions, claims, suggestions, different thoughts and experiences related to the topic are all put forward (Dillon, 1995; Brokkfield & Perskill 1999).

Based on the definitions, it is seen that discussion has a very wide area. Therefore, different classifications have been made about discussion in the researches. We can classify discussion in five different ways according to its purpose. These are discussions for predicting, discussions for questioning, discussions for decision making, discussions for problem solving and discussions for predicting (Hyman & Whitford, 1990). Drake and Nelson (2005) categorized discussion into four different groups: deliberative speeches, debates, recitation, and purposeless speeches. Wilen (1990) categorized discussion into two different groups: reflective discussions and guided discussions.

When lessons are taught with the discussion method, students' self-confidence, civil courage, speaking ability, persuasion skills, and questioning abilities improve (Güven, 2011). According to Ayas et al. (2007), if the lesson is to be taught with the discussion method, we need to pay attention to our actions, behaviors, gestures, mimics and speech. Thus, students can easily say what they think.

There are some techniques in which the discussion method is used. These techniques are panel, forum, buzz group, brainstorming, open session, debate, symposium, group discussion and short-term discussion etc. When we want to use these techniques; the subject we will teach, the readiness of the students, the physical environment of the classrooms, the duration of the lessons can be taken into consideration and the teacher can determine which technique to use and apply it (Tokdemir, 2013). The types of discussion used in schools are generally class discussion and group discussion. In order for the discussion method to be successful, it is necessary to determine the objectives thoroughly, form groups, know time management well and pay attention not to go beyond the subject (Demirel, 2006; Gürdal et al., 2001; Bilen, 1996).

In the research on the discussion method, it has been determined that this method increases the success of the students and increases their interest in the lesson. In addition, the discussion method is a flexible, unstructured and student-centered method that appeals to the student in the best way. Although this situation is not liked by those who defend the traditional education approach, it is a situation that educators who defend Dewey's problem solving views constantly emphasize for democratic education (Hill, 1977). It is stated that if the discussion method is well prepared and cooperated, the activity prepared verbally is more permanent than the reading and writing activity (Alexander, 2004).

Today, students need to become aware of self-directed learning. Different techniques should be used to help students take responsibility for their own learning. Traditional methods lead students to memorization and the information they learn does not become permanent. Today, however, the student comes to the forefront and different techniques and strategies are used for students. One of these methods is the discussion method. But teachers avoid using the discussion method. Some of the difficulties encountered are: the teachers' belief that

they may lose control of the classroom, the fact that students always speak loudly in the classroom, and the belief that students will not understand the subject well with the discussion method (Gall & Gillet, 1980).

In this study, small group discussion, panel, contrasting panel and circle techniques within the discussion method were applied by taking into consideration the class size, the principle of economy, the characteristics of the subject and the application time. The characteristics of the discussion techniques used in the research are as follows.

**Small group discussion:** Small group discussions are a learner-centered technique based on face-to-face interaction, cooperation, and students' explanations and reorganization of their views, which is carried out by dividing the large group into small groups of 4-5 students so that all students in the class can participate effectively in the discussion process (Powell, 1986; Aykaç, 2016). According to Sönmez (1994), small group discussions are called buzz or whisper groups. The class is first divided into groups as Group 22 and Group 44. Thus, students are divided into groups as Group 22, Group 44. Group 44 means that the class is divided into groups of 4 students each and each group discusses the topic for 4 minutes. As a result, the group members have a common opinion about the topic and express their ideas about the topic. In small group discussion, students should speak in whispers (Aykaç, 2016; Erginer, 2016). According to Sönmez (1994), these four conditions must be present in the classroom environment for the implementation of small group discussion:

- The target behaviors to be acquired should be at least at the level of understanding.
- Students should have achieved the target behaviors at the knowledge level of the subject they will discuss. In other words, if the subject to be discussed is at the level of understanding, students should have knowledge of it; if it is at the level of analysis, students should have the prerequisite target behaviors at the level of remembering and understanding.
- There should not be too many students in the class.
- Before starting the discussion, a theater, sketch, panel, a movie, etc. should be presented.

In this discussion, success is achieved by ensuring the participation of all students, eliminating the boredom of the subject, ensuring that the students have sufficient knowledge, using the time effectively, having a good attitude of the leader and making a good planning (Rudduck, 1978; Taşpınar, 2004).

**Panel:** Panel discussions are speeches in which a topic is discussed in front of the audience by people who have expertise on that topic. In the panel discussion technique, students conduct the necessary research and investigations on the given topic or problem and present the information they have obtained (Küçükahmet, 1995). The aim of this technique is to provide a common consciousness and working environment among students. In the panel technique, there is a chairman to manage the discussion. The number of speakers is between 3-6 people. Speakers should sit in a way to see each other and the audience. Each of the speakers discusses different aspects of the subject they have researched and gained expertise in and conveys their

knowledge. The speakers complete their speeches according to the guidance and time given by the panel chair. The chair summarizes and summarizes these speeches. At the end of the panel, the audience can ask questions to the speakers (Oğuzkan, 1970).

**Contrast panel:** The behavior to be gained with the contrast panels is at least at the level of understanding. Students should know the facts, principles and concepts related to the subject and the questions to ask and answer. Before the class is divided into two, a leader is selected and the class is divided into two groups. One group asks questions and the other answers them. After the groups are separated, the groups are given a certain amount of time and asked to prepare questions for the question group and answers for the answer group. At the end of the time limit, questions are asked and answers are received. The teacher should prevent the same student from speaking and going off topic (Toker, 2006).

**Circle technique:** In order for this technique to be applied, the behavior to be achieved must be at a minimum level of understanding and the students must have the necessary knowledge and skills about the subject to be discussed. The number of students is usually around 10 to 15. A leader should be appointed to manage the discussion and control the time, and a secretary and a timekeeper should be appointed to transfer the ideas to paper. Starting from the right of the chairperson, each student is allowed to speak for 2 minutes. The prepared questions are asked one by one to the students lined up in a circle and the speeches are written down by the secretary. Students should be given 1-2 minutes for each question and the main points should be emphasized at the end of the discussion (Oğuzkan, 1970; Küçükahmet, 1995).

When the literature was reviewed, there was no application in which the discussion techniques in the discussion method (contrast panel, panel, small group discussion, circle technique) were used in the "Conduction of Electricity" unit. Contrasting panel, panel, small group discussion and circle technique were selected among the discussion techniques. These techniques were adapted and applied to the "Conduction of Electricity" unit. These techniques were chosen because they are appropriate for the grade level, can be used more easily in the classroom and can be easily applied on students.

### **Research Problem and Sub-Problems**

The main problem of the study was determined as "Do the teaching practices supported by the discussion method have an effect on the academic achievement of the students in the teaching of the 'Conduction of Electricity' unit in the Science course?" The sub-problems of the research are respectively;

1. Is there a statistically significant difference between the academic achievement pre-test scores of the experimental group students who studied the "Conduction of Electricity" unit in the 6<sup>th</sup> grade science course with the discussion method in addition to the existing science program and the control group students who studied with the existing science curriculum?

2. Is there a statistically significant difference between the post-test academic achievement scores of the 6<sup>th</sup> grade science unit "Conduction of Electricity" of the 6<sup>th</sup> grade science course between the experimental group students who studied with the discussion method in addition to the current science program and the control group students who studied with the current science curriculum?
3. Is there a statistically significant difference between the academic achievement pre-test and post-test scores of the experimental group students who studied the "Conduction of Electricity" unit in the 6<sup>th</sup> grade science course with the discussion method in addition to the current science curriculum?
4. Is there a statistically significant difference between the academic achievement pre-test and post-test scores of the control group students who studied the "Conduction of Electricity" unit in the 6<sup>th</sup> grade science course with the existing science curriculum?

### **Importance of Research**

In science courses, theoretical knowledge and theories are mostly emphasized. This causes students to stay away from daily life and consequently have difficulty in finding solutions to the problems they encounter. The skills developed create a perception of the application. In order to break down this negative perception and make the course effective again, students should be made more active in the course based on the constructivist approach, they should be enabled to learn by doing and living and gain experience accordingly, and cooperative learning areas should be created. In this process, the teacher should not be in the position of a manager and get in front of the students, but should be in the position of a guide to facilitate their learning throughout the process. Thus, instead of a monotonous learning environment where only the teacher is at the center, an active learning environment where students are at the forefront will be created.

There are many teaching methods based on the constructivist approach that make the student active, make the student find the center, make the lesson interesting and remove it from monotony, and allow them to gain cooperation and experience. One of these is the "Discussion Method". In the discussion method, students achieve the ability to justify, develop and defend their thoughts. The discussion technique, which develops the ability to learn an incomprehensible subject and problem solving skills, also facilitates cooperative learning. By applying this technique in science lessons, an active learning environment can be created by moving away from lecturing. Thus, students' interest in the lesson is increased and they gain experience. This gives students the opportunity to apply what they have learned in real life based on their learning and problem solving experiences. The main purpose of this research is to examine the factors affecting the academic achievements of 6<sup>th</sup> grade students in science and to evaluate the effect of teaching supported by discussion method, especially in the 'Conduction of Electricity' unit, on these achievements.

### **Limitations**

- 2017-2018 academic year,
- 6<sup>th</sup> grade students studying in a village middle school in Kumlu district of Hatay province,

- MEB textbook as course content,
- 20 lesson hours in 5 weeks for the teaching process,
- Discussion method and the current science curriculum,

### Assumptions

- The following assumptions were adopted in this study.
- The students who participated in this study answered the data collection tool used during the application accurately and sincerely,
- Variables outside the control of the researcher affect all groups at the same level,
- The measurement tool used in the research measures the targeted characteristics in a valid and reliable way,
- Since the control and experimental groups will be taught by the researcher, the researcher's assumptions are that the subjects taught will be realized within the plans prepared for both groups.

### METHOD

In this section, information about the research model, the study group, the implementation of the research, the data collection tools used, the dependent and independent variables and the analysis of the data obtained are given.

In the study, pretest-posttest quasi-experimental research design, one of the quantitative research methods, was used. The pretest-posttest unbalanced group design, which is referred to as the static group pretest-posttest design by Büyüköztürk et al. (2011), is a method that allows the initial status of the groups to be known and the changes that occur over time in the process to be measured and tested.

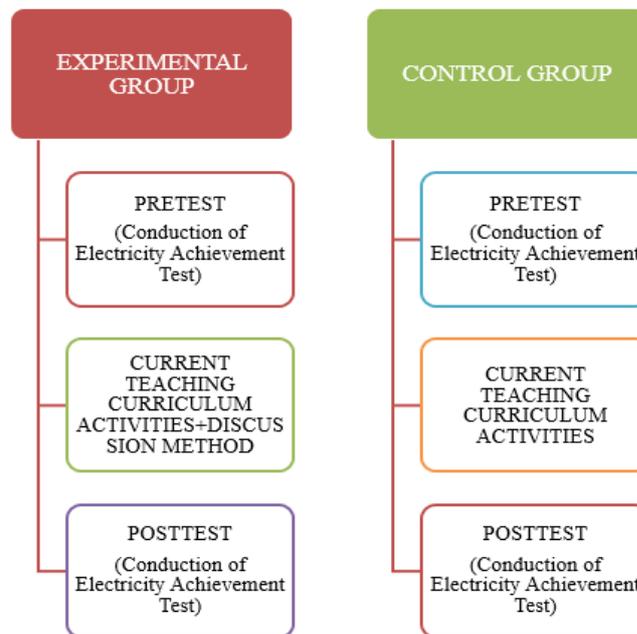


Figure 1. Research model

### The Studying Group

The research population consists of 6<sup>th</sup> grade students in a village secondary school in Kumlu district of Hatay in the 2017-2018 academic year. The sample of the study was selected by convenient sampling method from non-random sampling methods. In convenience sampling, the researcher can easily reach the students in a comfortable way, collect data in a comfortable way, and select individuals or groups to conduct research (Sönmez & Alacapınar, 2011). 6<sup>th</sup> grade students were randomly assigned to experimental and control groups by drawing lots. There were 18 students in the experimental group and 17 students in the control group.

**Table 1.** Data of the Study Group

Groups	Girl	Boy	Total
Experimental Group	12	6	18
Control Group	9	8	17
Total	21	14	35

In the control group, the "Conduction of Electricity" unit was taught with lesson plans prepared with the teaching methods in the current curriculum, while in the experimental group, it was taught with lesson plans prepared with the techniques used in the discussion method applied with the current curriculum.

### Data Collection Tools

The development of the "Conduction of Electricity Achievement Test" was carried out in a fall semester. In the preparation phase of the test, 21 questions belonging to the 6 achievements of the "Conduction of Electricity" unit were prepared by the researcher and reliability and validity studies were carried out. Since the discrimination index of the prepared test was above 0.30, no question was removed.

As a data collection tool, CEAT was administered to both groups before and after the application.

The CEAT was developed by the researchers and the preparation phases of the test are given below:

- For the development of the test, questions were prepared in accordance with the achievements of the 6<sup>th</sup> grade science course of the Ministry of National Education (MEB).
- A total of 21 classical questions were prepared, with at least 3 questions for each achievement area.
- The prepared classical questions were applied on 100 students studying in the 7th grade.
- In line with the answers given, the classical questions were transformed into a multiple-choice test with 4 options.
- This test was shown to science teachers and necessary arrangements were made.
- 100 7th grade students were administered this test again and asked to answer the questions and write their justifications.
- Afterwards, expert opinions were obtained from 4 science teachers, 1 Turkish teacher and 1 faculty member and the test was finalized for reliability study.

- When the achievement test was scored, it was applied in such a way that 1 point was given if the student gave the correct answer at both stages of the test, and 0 point was given in other cases.

After this stage, the test was administered to 100 students. The students were sorted according to their scores for item analysis. In the item analysis, 27% lower and 27% upper groups were selected and necessary procedures were performed. Thus, a 21-question achievement test was obtained.

**Table 2.** CEAT Item analysis results

ITEM NUMBER	Pj	Sj	Rjx
1	0,64	0,14	0,38
2	0,89	0,38	0,53
3	0,91	0,41	0,53
4	0,82	0,31	0,44
5	0,56	0,00	0,97
6	0,58	0,10	0,94
7	0,63	0,14	0,82
8	0,38	0,14	0,71
9	0,88	0,38	0,53
10	0,85	0,34	0,56
11	0,76	0,26	0,47
12	0,85	0,34	0,62
13	0,39	0,10	0,94
14	0,77	0,26	0,47
15	0,37	0,14	0,88
16	0,74	0,24	0,65
17	0,72	0,22	0,62
18	0,50	0,00	0,85
19	0,85	0,34	0,44
20	0,37	0,14	0,65
21	0,80	0,30	0,59

Table 2 shows the standard deviations (Sj), item difficulty indices (Pj) and discrimination indices (Rjx) of the items that make up the CEAT. When we look at the final version of the test, item difficulty indices vary between 0.37 and 0.91. When Table 3.6 is examined, it is seen that there are 8 very easy, 6 easy, 3 medium difficulty and 4 difficult questions in the test.

In parallel with the data obtained, item difficulty, discrimination and KR-20 calculations of the test were made and the following results were obtained.

**Table 3.** CEAT Pilot Study KR-20 and Descriptive Statistics Results

Number of questions	N	$\bar{X}$	sd	KR-20
21	100	14,42	3,41	0,93

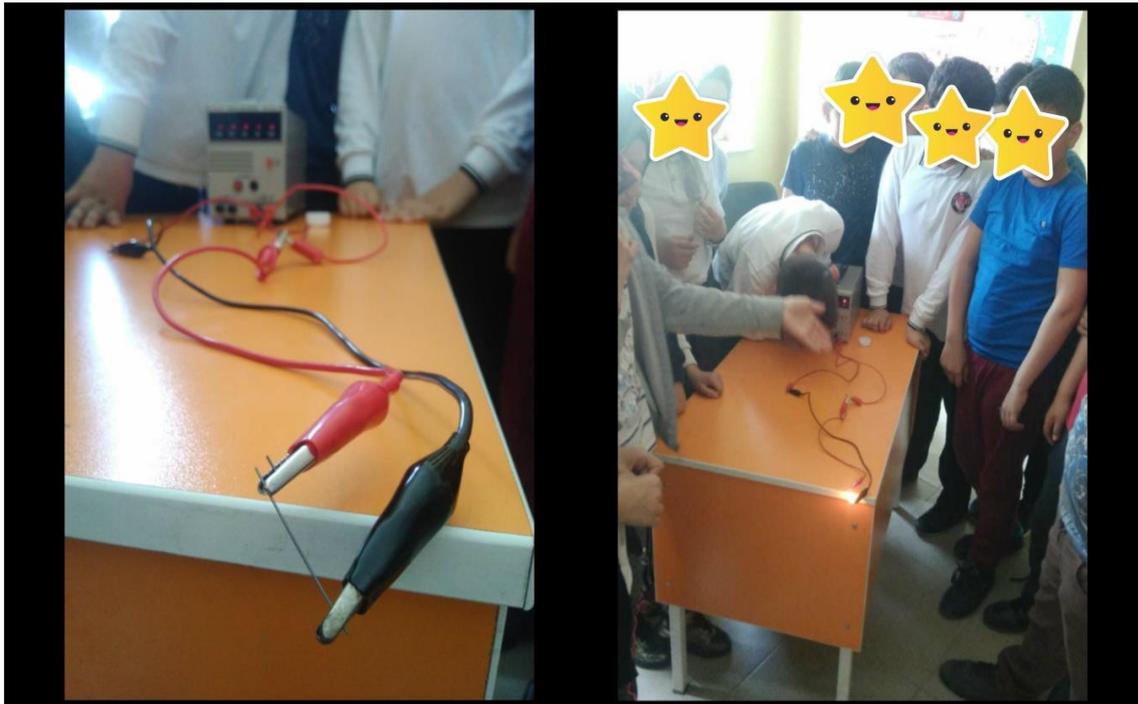
When Table 3 is examined, KR-20= 0,93 was found in the test. This value shows that the test is a reliable test. As a result of the statistical procedures, the test variance was found to be 11.54.

In this study, the achievements foreseen by the curriculum developed in 2018 were applied to the experimental and control groups with different teaching methods. The applied teaching methods are the independent variables of the research. These independent variables are the constructivist teaching method supported by the discussion method in the experimental group and the textbook-based teaching method applied in the control group. The dependent variable in the study was students' academic achievement in science related to the electricity conduction.

The application was carried out in a 5-week program as 2+2 per week, 16 lesson hours for the implementation of the methods and 4 lesson hours for data collection.

One week before the implementation, the experimental group was informed about the discussion method and discussion techniques. In addition, the discussion techniques to be applied were reminded to the students at the beginning of the lesson and information was given. The experimental and control groups were taught by the researcher. Pre-tests were administered two weeks before the beginning of the unit and post-tests were administered immediately after the end of the unit.

The application was made in the control group according to the lesson curriculum prepared in parallel with the unit achievements. At the beginning of the lesson, students were reminded of the information they had previously learned. During the lecture by the researcher, the textbook prepared by the Ministry of National Education (MEB) was used and the activities in the textbook were done by the students. In addition to the textbook, the smart board was utilized and EBA prepared by the Ministry of National Education (MEB) was used. This application lasted 16 hours, 4 hours a week. Photographs of the control group are given below.





**Photographs 1.** Photographs from the Activity Study of the Control Group Students

In the experimental group, the lesson was taught using the techniques of the discussion method within the unit achievements.

In Week 1, small group discussion technique was applied during the lesson in the experimental group and the following achievements were aimed to be acquired by the students.

Achievement 1. "Classifies substances according to their ability to conduct electricity using the electrical circuit he/she designed."

Achievement 2. "Explains the purposes for which the electrical conductivity and insulating properties of substances are used with examples from daily life."

While this topic was being taught, the students were divided into 4 groups. Two of these four groups consisted of 5 students and the other two groups consisted of 4 students. The members of these groups discussed how to design an electrical circuit and designed the circuit with a common decision. The students were able to look at the conductivity of the materials they brought and the materials in the classroom, which were thought to be conductors or insulators, by trying them in the electric circuit they designed. They discussed among themselves the reasons why some materials conduct electricity while others do not. Thus, the materials brought were classified as conductors and insulators. The same application was made in all groups. The groups discussed among themselves where and why conductive and insulating materials are used in daily life. The benefits provided by the conductivity and insulating properties of the materials were understood. Thus, face-to-face interaction and participation of all students was ensured. Photographs of the small group discussion are also given below.



**Photographs 2.** Photographs from the Small Group Discussion in the Experimental Group

In Week 2, the panel technique was applied during the lesson in the experimental group and the following achievement were aimed to be acquired by the students.

Achievement 3. "Predicts the variables on which the brightness of a light bulb in an electrical circuit depends and tests his/her predictions by experimenting."

Before this topic was taught, a total of 4 students, 3 students and 1 chairperson, were assigned to prepare for the topic. These students made their preparations and discussed with the other students, who were the audience group, in front of the chairperson. In the 5th grade, the information about this topic was explained to the audience group and the students were made to remember it. In fact, the students in charge brought an electric circuit and visually demonstrated the variables affecting the brightness of a light bulb. Thus, the group members shared their knowledge about the variables affecting the brightness of a light bulb with both the audience and

the chairperson. At the end of the panel, the audience asked questions that they did not understand. Finally, the chair summarized the topic and ended the panel. Photographs of the panel method are given below.



**Photographs 3.** Photographs from the Panel Application in the Experimental Group

In Week 3, while the lesson was being taught in the experimental group, the contrast panel technique was applied and the following achievements were aimed to be acquired by the students.

Achievement 4. "Predicts the variables on which the brightness of a light bulb in an electric circuit depends and tests his/her predictions by experimenting."

The contrast panel technique was applied on the variables on which the brightness of light bulbs in an electrical circuit depends. Thus, the class was divided into two, a leader was selected and a questioning group and an answering group were formed. The formed groups are given a certain amount of time. During this time, the group that will ask questions is allowed to prepare questions and the group that will answer questions is allowed to formulate answers to the questions that may come. After the given time is over, the group asking questions starts to ask questions and the other group begins to give answers. Thus, the students learned the parts they did not know and did not understand about the subject by doing question-answer. Photographs of the contrast panel method are given below.



**Photographs 4.** Photographs of the Contrast Panel Application in the Experimental Group

In the 4th week, the circle technique was applied during the lesson in the experimental group and the following achievements were aimed to be acquired by the students.

Achievement 5. "Measures the resistance of a conductor by expressing electrical resistance and specifies its value."

Achievement 6. "Realizes that a light bulb is also made of a conductor wire and has a resistance."

In this lesson, the topic of electrical resistance and the fact that a light bulb is made of a conductor wire and has a resistance was covered. When this topic was taught, the circle technique was applied. Before applying the circle technique, the students were seated in a circle and a leader, a secretary and a timer were selected among them. Thus, starting from the right of the leader, each student was allowed to talk about the topic for two minutes. After each student had spoken, all students participated in the lesson. The circle technique was practiced with the leader. When questions were asked and answers were given, the secretary took notes of the questions and answers. Photographs of the circle technique are given below.



**Photographs 5.** Photographs of the Circle Technique in the Experimental Group

#### Data Analysis

Statistical analysis of the data obtained within the scope of the research was carried out using SPSS 25.00 package program. In order to decide which tests to use in the data analysis phase, normality test was performed, extreme values were determined and it was decided to use dependent and independent t tests from parametric tests.

#### FINDINGS

In this part of the study, statistical analysis of the lesson taught with the discussion method and the findings obtained from the research questions are given. In the normality analysis of the data, Shapiro-Wilk test results were examined since the number of samples in both the control and experimental groups was below 29 (Kalaycı, 2016). Analyses related to the test results are shown in Table 4.

**Table 4.** CEAT Shapiro-Wilk Test Results

	Statistic	df	p
Experimental Group pre (CEAT)	,921	18	,132
Control Group pre (CEAT)	,925	17	,182
Experimental Group post (CEAT)	,939	18	,277
Control Group post (CEAT)	,934	17	,253

When Table 4 was examined, it was concluded that the control group pre and post CEAT, experimental group pre and post CEAT, did not negatively affect the normal distribution ( $p>.05$ ), therefore skewness and kurtosis values were examined.

**Table 5.** Skewness and kurtosis coefficients pretest-posttest CEAT result

Scale	Group	Skewness	Kurtosis
CEAT Pretest	Experimental	,119	-,869
	Control	-,657	,616
CEAT Posttest	Experimental	-,285	-,653
	Control	,226	-1,021

According to Kalaycı (2016), if the skewness and kurtosis values are between +3 and -3, the data are considered normally distributed. It is also understood from Table 5 that the data of CEAT are normally distributed. In this study, while analyzing the data, the assumptions for the use of parametric tests were examined and the research problems were analyzed by using appropriate tests after compliance was ensured.

In order to investigate the sub-problem of the research " Is there a statistically significant difference between the academic achievement pre-test scores of the experimental group students who studied the "Conduction of Electricity" unit in the 6<sup>th</sup> grade science course with the discussion method in addition to the existing science program and the control group students who studied with the existing science curriculum?" independent groups t-test was applied and the test results are given in Table 6.

**Table 6.** Independent Groups t-Test Analysis Results of CEAT Pre-Test Scores of Experimental and Control Groups

Groups	N	$\bar{X}$	sd	t	P
Experimental Group	18	7,11	2,026	0,969	0,339
Control Group	17	6,47	1,875		

When the data in Table 6 are analyzed, the mean score of the experimental group was 7.11 with a standard deviation of 2.026, while the mean score of the control group was 6.47 with a standard deviation of 1.875. When these scores were analyzed, it was seen that the average of the experimental group was higher. As a result of the statistical analysis between the two groups, it was seen that there was no statistically significant difference between the pretests of the CEAT ( $t= 0.969$ ;  $p>0.05$ ). According to these findings, the arithmetic averages of the students in both groups are similar.

In order to investigate the sub-problem of the research " Is there a statistically significant difference between the post-test academic achievement scores of the 6<sup>th</sup> grade science unit "Conduction of Electricity" of the 6<sup>th</sup> grade science course between the experimental group students who studied with the discussion method in

addition to the current science program and the control group students who studied with the current science curriculum?" independent groups t-test was applied and the test results are given in Table 7.

**Table 7.** Independent Groups T-Test Analysis Results of the Experimental and Control Group CEAT Posttest

Groups	N	Scores		t	P
		$\bar{X}$	sd		
Experimental Group	18	14,56	3,959	3,233	,003
Control Group	17	10,59	3,242		

When the data in Table 7 are analyzed, the mean score of the experimental group is 14.56 with a standard deviation of 3.959, while the mean score of the control group is 10.59 with a standard deviation of 3.242. When these scores were analyzed, it was seen that the average of the experimental group was higher. When the statistical analysis of the post-tests between the two groups was examined, it was concluded that there was a significant difference in favor of the CEAT experimental group ( $t= 3,233$ ;  $p<0.05$ ). According to the findings obtained, the reason for the increase in the course success of the students in the experimental group after the implementation may be that the students showed continuous active participation with the discussion method applied during the process. The effect size was determined as  $\eta^2= 1,09$ . This indicates a large level of impact.

In order to investigate the sub-problem of the research " Is there a statistically significant difference between the academic achievement pre-test and post-test scores of the experimental group students who studied the "Conduction of Electricity" unit in the 6<sup>th</sup> grade science course with the discussion method in addition to the current science curriculum?" dependent groups t-test was applied and the test results are given in Table 8.

**Table 8.** Dependent T-Test Analysis Results of the CEAT Experimental Group Pre-Test and Post-Test Scores

Test Type	N	$\bar{X}$	sd	t	P
Pretest	18	7,11	2,026	-8,398	,000
Posttest	18	14,56	3,959		

When the data of the experimental group in Table 8 are analyzed, it is seen that the pre-test score was 7.11 with a standard deviation of 2.026 and the post-test score was 14.56 with a standard deviation of 3.959. When these data are analyzed, it is seen that the average post-test score of the experimental group is high. As a result of the statistical analysis, it is seen that there is a statistically significant difference in the direction of the CEAT posttest compared to the CEAT posttest ( $t= -8,398$ ;  $p<0,05$ ). In line with the findings obtained, it was seen that the experimental group, which was taught with the weighing method, increased their course achievement after the application. The effect size was determined as (Cohen' d)  $d= 2,438$ . This indicates a large level of impact.

In order to investigate the sub-problem of the research " Is there a statistically significant difference between the academic achievement pre-test and post-test scores of the control group students who studied the "Conduction of Electricity" unit in the 6<sup>th</sup> grade science course with the existing science curriculum?" dependent groups t-test was applied and the test results are given in Table 9.

**Table 9.** Dependent T-Test Analysis Results of CEAT Control Group Pre-Test and Post-Test Scores

Test Type	N	$\bar{X}$	sd	t	P
Pretest	17	6,47	1,875	-3,896	,001
Posttest	17	10,59	3,242		

When the data of the control group in Table 9 are examined, it is understood that the pre-test score was 6.47, with a standard deviation of 1.875, and the post-test score was 10.59, with a standard deviation of 3.242. When these data are analyzed, it is seen that there is a positive change between the post-test score average of the control group and the pre-test score. In line with the statistical analysis, it was concluded that there was a statistically significant difference between CEAT pretest and posttest ( $t = -3,896$ ;  $p < 0,05$ ). The effect size was determined as (Cohen' d)  $d = 1,603$ . This indicates a large level of impact.

### CONCLUSION and DISCUSSION

This study examined the effect of teaching supported by discussion method in the "Conduction of Electricity" unit on the academic achievement of 6th grade science students. The findings show that the experimental group students have a higher academic achievement than the control group students. In particular, after the application of the discussion method, it was observed that the students in the experimental group understood the science topics better and the interaction between the students increased. These results reveal the potential of the discussion method in teaching practice and show that it can provide a more effective learning experience in science education. Üstünkaya and Savran Gencer (2012) found that discussion techniques increased students' achievement and that there was a significant difference between pre-test and post-test. Çeken and Tezcan (2011) used teacher-centered video presentation and class discussion method in their study and it was seen that these two methods were not effective in increasing student achievement. Sadi Yılmaz et al. (2014) taught the subject of electricity according to the life-based learning approach and found no significant difference between the experimental group and the control group. The method used did not increase student achievement.

Discussion techniques were used in this study. These techniques are panel, contrast panel, small group discussion and circle technique. In the literature search, no research in which these techniques were used together was found. It has been observed that these techniques contribute to students to be more active in the lesson, contribute to students' realization of meaningful learning and increase students' achievement.

When the CEAT prepared for the "Conduction of Electricity" unit was examined, it was concluded that the arithmetic averages of the experimental group students who were taught with the discussion method were higher than the control group students who were taught with the current curriculum. This difference is significant in favor of the experimental group post-test ( $p < .05$ ). The reason for such a situation can be shown as the change in the students' perspectives towards the lesson with the discussion method, their enjoyment of the lesson and the students being more active in the lesson.

It is thought that the application of the discussion method in the "Conduction of Electricity" unit gave the students a different perspective and the discussion method began to be seen as an easier method than it was

thought to be. It is thought that the students' active participation, face-to-face interaction and especially since the narrators were their peers, their achievement increased positively while teaching the "Conduction of Electricity" unit with the discussion method. The results of this study show that discussion methods have a positive impact on the teaching of the 'Conduction of Electricity' unit and increase academic achievement in science. These results suggest that discussion methods remain an effective tool to encourage more active participation in the lesson, deepening understanding, and maintaining in-depth learning. However, analyzes need to further examine these methods across different subject areas and different age groups. Additionally, more work should be done on training teachers to learn how to apply these methods more effectively. In conclusion, this study highlights the possibility of discussion methods to improve teaching practices and science curricula.

Discussion techniques are mostly used in social studies and language education (Kaya, 2021; Doğan & Demir, 2023). In the literature review, it is seen that argumentation is used more in science education (Uluay, 2012; Güler, 2016; Şahin, 2016; İnam & Güven, 2019). Discussion techniques other than argumentation should be used in science education. Aslan and Özyurt (2023) revealed that discussion techniques are one of the most used techniques by teachers, but there are few studies in the literature on the effectiveness of these techniques. Discussion techniques can be easily integrated into methods and approaches such as problem-based learning, project-based learning, STEM, discovery learning strategy, active learning, which are used predominantly in science education. Discussion techniques can be a tool to increase the effectiveness of these methods and approaches. With discussion techniques, 21st century skills such as communication, effective communication, communication, cooperation, knowing when to listen and speak, respecting cultural differences, approaching different ideas and values in an open-minded way, values education, leadership, using body language, guidance, self-criticism, critical thinking can be easily gained. The effects of the discussion method on these skills can be made the subject of research to ensure that our young people, who are the guarantee of our future, gain these skills.

#### **SUGGESTIONS**

- Other discussion techniques such as debate, large group discussion and collegium can also be utilized in science courses.
- In similar studies, different questionnaires etc. can be applied to determine students' social skills, attitudes towards science course and their friends.
- An interdisciplinary environment can be created by associating the discussion technique with other courses.
- Students' opinions can also be obtained by using structured, semi-structured or unstructured interview techniques.
- It can also be used in teaching other subjects in the science course.
- Other alternative measurement tools such as structured grids and concept maps can also be used.

- The sample can be kept wider and more people can be studied.
- When selecting key concepts for the word association test, concepts that are concretely separated from each other should be selected.
- The discussion technique can be used more frequently not only in science courses but also in other courses. In the science course, this method can be used more frequently.

#### ETHICAL TEXT

Since this study was conducted before 2020, ethical permission was not obtained. "This article complies with the journal's writing rules, publication principles, research and publication ethics rules, and journal ethics rules. The responsibility for any violations that may arise regarding the article belongs to the author(s)."

**Author(s) Contribution Rate:** All authors were involved in the conception, design, data collection, interpretation, writing, and critical revision of the manuscript. Therefore, the first author contributed 50% and the second author 50%.

#### REFERENCES

- Alexander, R. (2004). *Towards dialogic teaching rethinking classroom talk. (Second Ed.)*. University of Cambridge/ Dialogos.
- Aslan, H. & Özyurt, M. (2023). Analysis of students' attainment levels of higher order thinking skills through primary school fourth grade science curriculum and implementations. *Turkish Studies - Education, 18(2)*, 379-406. <https://dx.doi.org/10.7827/TurkishStudies.62660>
- Ayas, A. P. Çepni, S., Akdeniz, A. R., Özmen, H., Yiğit, N. & Ayvaci, Ş. (2007). *Kuramdan uygulamaya fen ve teknoloji öğretimi*. (Ed. S. Çepni), Pegem Akademi.
- Aykaç, N. (2016). *Öğretim ilke ve yöntemleri*. Pegem Akademi.
- Bilen, M. (1996). *Plandan uygulamaya öğretim*. Aydan Web Tesisleri.
- Binbaşıoğlu, C. (1994). *Genel öğretim bilgisi*. Kadioğlu Matbaası.
- Brookfield, S.D. & Preskill S. (1999). *Discussion as a way of teaching tools and techniques for university teachers*. Open University Press.
- Büyüköztürk, Ş. (2011). *Sosyal bilimler için veri analizi el kitabı istatistik, araştırma deseni, SPSS uygulamaları ve yorum (15. Baskı)*. Pegem Akademi
- Çeken, R. & Tezcan, R. (2011). The effects of teaching the physical and chemical changes using video and discussion teaching techniques on success levels of the 7 grade students, *Kastamonu Education Journal, 19(1)*, 221-228.
- Demirel, Ö. (2006). *Öğretimde planlama ve değerlendirme, öğretme sanatı*. Pegem Yayıncılık.
- Dillon, J. T. (1995). *Using discussions in classrooms*. Open University Press.

- Doğan, Z., & Demir, S. (2023). The contribution of student roles in small group discussions to language skills. *Educational Academic Research*, (49), 48-62.
- Drake, F. D & Nelson L. R. (2005). *Engagement in Teaching History Theory and Practises for Middle and Secondary Teachers*. Pearson Merrill Prentice Hall.
- Ekiz D. & Durukan H. (2006). *Eğitim bilimine giriş*, Lisans Yayıncılık.
- Erginer, E. (2016). *Öğretim ilke ve yöntemleri uygulamalı bir çalışma*. Pegem Akademi.
- Gall, M. D., & Gillet, M. (1980). The discussion method in classroom teaching. *Theory into Practice*, 19, 98–103.
- Güler, Ç. (2016). *Fen laboratuvarı derslerinde kullanılan "argümantasyon tabanlı bilim öğrenme" yaklaşımının, fen bilgisi öğretmen adaylarının akademik başarılarına etkisi ve yaklaşım hakkındaki görüşleri* [Yayımlanmamış Yüksek Lisans Tezi]. Akdeniz Üniversitesi Eğitim Bilimleri Enstitüsü.
- Gürdal, A., Şahin, F. & Çağlar, A. (2001). *Fen öğretimi: İlkeler, stratejiler ve yöntemler*. Marmara Üniversitesi Yayınları.
- Güven, M., Çubukçu, Z., Taşdemir. M., Güven, M., Babadoğan, C., Oğuz, A. & Aybek, B. (2011). *Öğretim ilke ve yöntemleri* (Ed. Bilal Duman). Anı Yayıncılık.
- Hill, WM. F., (1977). *Learning thru discussion guide for leaders and members of discussion groups*, Sage Publications.
- Hyman R.T. & Whitford, E.W. (1990). *Strategic discussion for content area teaching*. In Wilen W. William (Ed.) *Teaching and learning trough discussion the theory, research and practise of the discussion method* (pp: 127-147). Charles C. Thomas Publisher.
- İnam, A., & Güven, S. (2019). Analysis of experimental studies using argumentation method: A meta-synthesis study. *The Journal of International Lingual Social and Educational Sciences*, 5(1), 155-173.
- Karacaoğlu, Ö. C. (2020). *Eğitimde program geliştirme*. Nobel Akademik Yayıncılık
- Kaya, İ. F. (2021). *Sosyal bilgiler dersinde tartışma tekniklerinin akademik başarıya etkisi* [Yayımlanmamış Yüksek Lisans Tezi]. Niğde Ömer Halisdemir Üniversitesi.
- Küçükahmet, L. (1995). *Öğretim ilke ve yöntemleri*, Gazi Büro Kitabevi.
- Oğuzkan, T. (1970). *Grup münakaşası el kitabı*. Ülkü Yayınları.
- Özden, Y. (2003). *Öğrenme ve öğretme*. Pegem Yayıncılık.
- Powell, J. P. (1986). "Small group teaching methods in higher education," in *teach thinking by discussion* (Ed: Donald Bligh), pp: 26-37, *The society for researh into higher education*. Published by SRHE and NFER-NELSON.
- Rudduck, J. (1978). *Learning through small group discussion, research into education monographs*, SRHE, University of Surrey.
- Sadi Yılmaz, S., Othan, O. & Cantimur, E. (2014). Yaşam temelli öğrenme yaklaşımına göre elektrik, madde ve ısı konularının işlenmesinin öğrenci başarısına etkisi. *Kafkas Eğitim Araştırmaları Dergisi*, 1(3), 41-49.
- Şahin, E. (2016). *Argümantasyon tabanlı bilim öğrenme yaklaşımının üstün yetenekli öğrencilerin akademik başarılarına, üstbilmiş ve eleştirel düşünme becerilerine etkisi* [Yayımlanmamış Doktora Tezi]. Gazi Üniversitesi.
-

- Serin U. (2001). *Öğrencilerinin fen bilimlerine yönelik tutumlarının bazı değişkenler açısından karşılaştırılması [Yayımlanmamış Yüksek Lisans Tezi]*. Dokuz Eylül Üniversitesi.
- Sönmez, V. & Alacapınar, F. (2011). *Örneklendirilmiş bilimsel araştırma yöntemleri*. Anı Yayıncılık.
- Sönmez, V. (1994). *Program geliştirmede öğretmen el kitabı* (4. baskı). Pegem Yayıncılık.
- Taşpınar, M. (2004). *Kuramdan uygulamaya öğretim yöntemleri*. Nobel Yayın Dağıtım.
- Tokdemir, M. A. (2013). *Ortaöğretim tarih dersinin öğretiminde tartışma yöntemine ilişkin öğretmenlerin görüş ve uygulamaları: Ankara ili örneği [Yayımlanmamış Doktora Tezi]*. Gazi Üniversitesi.
- Toker, M. M. (2006). Aktif Öğrenme. URL:<http://www.geocities.com/egitimcilersitesi/eoaktifogrenme1.Htm> (Erişim Tarihi: 01.01.2018).
- Türker E. (2011). *Bilimsel süreç becerileri yaklaşımının model kullanılarak uygulanmasının öğrencilerin başarılarına, bilimsel süreç becerilerinin gelişimine ve motivasyonlarına etkisi [Yüksek Lisans Tezi]*. Karadeniz Teknik Üniversitesi.
- Uluay, G. (2012). *İlköğretim 7. sınıf fen ve teknoloji dersi kuvvet ve hareket konusunun öğretiminde bilimsel tartışma (argümantasyon) odaklı öğretim yönteminin öğrenci başarısına etkisinin incelenmesi. (Yayımlanmamış Yüksek Lisans Tezi)*. Kastamonu Üniversitesi.
- Üstünkaya, I. & Savran Gencer, A. (2012). İlköğretim 6.sınıf seviyesinde bilimsel tartışma (argumentation) odaklı etkinliklerle dolaşım sistemi konusunun öğretiminin akademik başarıya etkisi, X. *Ulusal Fen ve Matematik Eğitimi Kongresi..*
- Wilens, W. W. (1990). *Forms and phases of discussion. In Wilens W. William (Ed.) Teaching and learning through discussion the theory, research and practise of the discussion method (pp.3-25)*. Charles C. Thomas Publisher.