Investigation of the Effect of Teaching The Sixth Class Electricity Transmission Unit with REACT Strategy on Academic Success of Students

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Many studies are conducted to increase people's academic success. The effects of the teaching strategies and techniques implemented in the class on the school performance of the individual are scientifically examined. With the data got from the course, the necessary services are provided so as to increase the individual's study success. This study inspected the consequence of the REACT strategy and coursework on student academic performance. A quasi-experimental plan with control team was implemented in this study. In this research's sample, 32 students are studying in branch 6 of a secondary school in a territory of Sakarya in the 2021-2022 education year. The study used the 6th Grade Science Class 7th Unit Research Test developed by the researcher for a data collection device. The statistical program SPSS was conducted for data analysis. Pre-test, retention test, post-test, also delayed retention test were conducted to both groups in the study. While teaching with lesson plans according to the REACT strategy was carried out for 3 weeks in the experimental team; on the control team side, the lessons were conducted with lesson plans consistent with the current curriculum. When the data acquired was evaluated, it was defined that there was no statistically notable difference in the control and experimental teams's pupils' pre-test points, and that there was a statistically meaningful difference in the post-test, retention test also delayed retention test points in benefit of the experimental team

Keywords: Science, REACT strategy, transmission of electricity, academic success

INTRODUCTION

Humans have always tried to continuously maintain their development. In the early days, human evolution continued with hunting, ensuring individual security, and adapting to cave life. Some solutions have been progressed for this, such as crafting stone and iron tools, weapons from different mines or plants, finding different methods of tilling the soil, and crafting farming tools based on cave walls. In the following processes, humanity has brought many innovations in the adventure of self-development. In our time, with the boosts in technology and science, people have developed new methods to solve their needs. Rapid changes in technology and science, changing human and social needs, innovations and developments in theories and approaches to learning and teaching have also directly impacted the roles expected of individuals (National Education's Ministry (MEB), 2018). In our country, the National Education's Ministry updates the curriculum at regular intervals to ensure that people accustom to the rapidly developing science and technology. One of the updates made is a constructivist approach that was reinforced in the science curriculum beginning in the 2004–2005 academic period. Although this curriculum did not reject other learning theories, it emphasised the constructivist learning approach(MEB, 2005).

The constructivist approach is an method to learning in which the pupil is the center, the teacher is the guide, and the information is internalized giving it structure or making sense in the mind. While the constructivist approach is effective in assimilating knowledge into science courses, making it meaningful, or ensuring the sustainability of knowledge, it is not very successful in translating knowledge gained in the classroom into science due to deficits encountered by practitioners in daily life. This deficiency is covered by the effective use of context-based learning based on constructivism in classroom practice. Context-based learning is about making sense of concepts in students' minds by relating the concepts to everyday life. The REACT strategy; conversely, is a strategy depend on based of context learning. CORD (The Development and Occupational Research Centre) provided the REACT strategy by the professional research and development institution as part of a context-based learning approach (Karamustafaoğlu & Tutar, 2018). The REACT strategy is an approach that includes the steps 'Make connections', 'Gather experience', 'Practice', 'Work with the group' and 'Transfer' and is accomplished using the initial of the English equivalents of these steps(Crawford, 2001).

According to Navarra (2006), the REACT strategy

• attach importance to advance information,

• Allow alternative concepts to be translated into scientific knowledge during the course, helping to unite concepts, themes or achievements and contexts,

• give the opportunity to gain experience,

• provide the possible choice to put knowledge into hand on activities,

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• it is a didactic strategy that allows applying what has been received in different context and in different areas.

Studies on REACT strategy are increasing regularly. When the studies are reviewed, there are studies that examine the academic achievement of students with REACT strategy (Tatlı & Bilir 2021; Keleş & Dede, 2020). However, there is no research examining in which direction the processing of the 6th grade "Transmission of Electricity" unit with the REACT strategy affects the academic achievement of the students in the lessons. This article aims to fill this gap in the field.

Purpose of the Research

The research's purpose is to look into the scores of the implement of the REACT strategy on the academical achievements of pupils in the Electrical Conduction, a unit of the science lesson of the 6th grade.

Problem Statement of the Research

This research's problem arguament: "Does teaching the 6th grade unit "Electricity Transmission" with the REACT strategy have an effect on the pupils' academic achievement, the retention and delayed retention?"

Sub-problems of the Research

In this research, the average points of the experimental team, whose lessons were exercised with the strategy of REACT, the control team, whose lessons were taught with traditional methods, were analyzed. Consequently, the research's sub-problems are listed below.

1. Are the average FBASYÜAT pre-test points of the teams notable different from each other?

2. Are the averages of the FBASYÜAT post-test points of the teams notable different from each other?

3. Are the average FBASYÜAT retention test points of the teams notable different from each other?

4. Are the average of the FBASYÜAT delayed retention test points of the teams notable different notable from each other?

5. Are the averages of the FBASYÜAT post, pre-tests scores of the team taught with the REACT strategy notable different from each other?

6. Are the averages of the FBASYÜAT post-test also retention test points of the team taught with the REACT strategy notable different from each other?

7. Are the average points of the FBASYÜAT retention test also the delayed retention test of the team taught with the REACT strategy notable different from each other?

8. Are the averages of the FBASYÜAT post, pre-tests scores of the team taught with the traditional method notable different from each other?

9. Are the average scores of the FBASYÜAT retention and post-tests of the team taught with the traditional method notable different from each other?

10. Are the average scores of the FBASYÜAT retention test also the delayed retention test of the team taught with the traditional method notable different from each other?

METHOD

In this part, there are research's model, research's working group, data collection device and data analysis.

Research Design

In this investigation, before and after the application, a quasi-experimental method was implemented to the students, in which the experimental team and the control team were included((Frankel & Wallen, 1996)

Participants

The participants of this research, 32 students were studying in the school year of 2021-2022 at a school of secondary in a area of Sakarya.

Data Collection Tool

In this research, which used the control team model and pretest-posttest, one of the quasi-experimental methods, the "Science Class 7th Grade 6th Grade Unit Research Test" developed by the researcher (FBASYÜAT) and the teaching materials are used as quantitative data collection devices. . The multiple choice test called FBASYÜAT consists of 28 questions. During the development of FBASYÜAT, a first class and unit selection was made. In conclusion of the investigation executed in this regard, the 6th grade was selected as a class and the unit "Transmission of electricity" as a unit. Based on the science course curriculum of the Education and Discipline Committee of the National Education's Ministry, the performances of the "Electricity Transmission" unit of the sixth grade science course were studied, and the researcher prepared a draft of the FBASYÜAT with 30 questions according to the outcomes of the unit. To verify of FBASYÜAT's validity and reliability, three science teachers who are experts in their occupation, two academics who are their occupation's experts, and one Turkish professor who is an expert in his occupation, were sent. Experts have determined that the FBASYÜAT questions relate to the acquisition of the five acquisitions in the sixth grade Electricity Transmission unit. Accordance with data acquired from the experts, some content changes were made to the seven questions. Moreover, based on the evidences received from the experts, two questions were eliminated from the performance test and two more were added in their place. The added questions were returned to experts in the field. Accordance with the information acquired from the experts, FBASYÜAT remained at 30 questions. The FBASYÜAT pilot application, which passed the review, was applied to 332 seventh grade students in eight different schools who were teaching the power line unit in their science class. To analyze 30 questions' validity and reliability in the pilot application, questions' indices' item of difficulty and discrimination were calculated using the Tests of Achievement Test Analysis Program (TAP). As a consequences of the analysis, two FBASYÜAT questions were eliminated from the test. Therefore, in the final version of FBASYÜAT, there are 28 questions. The item difficulty index (mean probability of choosing correctly) of 28 questions was calculated to be 0.477, and the item discrimination index's average was calculated to be 0.386. The FBASYÜAT's KR-20 reliability coefficient was detected at 0.762. These values show that the test's difficulty's grade, which consists of 28 questions, is medium fo the students and the level is high.

Data Analysis

During the research, data was checked conducting SPSS (Social Sciences's Statistical Package) 24 application packages. In the test data's statistical analysis from the control and experimental teams, the significance's degree between the variables was expressed as 0.05. To find out whether the results of the pretest, posttest, durability test, and delayed durability test given to pupils in the experimental and control teams produced the desired degree of within-group and between-group change, independent samples test of t and paired samples test of t were executed.

FINDINGS

In this section, the findings of the study are presented.

First Sub-Problem's Results

The research's first sub-problem is "Are the average FBASYÜAT pre-test points of the teams notable different from each other?" To acquive the first sub-problem's answer, the FBASYÜAT pre-test values of the pupils in the teams were examined.

Mean values of the pupils's pre-FBASYÜAT points in the both teams were calculated. The teams' pupils' FBASYÜAT points mean values are exhibited in the Figure 1.
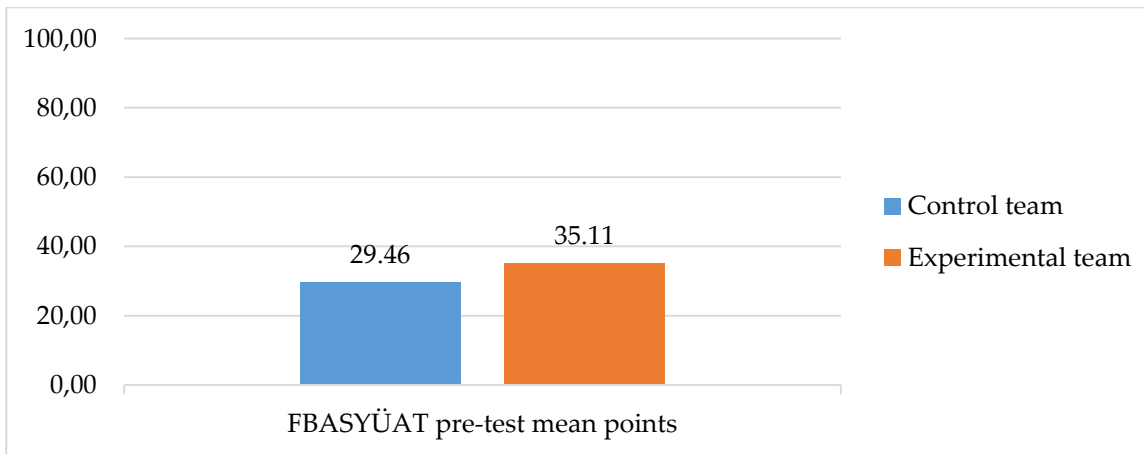
Figure 1. Arithmetic Mean of FBASYÜAT Pre-test Points

In the Figure 1 it is displayed that the pupils's mean pretest points in the control team is 29.46 and the pupils's mean pre-test point in the experimental team is 35.11. As a consequences of the data acquired, it turns out that the average points of pupils in the teams of the pre-tests are in proximity to each other. From first figure it is clear that teams are similar.

The normality of the FBASYÜAT pre-test scores's average values of teams was examined. The normality test's outcome associated with the FBASYÜAT pretest, pupils' the mean points in the both teams displayed in the Table 1.

Table 1. Normality Test Results Related to Averages of FBASYÜAT Pre-Test Scores

		Kolmogorov-Smirnov			Shapiro-Wilk		
Test	Team	Statistic	sig	df	Statistic	Sig.	df
Pre	Control	.188	.159	15	.895	.079	15
	Experimental	.195	.086	17	.946	.398	17

Looking the Table 1, it can be indicated that the pre-test results's mean values of both teams have a normal distribution (sig.>0.05).

The variance's homogeneity of the mean assesses of the results of the FBASYÜAT pre-test of the pupils in the both teams was verified. The Levene test scores related to pupils's the mean of the previous FBASYÜAT test scores in the two teams are exhibited in the Table 2.

Table 2. Levene Test Results Related to the Averages of FBASYÜAT Pre-Test Points

		Levene statistic	df1	df2	Sig.
Test of pre	Based on mean	.254	1	30	.618

Examining the Table 2, the significance value (p) determined by Levene's test for the pre-test was 0.254. Thus, the variances of the groups for the pretest variable were considered equal (sig.>0.05).

Unrelated samples' t tests' results, carried out to determine if the teams' pupils' pre-test points' mean assesses, are exhibited in the Table 3.

Table 3. Results of the Unrelated Samples' t Test Regarding the Means of the FBASYÜAT Pre-Test Scores

Test	Team	N	Mean	Std. Deviation	t	df	Sig.
Pre	Control	15	29.4667	11.19864	-1.384	30	.177
	Experimental	17	35.1176	11.81039			

Looking at the Table 3, it is noticeable that there is no notable difference between the pupils's mean points in the two pretest teams (t= -1.384; sig.>0.05). Namely, it can be specified that the levels of preparation of the pupils in the both teams are similar.

Second Sub-problem's Results

The research's second sub-problem is, "Are the averages of the FBASYÜAT post-test points of the teams notable different from each other?" The pupils's FBASYÜAT post-test results in the control and experimental teams were analyzed to discover the answer to the second sub-problem. To get the second sub-problem's answer, the FBASYÜAT post-test values of the pupils in the teams were examined.

Pupils's mean values of the post-FBASYÜAT points in the both teams were calculated. Pupils's mean values of the post-test FBASYÜAT points in the teams are exhibited in the Figure 2.
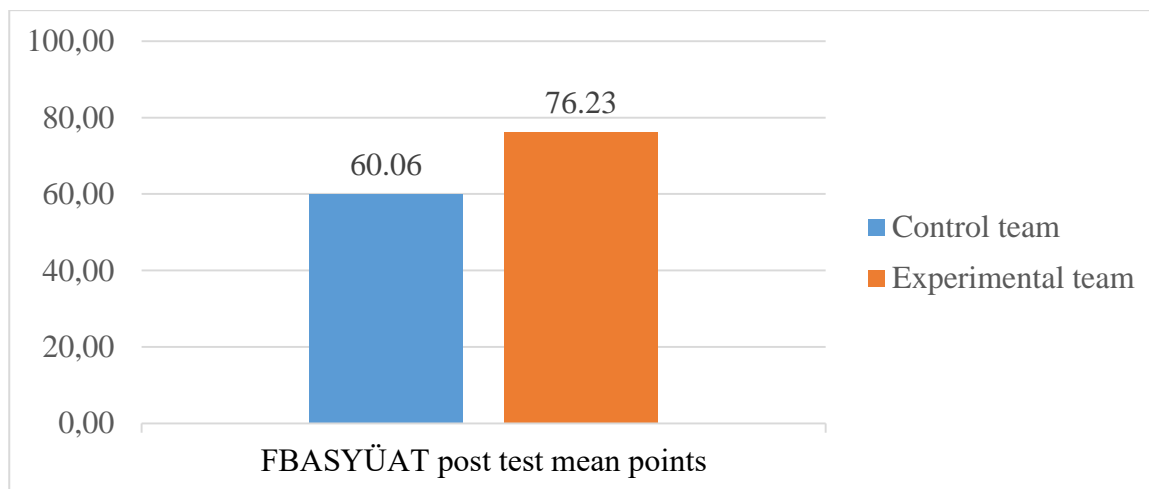

Figure 2. Arithmetic Mean of FBASYÜAT Post-test Points

In the Figure 2 it is demonstrated that the pupils's post-test point mean in the control team is 60.06 and the pupils's post-test point mean in the experimental team is 76.23. As a consequences of the data acquired, it turns out that the average points of pupils in the teams of the post-tests are not in proximity to each other. From second figure it is clear that teams are not similar.

The normality of the average assesses of the post-test FBASYÜAT points of teams was examined. The normality test's outcome associated with the FBASYÜAT post-test, the pupils's mean points in the both teams are exhibited in the Table 4.

Table 4. Normality Test Results Related to the Averages of FBASYÜAT Post-Test Points

		Kolmogorov-Smirnov			Shapiro-Wilk		
Test	Team	Statistic	df	Sig.	Statistic	df	Sig.
Post	Control	.134	15	.200	.972	15	.888
	Experimental	.167	17	.200	.941	17	.327

Table 4 shows that the average results of the post-test assesses of both teams have a normal distribution. (sig.>0.05).

The variance's homogeneity of the of the mean assesses of the results of the pupils's the FBASYÜAT post-test in the both teams was verified. The Levene test points related to the mean of the previous FBASYÜAT test scores of the pupils in the two teams are exhibited in the Table 5.

Table 5. Levene Test Results Regarding the Averages of FBASYÜAT Post-Test Points

		Levene statistic	df1	df2	Sig.
Post	Based on Mean	.440	1	30	.512

Examining the Table 5, the significance value (p) determined by Levene's test for the post-test is 0.440. Thus, the variances of the groups for the post-test variable were considered equal (sig.>0.05).

The t-test for unrelated samples's outcome, carried out to found out if the pupils's mean values of the post-test points in the teams, called control and experiment, according to the team, are exhibited in the Table 6.

Table 6. T-Test Results for Unrelated Samples Regarding Whether the Means of the FBASYÜAT Post-Test Points Changed According to the Groups

Test	Team	N	Mean	Std. Deviation	t	df	Sig.
Post	Control	15	60.0667	15.39233	-3.266	30	.003
	Experimental	17	76.2353	12.60223			

Looking at the Table 6, it is clear that there is noteworthy difference between the pupils's mean points in the two post-test teams (t= -3.266; sig.< 0.05). Namely, it can be said that the participans of the experimental team have a higher conceptual knowledge of the sixth grade "conduction of electricity" compared to the control team's pupils.

Third Sub-problem's Results

The research's third sub-problem is, "Are the averages of the FBASYÜAT retention test points of the teams notable different from each other? The control and experimental teams's pupils' FBASYÜAT retention test

results were analyzed to detect the reply to the third sub-problem. To get the third sub-problem's answer, the FBASYÜAT retention test values of the pupils in the teams were examined.

The pupils's mean values of the retention FBASYÜAT in the both teams were calculated. The pupils's mean values of the retention test FBASYÜAT points in the teams are demonstrated in the Figure 3.
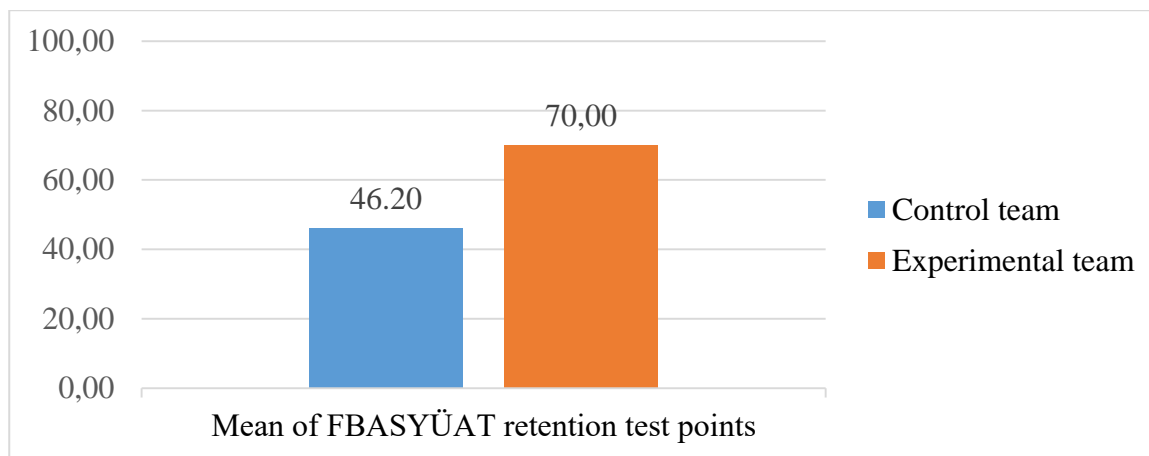

Figure 3. Arithmetic Mean of FBASYÜAT Retention Test Points

In the Figure 3 it is demonstrated that the pupils's retention test point mean in the control team is 46.20 and the pupils's post-test point mean in the experimental team is 70.00. As a consequences of the data acquired, it turns out that the average points of pupils in the teams of the retention tests are not in proximity to each other. From third figure it is clear that teams are not similar.

The normality of the average assesses of the retention test FBASYÜAT points of teams was examined. The normality test's outcome associated with the FBASYÜAT retention test, the pupils's mean points in the both teams are demonstrated in the Table 7.

Table 7. Normality Test Results Related to Averages of FBASYÜAT Retention Test Points

	Team	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Retention test	Control	.132	15	.200	.945	15	.454
	Experimental	.156	17	.200	.950	17	.454

Looking the Table 7, it can be declared that the mean scores of the retention test consequences of both teams have a normal distribution (sig.>0.05).

The variance's homogeneity of the mean assesses of the consequences of the pupils's FBASYÜAT retention test in the both teams was verified. The Levene test points related to the pupils's mean of the FBASYÜAT retention test points in the two teams are demonstrated in the Table 8.

Table 8. The Levene Test Results Related to the Averages of the Students' FBASYÜAT Retention Test Points

		Levene statistic	df1	df2	Sig.
Retention test	Based on mean	2.297	1	30	.140

Examining the table 8, the significance value (p) determined by Levene's test for the retention test is 0.140. Thus, the variances of the groups for the retention-test variable were considered equal (sig.>0.05).

The t-test for unrelated samples's outcome, carried out to found out if the mean worths of the retention test points of pupils in the both teams are exhibited in Table 9.

Table 9. Unrelated Samples' T-Test's Results

Test	Team	N	Mean	Std. deviation	t	df	Sig.
Retention test	Control	15	46.2000	18.27645	-4.200	30	.000
	Experimental	17	70.0000	13.69306			

Looking at the Table 9, it is obvious that there is noteworthy difference between the pupils's mean points in the two retention test teams (t= -4.200; sig.< 0.05). Namely, it can be defined that the retention of the unit "Transmission of Electricity" of 6th grade of the pupils of the experimental team is at a higher level than the control team's pupils.

Fourth Sub-problem's Results

The research's fourth sub-problem is "Are the average of the FBASYÜAT delayed retention test points of the teams notable different notable from each other?" To acquire the fourth sub-problem's answer, the FBASYÜAT delayed retention test values of the pupils in the teams were examined.

Mean values of the pupils's the delayed retention FBASYÜAT points in the both teams were counted. The mean worths of the pupils's the delayed retention test FBASYÜAT points in the teams are illustrated in the Figure 4.
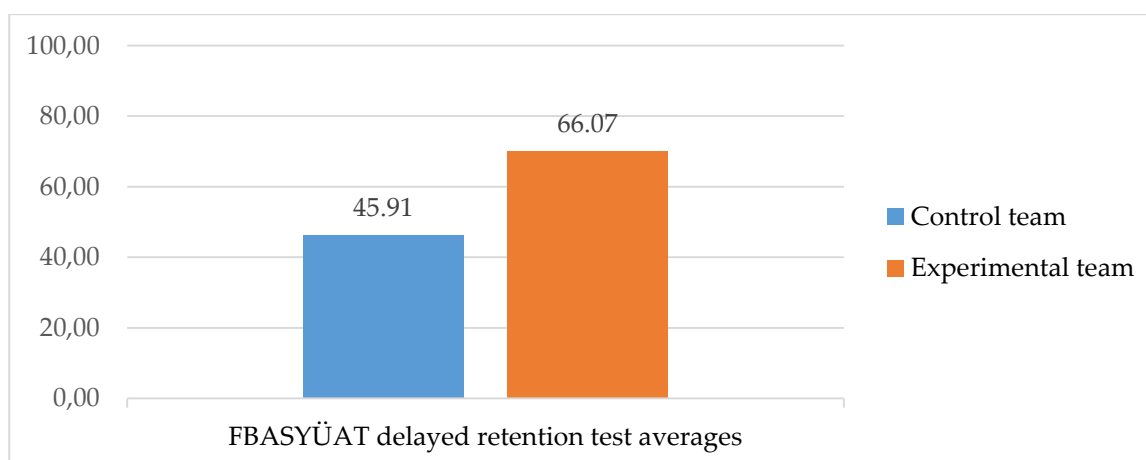

Figure 4. Arithmetic Mean of FBASYÜAT Delayed Retention Test Points

In the Figure 4 it is shown that the pupils's mean delayed retention test point in the control team is 45.91 and the pupils's the mean post-test point in the experimental team is 66.07. As a consequences of the data acquired, it turns out that the average points of pupils in the teams of the delayed retention tests aren't close to each other. From fourth figure it is clear that teams are not similar.

The normality of the average assesses of the delayed retention test FBASYÜAT points of both teams was examined. The normality test's outcome associated with the FBASYÜAT delayed retention test, the pupils's mean points in the both teams are illustrated in the Table 10.

Table 10. Results of the Normality Test Related To The Data of the FBASYÜAT Delayed Retention Test

		Kolmogorov-Smirnov			Shapiro-Wilk		
	Team	Statistic	df	Sig.	Statistic	df	Sig.
Delayed retention test	Control	.125	15	.200	.978	15	.959
	Experimental	.205	17	.070	.952	17	.530

Looking the Table 10, it can be stated that the mean assesses of the delayed retention test consequences of both teams have a normal distribution (sig.>0.05).

The variance's homogeneity of the mean assesses of the consequences of the FBASYÜAT delayed retention test of the pupils in the both teams was verified. The Levene test points related to the pupils's mean of the FBASYÜAT retention test points of in the two teams are demonstrated in the Table 11.

Table 11. The Levene Test Results Related to the Averages of the Pupils' FBASYÜAT Delayed Retention Test Points

		Levene istatistik	df1	df2	Sig.
Delayed retention test	Based on mean	1.624	1	28	.213

Examining the Table 11, the significance value (p) determined by Levene's test for the delayed retention test is 0.213. Thus, the variances of the groups for the delayed retention-test variable were considered equal (sig.>0.05).

The t-test for unrelated samples's outcome, carried out to define if the pupils's mean values of the delayed retention test points in the both teams are exhibited in the Table 12.

Table 1 . Unrelated Samples t-test Results Related to FBASYÜAT Delayed Retention Test Data

Test	Team	N	Mean	Std. Deviation	t	df	Sig.
Delayed retention test	Control	15	12.86	5.829	-3.000	28	.006
	Experimental	17	18.50	4.457			

Looking at the Table 12, it is obvious that there is noteworthy difference between the pupils's mean points in the two delayed retention test teams (t= -3.000; sig.< 0.05). Namely, it can be said that the delayed retention of the unit "Transmission of Electricity" of 6th grade of the pupils of the experimental team is at a higher level than the control team's students.

Fifth Sub-problem's Results

The research's fifth sub-problem is "Are the averages of the FBASYÜAT pre and posttest points of the team taught with the REACT strategy notable different from each other?" To acquire the fifth sub-problem's answer, the FBASYÜAT pre-test and post- test assesses of the experimental team's pupils were examined.

Mean values of the FBASYÜAT pre and post-tests points of the team's pupils were computed. The mean assesses of the FBASYÜAT pre and post- tests points of the team's pupils are shown in the Figure 5.
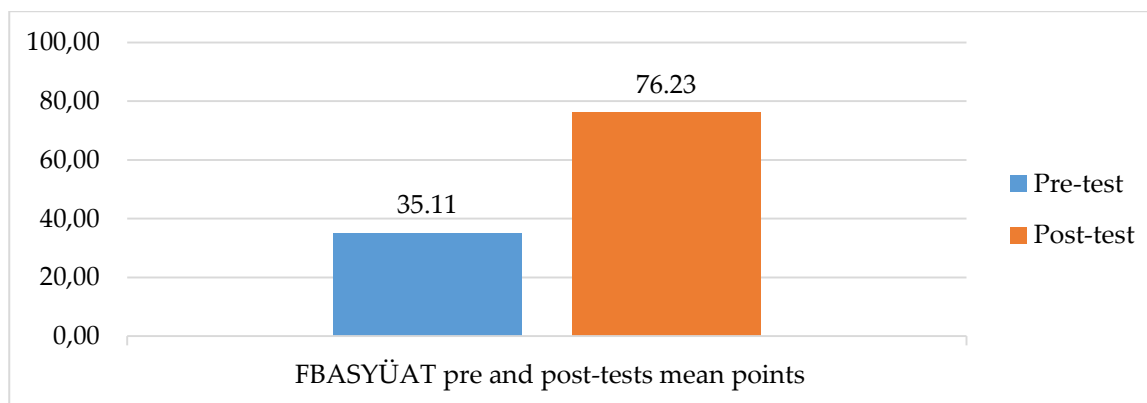

Figure 5. The Arithmetic Mean of the Team's FBASYÜAT Post and Pre-test Points

In the Figure 5 it is exhibited that the mean pre-test points of the pupils 35.11 and the mean post-test points of the pupils 76.23. As a consequences of the data acquired, it turns out that the average points of pupils in the team of the post and pre-tests are not in proximity to each other. From fifth figure it is obvious that the mean of the post and pre- tests points are not similar.

The normality of the difference between the pupils' post and pre-test points on the FBASYÜAT was examined. The normality test's results of the related to the difference in points before and after the FBASYÜAT test are presented in the Table 13.

Table 13 The Normality Test's Results

	Kolmogorov-Smirnov			Shapiro-Wilk		
Variable	Statistic	df	Sig.	Statistic	df	Sig.
Post and pre-tests difference	.092	17	.200	.976	17	.915

Looking the Table 13, it can be understandable that the difference between the post and pre-tests of the team have a normal distribution according to the Shapiro-Wilk normality test's consequences(n<50, sig.>0.05).

The dependent sample t-test's consequences, which was carried out to define whether the means of the post and pre-tests points of the team's pupils, are shown in the Table 14.

Table 14. Dependent Sample t-Test's Results

Test	Group	N	Mean	Std. Deviation	t	df	Sig.
Post and pre-test	Experimental	17	41.118	13.114	-12.927	16	.000

Looking at the Table 14, it is obvious that there is noteworthy difference between the mean points of the team's pupils (t= -12.927; sig.<0.05). Namely, it can be understandable that the FBASYÜAT pre and post-tests points' average of the experimental team's pupils aren't in proximity to each other.

Sixth Sub-problem's Results

The research's sixth sub-problem is "Are the averages of the FBASYÜAT post and retention tests points of the team taught with the REACT strategy notable different from each other? To acquire the sixth sub-problem's answer, the FBASYÜAT post-test and retention test values of the experimental team's pupils were examined.

Mean values of the FBASYÜAT post and retention tests points of the team's pupils were computed. The FBASYÜAT post and retention tests points' mean values of the team's pupils are shown in the Figure 6.
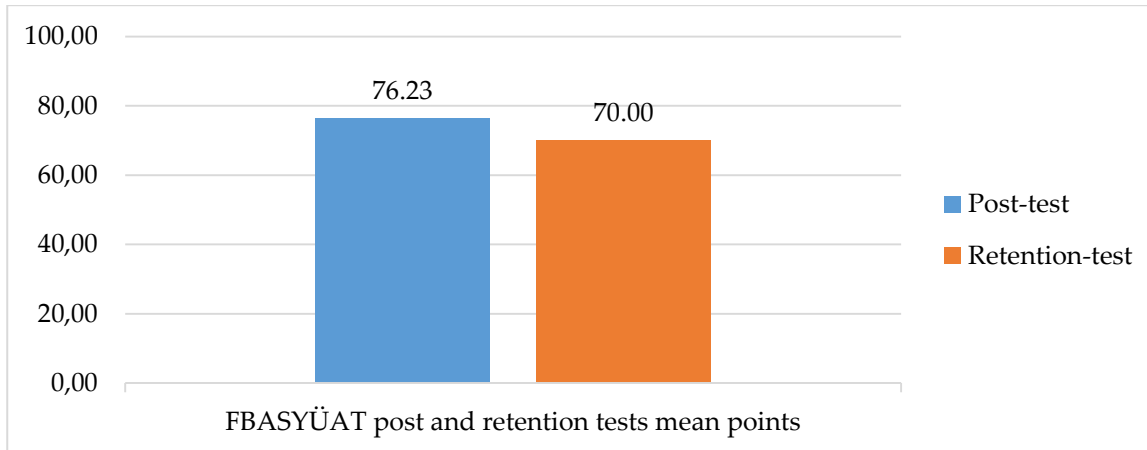

Figure 6. The Arithmetic Mean of the Team FBASYÜAT Post and Retention Tests Points

In the Figure 6 it is demonstrated that the mean post-test points of the pupils 76.23 and the mean retention test points of the pupils 70.00. As a consequences of the data acquired, it turns out that the average points of pupils in the team of the retention and post tests points are in proximity to each other. From sixth figure it is clear that mean of the retention and post tests points are similar.

The normality of the average assesses of the FBASYÜAT post and retention tests points of the team was examined. The outcome of the normality test associated with the FBASYÜAT post and retention tests' mean points of the team's pupils was shown in the Table 15.

Table 15. Normality Test Results Related to the Difference of FBASYÜAT Retention and Post-tests Points of the Team

	Kolmogorov-Smirnov			Shapiro-Wilk		
Variable	Statistic	df	Sig.	Statistic	df	Sig.
Retention and post	.132	17	.200	.942	17	.340

Looking at the table 15, it can be understandable that the mean assesses of the retention and post-tests consequences of the team have a normal distribution according to the Shapiro-Wilk normality test's consequences ($n<50$, $sig.>0.05$).

The dependent sample t-test's consequences, which was conducted to determine whether the means of the retention and post-tests points of the team's pupils, are shown in the Table 16.

Table 16. The Dependent Sample t-Test's Results

Test	Team	N	Mean	Std. Deviation	t	df	Sig.
Retention and post	Experimental	17	5.412	11.164	1.999	16	.063

Looking at the Table 16, it is clear that there isn't notable difference between the mean of post and retention tests' points of the pupils in the team (t= 1.999; sig.>0.05). Namely, it can be understandable that the FBASYÜAT post and retention tests points' average of the pupils in the experimental team are close to each other.

Seventh Sub-problem's Results

The research's seventh sub-problem is " Are the average points of the FBASYÜAT the delayed retention and retention tests of the team taught with the REACT strategy notable different from each other?" To acquire the seventh sub-problem's answer, experimental team's pupils's the FBASYÜAT retention and delayed retention tests values were examined.

The team's pupil's the mean values of the FBASYÜAT retention and delayed retention tests points were calculated. The team's pupil's the mean values of the FBASYÜAT retention and delayed retention tests points are shown in the Figure 7.
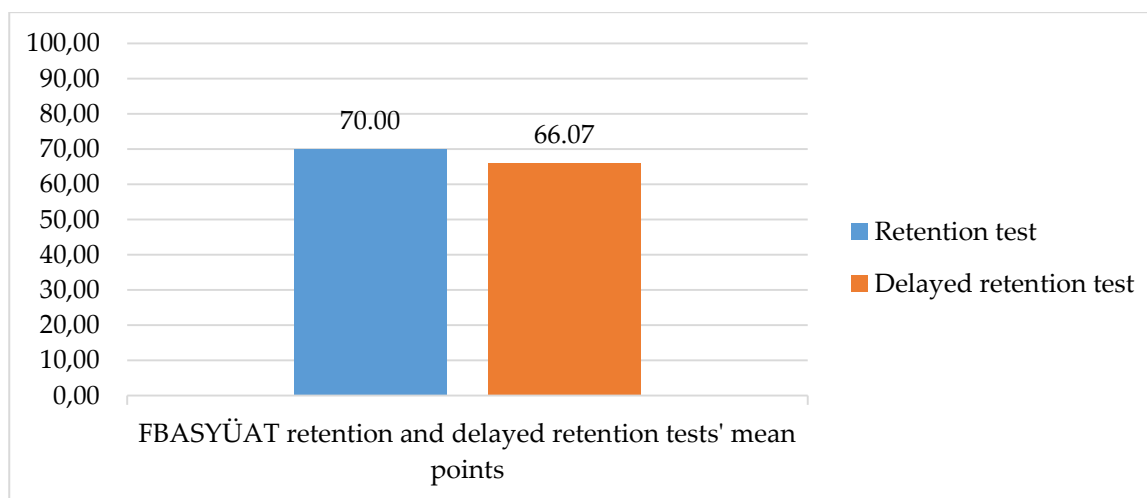

Figure 7. The Arithmetic Mean of the Experimental Team FBASYÜAT delayed Retention and Retention Tests Points

In the Figure 7 it is demonstrated that the pupils' retention test's mean 70.00 and the mean delayed retention test points of the pupils 66.07. As a consequences of the data acquired, it turns out that the average points of pupils in the team of the delayed retention and retention tests points are in proximity to each other. From seventh figure it is clear that mean of the delayed retention and retention tests points are similar.

The normality of the average values of the FBASYÜAT delayed retention and retention tests points of the team was examined. The team's pupils's the outcome of the normality test associated with the FBASYÜAT delayed retention and retention tests' mean points are exhibited in the Table 17.

Table 17. Normality Test Results Related to the Difference of FBASYÜAT Delayed Retention and Retention Tests Points of the Experimental Team

	Kolmogorov-Smirnov			Shapiro-Wilk		
Variable	Statistic	df	Sig.	Statistic	df	Sig.
Delayed retention and retention tests' difference	.186	16	.141	.920	16	.172

Looking at the Table 17, it can be defined that the difference between the points of the delayed retention and retention tests of the pupils have a normal distribution according to the Shapiro-Wilk normality test's consequences (n<50, sig>0.05).

The dependent sample t-test's consequences, which was conducted to determine whether the team's pupils's the means of the delayed retention and retention tests points are shown in the Table 18.

Table 18. The Dependent Sample t-Test's Results Regarding the Means of the FBASYÜAT Delayed Retention and Retention Tests Points

Test	Team	N	Mean	Std. Deviation	t	df	Sig.
Delayed retention and retention	Experimental	16	4.688	7.922	1.981	15	.032

Looking at Table 18, it is obvious that there is noteworthy difference between the mean of retention test points and delayed retention test points of the pupils in the team (t= 1.981; sig<0.05). Namely, it can be said that the points 's average of the pupils of the experimental team of the FBASYÜAT retention test and the points' average they obtained from the delayed retention test are not similar.

Eighth Sub-problem's Results

The research's eighth sub-question is" Are the averages of the FBASYÜAT post and pre-test points of the team taught with the traditional method notable different from each other?" To acquire the eighth sub-problem's answer, the control team's pupils's the FBASYÜAT post and pre-test values were examined.

The pupils's mean values of the FBASYÜAT post and pre-test tests points were calculated. The team's pupils's mean values of the FBASYÜAT pre and post- tests points are shown in the Figure 8.
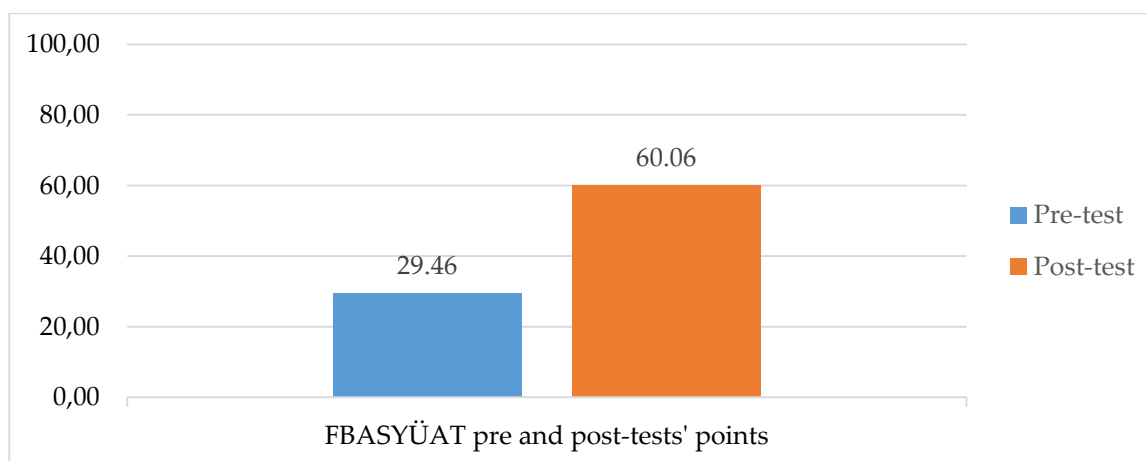

Figure 8. The Arithmetic Mean of the Control Team's FBASYÜAT Post and Pre-tests points

In the Figure 8 it is demonstrated that the pupils's mean of pre-test points 29.46 and the mean post-test points of the pupils 60.06. As a consequences of the data acquired, it turns out that the average points of pupils in the team of the post and pre-tests are not close to each other. From eighth figure it is obvious that the post and pre-test points' mean are not similar.

The normality of the difference between the pupils' pre and post-tests points on the FBASYÜAT was examined. The normality test's consequences related to the difference in points FBASYÜAT post and pre-tests are presented in the Table 19.

Table 19. Normality Test Results Related to the Difference of FBASYÜAT Post and Pre-Tests Points of the Team

	Kolmogorov-Smirnov			Shapiro-Wilk		
Variable	Statistic	df	Sig.	Statistic	df	Sig.
Post and Pre-tests difference	.120	15	.200	.966	15	.793

Looking at the Table 19, it can be said that the between the post and pre-tests' difference of the team have a normal distribution according to the Shapiro-Wilk normality test's results (n<50, sig>0.05).

The dependent sample t-test's results, which was conducted to determine whether the team's pupils's means of the post and pre-tests points are shown in the Table 20.

Table 20. The Dependent Sample t-Test's Results Regarding Means of FBASYÜAT Post and Pre-tests Points of the Team

Test	Team	N	Mean	Std. Deviation	t	df	Sig.
Post and pre-test	Control	15	-30.600	20.063	-5.907	14	.000

Looking at the Table 20, it is apparent that there is noteworthy difference between the team's participans' mean points (t= -5.907; sig.<0.05). Namely, it can be understandable that the points' average of the participants of the control team of the FBASYÜAT pre- test and the average of the points they obtained from the post-test are not similar.

Ninth Sub-problem's Results

The research's ninth sub-problem is "Are the average points of the FBASYÜAT post and retention tests of the team taught with the traditional method notable different from each other?" To acquire the ninth sub-problem's answer, the FBASYÜAT post and retention tests values of the pupils in the control team were examined.

Mean values of the FBASYÜAT post-test and retention test points of the pupils in the team were computed. The mean assesses of the control team's pupils's FBASYÜAT post and retention tests points are exhibited in the Figure 9.

Figure 9. The Arithmetic Mean of the Team FBASYÜAT Retention and Post-tests Points

In the Figure 9 it is exhibited that the mean post-test points of the pupils 60.06 and the mean retention test points of the pupils 46.20. As a consequences of the data acquired, it turns out that the average points of pupils in the team of the retention and post-tests points are not in proximity to each other. From ninth figure it is clear that mean of the retention and post-tests points are not similar.

The normality of the difference between the students' FBASYÜAT retention and post-tests points of the team was examined. The outcome of the normality test associated with the difference between the team's pupils's FBASYÜAT retention and post-tests points are displayed in the Table 21.

Table 21. Normality Test Results Related to the Difference of FBASYÜAT Retention and Post-tests Points of the Team

	Kolmogorov-Smirnov			Shapiro-Wilk		
Variable	Statistic	df	Sig.	Statistic	df	Sig.
Retention and post-tests' difference	.120	15	.200	.966	15	.793

Looking at the Table 21, it can be defined that the team's pupils's the post and the retention tests points' difference has a normal distribution according to the Shapiro-Wilk normality test's consequences (n <50) (Sig.>0.05).

The dependent sample t-test's consequences, which was conducted to determine whether the team's pupils's the post and the retention tests points' difference is shown in the Table 22.

Table 22. The Dependent Sample t-Test's Results Regarding the Difference of the FBASYÜAT Retention and Post Tests Points

Test	Team	N	Mean	Std. Deviation	t	df	Sig.
Retention and post	Control	15	13.867	11.463	4.685	14	.000

Looking at the Table 22, it is clear that the team's pupils's mean of post and retention tests' points have not notable difference (t= 4.685; sig.<0.05). Namely, it can be understandable that the team of control's pupils's average of the FBASYÜAT post and retention tests' points are close not to each other.

Tenth Sub-problem's Results

The research's tenth sub-problem is "Are the average points of the FBASYÜAT retention and delayed retention tests of the team taught with the traditional method notable different from each other? To get the tenth sub-problem's answer, the control team's pupils's FBASYÜAT delayed retention and the retention tests points were examined.

The team's pupils's mean values of the FBASYÜAT delayed retention and the retention tests points were calculated. The team's pupils's mean values of the FBASYÜAT delayed retention and the retention tests points are displayed in the Figure 10.
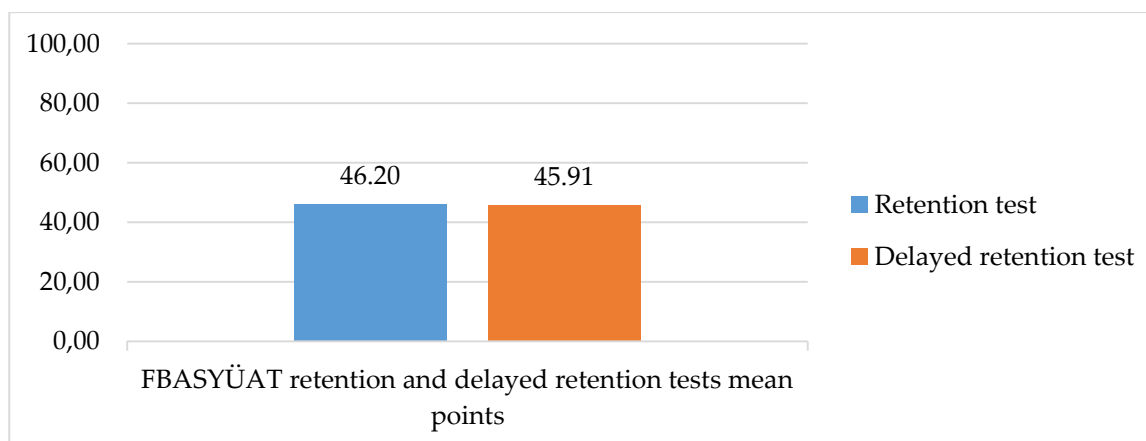

Figure 10. The Arithmetic Mean of the Team FBASYÜAT Delayed Retention and Retention Tests Points

In the Figure 10 it is exhibited that the mean retention test points of the pupils 46.20 and the mean delayed retention test points of the pupils 45.91. As a consequences of the data acquired, it turns out that the average points of pupils in the team of the delayed retention and the retention tests points are in proximity to each

other. From tenth figure it is clear that mean of the delayed retention and the retention tests points are similar.

The normality of the average values of the FBASYÜAT delayed retention and the retention tests points of the team was examined. The outcome of the normality test associated with the team's pupils's FBASYÜAT delayed retention and the retention tests' mean points was shown in the Table 23.

Table 23. The Normality Test's Results Related to the Difference of the Points of the FBASYÜAT Delayed Retention and Retention Tests of the Team

	Kolmogorov-Smirnov			Shapiro-Wilk		
Variable	Statistic	df	Sig.	Statistic	df	Sig.
Retention and delayed retention tests' difference	.190	14	.182	.911	14	.163

Looking at the Table 23, it can be stated that the team's pupils's delayed retention and the retention tests points have a normal distribution according to the Shapiro-Wilk normality test's consequences(n<50, sig>0.05).

The dependent sample t-test's consequences, which was executed to determine whether the means team's pupils's delayed retention and the retention tests points are shown in the Table 24.

Table 24. The Dependent Samples t-test's Results with Respect to the Points of the FBASYÜAT Delayed Retention and Retention Test of the Team

Test	Team	N	Mean	Std. Deviation	t	df	Sig.
Delayed retention and retention	Control	14	13.291	3.552	0.060	13	.953

Looking at the Table 24, it is apparent that there isn't notable difference between the team's pupils's mean of retention test points and delayed retention test points(t= 0.060; sig>0.05). Namely, it can be defined that the points' average of the pupils of the experimental team of the FBASYÜAT retention test and the points' average they obtained from the delayed retention test are similar.

RESULT and DISCUSSION

In this study, according to the data obtained from the FBASYUAT pre-test results, it is seen that there is no statistically significant difference between the FBASYUAT pre-test scores of the students in the control group where the current programme was carried out before the application and the students in the experimental group where the REACT strategy was used. This indicates that, the data shows that the two teams are similar in terms of academic performance and subject-related readiness levels prior to application. When the literature is looked, it is seen that the teams's preparation levels are close to each other according to the consequences of the pre-test before the application (Akın Yanmaz, 2021; Herlina, Turmudi and Dahlan, 2012; Yalçın, 2020). This result allows us to investigate the effectiveness of teaching the 6th grade unit "Conduction of Electricity" with the REACT strategy compared to teaching it with existing methods.

According to the data obtained from the FBASYUAT post-test results, it is explicitly seen that there is noteworthy difference for benefit of the experimental team in the FBASYÜAT post-test points of the experimental team's pupils and the control team's pupils. This indicates that, the data shows that after the application, the academic performance of the experimental team's pupils with respect to the unit "Conduction of electricity" of 6th grade is higher than that of the team of control's pupils. Studies show that teaching with the strategy of REACT has a positive effect on pupils' academic success (Görmüş, 2021; Kaya, 2020; Quainoo et al., 2021). This result obtained from the literature supports the conclusion that teaching with the strategy of REACT has a positive effect on the pupils's academic performance. By teaching with the REACT strategy, pupils' ability to relate topics to daily life, gain experience with teaching materials such as

worksheets and experiment reports, practice with experiments, work in cooperative groups with their friends, and transfer the knowledge they have learned to different situations can be shown as the reason for this consequence.

According to the data obtained from the FBASYUAT retention-test results, there is a significant difference for benefit of the experimental team in the average of the experimental and control teams' pupils' the FBASYÜAT retention test points. This indicates that, the data show that the experimental team's pupils have a higher level of permanence in the 6th grade unit "Conduction of electricity" after the application compared to the control team's pupils. Studies show that teaching with the REACT strategy has a positive effect on the retention of pupils' academic success (Arıkan, 2019; Gül, 2016; Keleş and Dede, 2020). This result obtained from the literature supports the conclusion that teaching with the REACT strategy has a positive effect on the permanence of student academic achievement. In REACT teaching, students' ability to relate topics to daily life, gain experience with teaching materials such as worksheets and experiment reports, practice with experiments, work in cooperative groups with their friends, and transfer the learned to different situations can be cited as the reason for this consequence.

According to the data obtained from the FBASYUAT delayed retention test results, there is a noteworthy difference for benefit of the experimental team in the points' average of the FBASYÜAT delayed retention test of the experimental team's and control team's pupils. This indicates that, the data show that the experimental team's pupils have a higher level of delayed retention in the 6th grade unit "Conduction of electricity" after the application than the control team's pupils. Studies show that teaching with the REACT strategy has a positive effect on staying behind in pupils academic achievement. This result obtained from the literature supports the conclusion that teaching with the REACT strategy has a positive effect on the permanence behind the pupils' academic achievement. In REACT teaching, pupils' ability to relate topics to daily life, gain experience with teaching materials such as worksheets and experiment reports, practice with experiments, work in cooperative groups with their friends, and transfer the learned to different situations can be cited as the reason for this result.

According to the data obtained from the FBASYUAT post and pre-test results, it is explicitly seen that the experimental team's pupils' the post and pre-test's points averages have a noteworthy difference. This indicates that, the points' average that the experimental team's pupils obtained in the FBASYÜAT pre-test and the points' average that they obtained in the post-test are not similar to each other. This result demonstrates that teaching the 6th grade unit "Conduction of Electricity" with the REACT strategy increases the pupils' academic success.

According to the data obtained from the FBASYUAT post and retention-test results, it is explicitly seen that there is no notable difference between the experimental team's pupils' the retention and post test's points average. This indicates that, the experimental team's pupils' points' average obtained in the FBASYÜAT post-test and the average of the points that they obtained in the retention test are similar to each other. This result shows that the teaching of the 6th grade unit "Conduction of electricity" with the REACT strategy increases the permanence in student learning.

According to the data obtained from the FBASYUAT retention and delayed retention test results, it is explicitly seen that the students in the experimental team's pupils' the retention and the delayed retention tests' the mean points have a noteworthy difference. These indicates that, the experimental team' s pupils' the FBASYÜAT retention test' points' average and the delayed retention test' points' average are not similar.

According to the data obtained from the FBASYUAT pre and post test results, it is explicitly seen that there is a noteworthy difference between the control team's pupils' the post and pre-tests' points average. This indicates that, the control team's pupils'points'average obtained in the FBASYÜAT pre-test and the points' average that they obtained in the post-test are not similar to each other. These results show that teaching the 6th grade unit "Transmission of electricity" with the traditional method increases the academic success of students.

According to the data obtained from the FBASYUAT post and retention-test results, it is explicitly seen that there is noteworthy difference between the control team's pupils' the post and retention tests' points average. That is to say, the points' average that the control team's pupils obtained in the FBASYÜAT post-test and the points' average that they obtained in the retention test are not similar to each other. These results demonstrates that the teaching of the unit "Conduction of electricity" of 6th grade with traditional methods don't increase the permanence in the learning of the students.

According to the data obtained from the FBASYUAT retention and delayed retention tests results, it is explicitly seen that there is a noteworthy difference between the students in the control team's pupils' the retention test's the mean points and the delayed retention test. Simply put, the control team's pupils' the FBASYÜAT delayed retention points average and the delayed retention test points average.

The effect of teaching REACT on student achievement the science course's other units or in units of other courses can be examined. The effect of teaching with the strategy of REACT on retention and delayed retention of student learning the science course's other units or in units of other courses can be examined. The effect of the contribution of teaching materials to be designed according to the REACT strategy can be examined in larger study groups or other grade levels. In future studies, the contribution of the REACT strategy on other variables such as conceptual understanding, misconceptions about the concept, motivation, questioning ability and orientation can be examined. Different classes or schools in different locations can be selected for similar research on the REACT strategy's effectiveness. Since the gender of the people present in the sample group of this research is limited to male students, coeducational schools can be selected for similar studies. Thereby, the gender variable's effect variable can also be investigated. REACT strategy's effect on extracurricular learning can be examined.

Declarations

Conflict of Interest

No potential conflicts of interest were disclosed by the author(s) with respect to the research, authorship, or publication of this article.

Ethics Approval

The formal ethics approval was granted by the Educational Research and Publication Ethics Committee of Sakarya University.

Funding

No specific grant was given to this research by funding organizations in the public, commercial, or not-for-profit sectors.

Research and Publication Ethics Statement

The study was approved by the Educational Research and Publication Ethics Committee of Sakarya University (Approval Number E-61923333-050.99-124036. Hereby, we as the authors consciously assure that for the manuscript the following is fulfilled:

- This material is the authors' own original work, which has not been previously published elsewhere.
- The paper reflects the authors' own research and analysis in a truthful and complete manner.
- The results are appropriately placed in the context of prior and existing research.
- All sources used are properly disclosed.

Contribution Rates of Authors to the Article

1st author contributed 50%, 2nd author 50%.

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