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THE EFFECT OF GROUP RESEARCH AND COOPERATIVE READING-WRITING-APPLICATION TECHNIQUES IN THE UNIT OF "WHAT IS THE EARTH'S CRUST MADE OF?" ON THE ACADEMIC ACHIEVEMENTS OF THE STUDENTS AND THE PERMANENT

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Abstract: The aim of this study is to determine the effect of the group research technique and cooperative reading-writing-application technique in the science and technology course in the unit of "what is the Earth's crust made of" on the academic achievement of the students and whether the change observed in the student achievement is permanent or not. The study group is formed of total 62 students in two classes studying in the 6th grade of a primary school in 2010-2011 education year. One of the classes is determined to be Group Research Group (GRG) where group research technique is used and the other one is Reading-Writing-Application Group (RWAG) where cooperative reading-writing-application technique is used. The main instruments for obtaining data were the Academic Achievement Test (AAT). The data obtained on instruments were evaluated by using descriptive statistic, independent sample *t* test, paired sample *t* test and effect sizes. As a result, it was determined that the academic achievements of the students who were taught with cooperative reading-writing-application technique were at a higher level than the academic achievements of the students who were taught with group research. In addition teaching with group technique did not have a permanent effect on the student achievement.

Key words: Cooperative Learning, Group Research, Reading-Writing-Application Technique-Academic Achievement, Retention-Test

INTRODUCTION

The contemporary approaches in education reveal that both individual study model and the group work model are necessary. In individual studies, the development of the individual is intended where as with group works, the aim is to make the individual be aware of the society s/he lives in and grow up as a social being [1, 2].

One of the most important problems of the education teaching activities is that the traditional education understanding which forces the student to memorization are still being used by the educators due to various reasons [3, 4]. In traditional understanding, education is teacher centered. In this understanding, the teacher is the one who transfers the knowledge and the student is in position who is the recipient of the knowledge. Because of this, the traditional approach does not give an active role to the student in the formation of the knowledge. In order to materialize an effective teaching process, it is essential to choose appropriate methods and techniques for the target purpose [5]. Many teaching methods and techniques emerged as a result of education system based on rote-learning leaving its place to student-centered education. One of the most applied methods among these is the cooperative learning method. The reasons for the popularity of cooperative learning is that the group members recognize the problem, they decide cooperatively for the solution of the problem, and they reveal various methods as a result of cooperation with each other [6-8]. It is observed that the students realize an active learning with their dialogues in the group where cooperative learning method is used with the activities in the learning process because learning process is a social phenomenon rather than an individual process or operation [9-11].

Although many studies have been conducted about group research in the literature so far, the studies which compare and contrast group research and cooperative reading-writing-application technique in education processes are very few. The purpose of the study is to determine the change in the academic achievement of the students by using the two cooperative techniques (group research and cooperative reading-writing-application technique) in teaching process of the unit "what is the Earth's crust made of?" in science and technology course and whether the change observed in the student achievement is permanent or not.

METHOD

Model

The mostly used nonequational control group design among the models of the experimental design models is taken as the basis in the study to determine the change in the academic achievement of the students by using group research and reading-writing-application technique within the content of the unit "what is the Earth's crust made of?" in the 6th grade primary school science and technology course and the effect of these techniques on permanent in the study [12].

Sample

Total 62 students in two classes studying in the 6th grade of a primary school in 2010-2011 education year formed the study group of the research. One of the groups taught with Group Research Group (GRG) (n=32) and the other one taught with cooperative reading -writing-application group (RWAG) (n=30) were chosen randomly. The study lasted four weeks in both groups.

Data Collection Tool

Academic Achievement Test (AAT) is used as a data collection to determine whether the change which occurs in the student's prior knowledge, ultimate knowledge and the change in the student achievement is permanent or not.

Academic achievement Test (AAT)

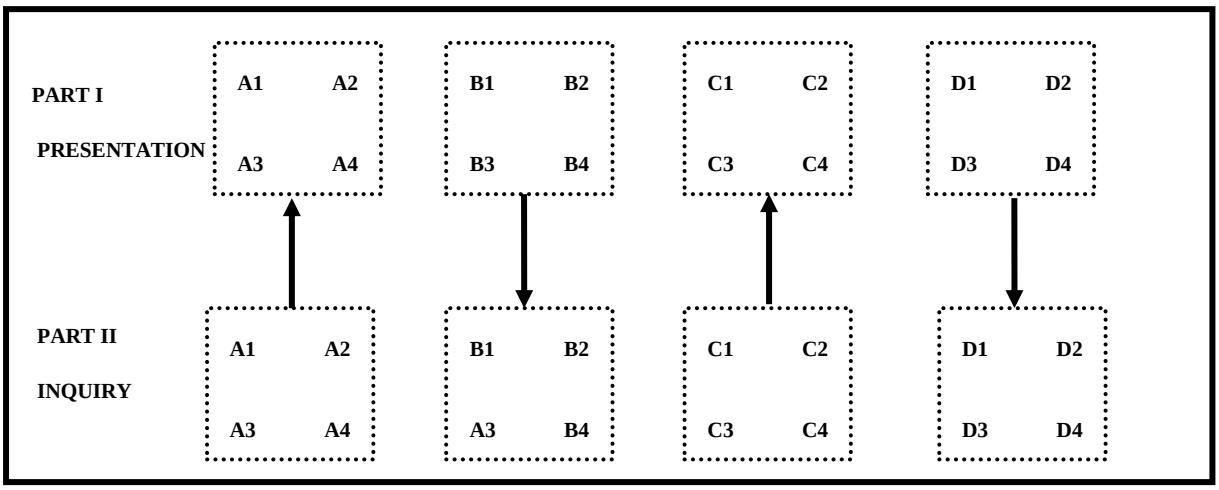
By taking into consideration the unit subjects of "what is the Earth's crust made of?" with in the context of the study, Academic Achievement Test (AAT) was designed as a multiple choice test with four options to evaluate the target student goals by benefiting from the primary education science and technology program and the course books of science and technology. Questions specifications table was prepared according to subject distribution and questions, and examined and corrected by 2 academics who are leading experts on the subject and 3 science and technology teachers (teaching at 6th class), AAT was designed as a 30 multiple choice question. After the corrections made, AAT was practiced with the total 44 students studying in two classes of the 7th grade and the reliability of the test was determined. 5 questions of AAT were removed from the test so, AAT was design as 25 questions and the reliability coefficient (with Cronbach alpha) was determined to be 0.74.

APPLICATION

Teaching with Group Research Technique

During the application of group research technique, the subjects in the unit of "what is the Earth's crust made of?" were divided into four sub-topics (1- rocks-mines-fossils, 2- different types of soil and erosion, 3- ground and surface water, 4- natural monuments). Then, the students in Group Research were divided randomly into two equal parts (16+16) as Part I and Part II. 8 research groups, each made of 4 students, (4 PART I, 4 PART II) are formed from the students in each part according to their AAT pre-test points and class size (Figure1). The number of students in the group either increased or decreased to have all the students participates in the applications of group research.

Figure 1 The formation of presentation and inquiry groups in the classes where group research technique is used.



*** The letters in the boxes present the students.**

In order to reach the learning goals with group research technique, the aim is to create class environments where the students can work cooperatively and practice scientific researches. Teaching with group research technique was carried out in three stages: 1. doing research outside the class, 2. in-class discussion, 3. presentation of the works in the class. In the stage of doing research outside the class, each group prepared a plan about the sub-topics given to them. The research groups which took the unit of "what is the Earth's crust made of?" including four sub-topics (1- rocks-mines-fossils, 2- different types of soil and erosion, 3- ground and surface water, 4- natural monuments) worked out a plan to gather data about the unit and combine the collected data. The works of the groups were controlled during the class hours and the necessary guidance was given. In the in-class discussion stage, the students in the research groups gathered to study the subjects and discuss with their own group members within the framework of the information collected outside the class during the stage of doing research. The group members used different reference books to determine their problems, questions and subject throughout the in-class discussions.

During the presentation of the works in the class, after the students in the research groups completed their researches and the discussions in their groups, they presented their works in the class. The research groups were organized as presentation and inquiry groups for the presentation in the class (Figure 1). Part I was determined to be presentation group and Part II as inquiry group in the first presentation. While the students were doing presentations in Part I group, the students in Part II group made contributions by asking questions to Part I group and making up the deficiencies. At the same time, the other students in the class were given an opportunity to participate in the discussions. In the other groups similarly, while the students in research groups in one part were doing presentations, the other research group students in another part supported the works as an inquiry group. With participation of all groups in presentation and inquiry studies mutually, teaching the unit "what is the Earth's crust made of?" was completed in four weeks. AAT used as a post-test just after the completion of the study to measure the change in the students' academic achievement was performed as a retention-test a month later to determine the permanent of the teaching technique used.

Teaching with Cooperative Reading-Writing-Application Technique

Reading-writing-application technique of cooperative studies supported with reading and writing activities is quite a useful technique both in terms of its suitability to the primary education science and technology teaching program and increasing the primary school students' activeness in the lesson [13-17]. The students in RWAG were divided into 6 cooperative learning groups, each of which was formed of 5 students, by taking their AAT pre-grades. Contact meetings were organized for the whole class about issues such as on which criteria the students would be assessed, and what they should pay attention throughout the learning process before the application. Reading-writing-application technique was carried out in three stages. In reading stage, which is the first one, 4 different posters (a- rocks-mines-fossils, b- different types of soil and erosion, c- ground and surface water, d- natural monuments) which consisted of the subjects related to the unit within the context of the study and the visual and written activities to be done about this subject were prepared and distributed to all groups. After the posters distributed were read as a group, the second stage was moved on. In the writing stage, the second stage, the group members had written about the subjects studied in the relevant week and the things they learned about the activities belonging to these subjects as a common group product. Then, application stage, the third one, was moved on. In this stage, the groups moved on to the activity application and they tried to do the activities and shapes related to the unit as a group. One of the researchers, taking in charge of the role of the media coordinator in all the stages, interfered the groups to make them work according to the cooperative method on the required points. The study was completed by using the same techniques in four weeks.

FINDINGS

In this section, the findings obtained in teaching the unit of "what is the Earth's crust made of?" from the examination of the effect of the cooperative reading-writing-application technique and the focus group research technique on the academic achievement of the students were presented.

Academic Achievement Test (AAT) was applied to the groups who participated in the study as a pre-test before the study, post-test just after the study, and a retention-test after a month the study was completed. The data obtained by calculating the analysis results of the independent sample *t*-test and the effect sizes (ES) of AAT average scores were presented in Table 1.

Table 1. Independent sample *t* test analysis and effect sizes values belonging to AAT pre-test and AAT post-test average scores of the students.

	GRG		RWAG				
Tests	X	SS	X	SS	*t*	p	ES
Pre-test	57.19	13.73	54.17	11.45	0.94	0.35	0.11
Post-test	75.78	15.40	84.00	12.35	2.30	0.02	0.28

When p and Effect Sizes (ES) values according to 0.05 significance level of the data presented in Table 1 were looked at, it was observed that there was not a statistically significant difference between the groups in terms of AAT pre-test (p>.05; ES=0.11). While ES values were being interpreted, the effects of the independent variables were interpreted as 0.10 small effects; 0.24 medium effects; and 0.31 high effects [18, 19]. It was understood from the values in Table 1 that 54 % of the students both in RWAG and GRG owned the prior-knowledge level.

Moreover, When p and Effect Sizes (ES) values according to 0,05 significance level of the data presented in Table 1 were studied, it was observed that there was a statistically significant difference between the groups in terms of AAT post-test(p<.05; ES=0.28). When the average scores of AAT post-test which was applied after the activities done with both groups were completed were analyzed (RWAG=84.00; GRG=75.78), it was observed that RWAG students increased their academic achievements more than the GRG students.

The data obtained by calculating the analysis results of the paired sample *t*-test and the effect sizes (ES) of average scores which the groups participating in the study took from AAT as a pre-test before the study and post-test after the study were presented in Table 2.

Table 2. Paired sample *t* test analysis and effect sizes values belonging to AAT pre-test and AAT post-test average scores of the students.

	Pre-test		Post-test				
GROUPS	X	SS	X	SS	*t*	p	ES
GRG	57.19	13.73	75.78	15.40	4.99	0.01	0.54
RWAG	54.17	11.45	84.00	12.35	9.73	0.01	0.78

When the data in Table 2 was analyzed, it was observed that there was a statistically significant difference between the AAT pre-test and AAT post-test scores of RWAG (p>.05; ES=0.78) and there was also a statistically significant difference between the AAT pre-test and AAT post-test points of GRG (p<.05; ES=0.54). These results revealed that the students benefited from the teaching activities applied to both groups. During the teaching process, the students in RWAG increased their academic achievement to 78% and the students in GRG increased their academic achievement nearly to 54%.

The data obtained by calculating the analysis results of the paired sample *t*-test and the effect sizes (ES) of average scores which the groups participating in the study took from AAT as a post-test after the study and retention-test used just after a month the study was completed were presented in Table3.

Table 3. Paired sample *t* test analysis and effect sizes values belonging to AAT post-test and AAT retention-test average scores of RWAG and GRG students.

	Post-test		Retention-test				
Groups	X	SS	X	SS	*t*	p	ES
GRG	75.78	15.40	68.28	13.17	2.16	0.04	0.25
RWAG	84.00	12.35	77.17	14.66	1.99	0.06	0.23

When the data in Table 3 was analyzed, it was observed that there was not a statistically significant difference between the AAT post-test and AAT retention-test average scores of RWAG (p>.05) but there was a statistically significant difference between the AAT pre-test and AAT retention-test average scores of GRG

($p<.05$). It was determined that the academic achievement of the students in RWAG decreased 23 % and the academic achievement of the students in GRG decreased 25 % a month after the study. Despite the decrease in AAT retention-test average scores of the two groups that joined the study, it was revealed that the average scores of RWAG were higher than GRG. It was understood from the results that the group research did not have permanent effect on the rise in the academic achievement but reading-writing-application technique had a permanent effect on the rise in the academic achievement.

CONCLUSION AND SUGGESTIONS

The results obtained from the study and the suggestions for the studies to be conducted in the future in line with the results were presented in this section. The learning levels of the students by using two different techniques (group research technique and cooperative reading-writing-application technique) in teaching the unit "what is the Earth's crust made of" in primary education 6^{th} grade science and technology course were tried to be determined. The academic levels of the students were measured throughout the application process. The following results were acquired depending on the data obtained from the tests performed before and after the study.

When the data obtained from the application of AAT pre-test to the student groups were analyzed, it was found that the achievement level of all the groups was over 54 % and there was not a statistically significant difference between the groups. It was thought that the high level prior knowledge of the students caused them to understand the abstract subjects to be studied, the experiments and the activities about the subjects more easily.

The same levels of the students in terms of AAT pre-test average scores can be attributed to their taking the same courses in the previous terms and the similar levels of the work groups.

It was revealed by the findings obtained from the statistical analysis of AAT post-test scores of the students participating in the study that the application of cooperative reading-writing-application and group research techniques in teaching unit "what is the Earth's crust made of?" in science and technology course caused a significant difference between the academic achievements of the students. It was also found that RWAG students were more successful than GRG students in terms of their AAT post-test average scores. It was thought that the main reason for the students to be more successful with reading-writing-application technique could have resulted from the students' going through at least three stages during teaching process. Each stage takes the academic achievement of the students a step further. It was thought that the activities the groups carried out during the writing process improved their skills to express what they know. The results obtained by the application of this technique are compatible with the other results of the studies conducted in the field [20-25].

When the pre-test and post-test data of two groups were analyzed, it was determined that the teaching activities carried out increased the academic achievement of the students (Table 2). These results revealed that the students benefited from the teaching activities applied to both groups. It as also determined that the academic achievements of the students in RWAG increased 78 % and the academic achievements of the students in GRG increased 54%. The reasons thought for RWAG students to increase their academic achievement more than GRG students were that RWAG students read together before the subject to be studied, they did cooperative writing about the readings and finally they did the activities related to the subject cooperatively. It was observed that in each stage of this consecutive teaching process, the groups increased their achievement, they developed their in-group social communicative skills, and they formed resource dependence in the group. It did not go unnoticed that the GRG students were uneasy during the inquiry process [13, 14, 26-30].

According to the AAT retention-test average scores applied a month after the completion of the study, it was found that while there was not a significant difference between the AAT post-test and AAT retention-test scores of the students in RWAG, there was a significant difference between the AAT post-test and AAT retention-test scores of the students in GRG. It was thought that the main reason for the lower academic achievement of the students in GRG than the students in RWAG could have resulted from the fact that students taught with group research technique were not able to perform the inquiry process completely during the teaching process.

According to the results of the study, because the students are not used to the techniques (RWAG and GRG) used in cooperative groups and they encountered them for the first time, orientation practices must be carried out for the students. During the orientation practices, the techniques to be used must be introduced, and how the application processes and the products are going to be evaluated must be told.

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