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GROUP INVESTIGATION TEACHING TECHNIQUE IN TURKISH PRIMARY SCIENCE COURSES

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Abstract: This study examined the effectiveness of group investigation teaching technique in teaching 'Light' unit 7th grade primary science education level. This study was carried out in two different classes in the Primary school during the 2011–2012 academic year in Erzurum, Turkey. One of the classes was the Experimental Group (group investigation teaching technique applied) and the other was the Control Group (traditional teaching methods applied). Students in the Experimental Group were divided into 6 groups and each group concluded 4 members since 'Light' unit formed 4 subtopics. The subtopics names are a) absorption of light, b) refraction of light, c) lenses and d) prism of light. The main instrument for obtaining data was the Light Achievement Test (LAT), which was applied to groups both pre-test and post-test. The data obtained indicated that the students in the Experimental Group were more successful than students in the Control Group.

Keywords: 'Light' unit; cooperative learning; group investigation teaching technique, science and technology, academic achievement

INTRODUCTION

Science teachers and researcher must realize that teaching activities in the new technology era will require for more of past applications. Researcher will have to become adept at teaching cooperatively because the world of education, which was teacher centered, has now become student centered. The teacher, who used to be infinite, has become finite and in now required to be adept at this situation. Unfortunately, many school science teachers are already intimidated by their drastically changing profession [1]. Whereas, the effects of new techniques in education are identified, this problem will be eliminated.

Meaningful learning in the science lessons environment would occur if students are given enough time for interaction and reflection. A great deal of research has been done that clearly demonstrates the educational advantages of students working together; cooperative learning [2]. Allowing students to work together may allow for a deeper understanding of the content as the students will have the opportunity to problem solve together.

In cooperative learning, students are divided into groups, or teams, in which they carry out assigned work. This way of forming teams differs from the common practice of asking students to form their own groups and to divide the work without guidance [3-9].

Different techniques, designed with various aims, are used in the cooperative learning method. Group investigation teaching technique, one of these techniques [10], is preferred by researchers since it can be used in the classroom and makes it easy for students to understand the subtopics. Group investigation teaching technique is an effective organizational medium for encouraging and guiding students' involvement in learning. Students actively share in fluencing the nature of events in their classroom. The students in the Experimental Group collaborate to produce a group product for presentation. This is an open-ended investigation which students may help determine the focus of their investigation. The activity is structured to emphasize higher-order thinking skills. Students are assigned on the unit for investigation. Each student is responsible for researching one of the unit's subtopics. Students come together as a group and share their information and discuss each other about the unit. Through discussion, group members exchange views about the scope of their in inquiry. They clarify exactly what it is they want to investigate. Students synthesize information to produce an end product presentation. Each group member participates in the class presentation [11].

In this study in the 'Light' unit, lessons carried out group investigation teaching technique. In most research on the teaching of light, it has been repeated that students have difficulty in teaching 'Light' unit [12-14]. The most important reason why students have difficulty in learning these subjects might be the fact that the teacher plays an active role throughout the learning process while the students are passive listeners.

'Light' unit compatible for cooperative applications because it is multifaceted and it will trigger a variety of reactions from the students. In this study, groups of Experimental Group, the members were asked to familiarize themselves with their subtopics about 'Light' unit. As these groups understood the subtopic, each groups of Experimental Group had to prepare a teaching. In this study, cooperative learning was used, in which the student has the active role and the researcher the passive one.

METHOD

Model

Within the scope of primary school 7th grade science and technology lesson's 'Light' unit, in this study, control group design of pre test & post-test was predicated [15] to examine the results of two different teaching methods and technique on students' academic achievements.

Sample

The sample of this study consisted of a total of 49 7th grades from two different classes enrolled in the science and technology course for the 2011–2012 academic year at Erzurum Yildizkent Primary School, Turkey. One of the classes was defined as the Experimental Group (n = 24) was taught through group investigation teaching technique of cooperative learning while the other class as the Control Group (n = 25) was taught by the traditional teaching approach. The study was continued in all groups for four weeks (four lessons per week). Both Experimental Group and Control Group lessons were carried out by the one of researchers.

Instruments

Light Academic Achievement (LAT)

By taking into consideration the unit subjects of 'Light' with in the context of the study, Light Achievement Test (LAT) 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 a professor who is leading experts on the subject and 2 science and technology teachers (teaching at 7^{th} class), LAT was designed as a 24 multiple choice question. After the corrections made, LAT was practiced with the total 32 students studying in two classes of the 8^{th} grade and the reliability of the test was determined. 4 questions of LAT were removed from the test so, LAT was design as 20 questions and the reliability coefficient (with Cronbach alpha) was determined to be 0.63. LAT was applied to all groups as both pre-test & post-test to determine the change in the academic achievement level.

Process

Group Investigation Teaching Technique Applications

The students in the Experimental Group progressed through six consecutive steps [11].

Step 1= In this step, firstly the researcher identified the 'Light' topic and presented a broad topic to the whole class then researcher organized students into six cooperative groups. Each group contained four students, because 'Light' unit formed four subtopics. The subtopics names are a) absorption of light, b) refraction of light, c) lenses and d) prism of light. Secondly each group members assigned a subtopic then investigated own subtopic. Students met in groups and each group members expressed his or her ideas about what do investigate. Then each student joined the group studied the subtopic of his or her choice.

Step 2= In this step, as the researcher circulated among the groups, he offered help so those who need it. The researcher in this step discussed alternatives and helped group members redirected their goal and helped them formulated a more realistic plan to investigate.

Step 3= In this step, each group carried out the plans. Group members gathered information from a variety of sources, evaluated data about his or her subtopics. Group members studied their subtopics both in class and out of class.

Step 4= In this step, each group prepared a final report. The final reports included most significant results of the inquiry. And in this step, groups planned how to teach their classmates, in an organized way.

Step 5= In this step, groups presented the final report to whole class in a schedule. Other groups asked their questions to representative group.

Step 6= In this step, the researcher evaluated students' achievement about the topic the studies based on observations of the students' academic and social activity.

The study was concluded in four weeks with the same methods being applied in each. At the end of the study, LAT post-test was conducted to determine the level of increase in the subject related academic achievement.

Traditional Teaching Methods Applications

In the class designated as the Control Group, lecturing of the subjects included in the 'Light' unit was realized according to the traditional teaching methods. Subject was generally addressed by questions-answers and simple lecturing methods. While the students were trying to solve the problem, the researcher walked among the students and helped the students make their own corrections. When all the students were through with the problem, a student was called to the board to solve the problem with the help of the researcher. At the end of the lesson, the students were given homework, which was discussed the next day in class. The Control Group did not participate in any team studies since such an activity was not an essential part of the traditional method. During the lectures, students were asked questions at certain times and feedbacks were made according to their answers. Students were also given homework for studying the subjects out of the class. At the end of each lesson, the students were asked to read about the subjects of the next lesson and be prepared for it. In the Control Group, lecturing of the subjects included in the 'Light' unit lasted for four weeks. Lectures in both Experimental Group and Control Group were given by the researcher. In order to determine the level of increase in students' achievements at the end of the study, LAT post-test was used. The study was concluded in four weeks with the same methods being applied in each. At the end of the study, LAT post-test was conducted to determine the level of increase in the subject related academic achievement. As in the Experimental Group, also with this group, science and technology was taught for 4 hours per week. Both Experimental Group and Control Group lessons were carried out by the same researcher.

FINDINGS AND DISCUSSION

This research investigated the effects of intervention discussion sections on student learning. The goal was to understand how to foster better understanding of the principles of 7th grade 'Light' unit in primary level science course.

The Light Achievement Test (LAT) was implemented to the students included in both the Experimental Group and the Control Group individually once before the lectures as pre-test and once after the lectures as post-test. The data obtained from independent *t* test analysis of the LAT pre-test and LAT post-test score averages are presented in Table 1.

Table 1. Independent *t* test analysis of the point averages scored from LAT pre-test and LAT post-tests and impact magnitude values.

Tests	Experimental Group		Control Group		*t*	p
	X	SD	X	SD		
LAT pre-test	60.83	9.51	58.60	12.29	0.70	0.48
LAT post-test	81.92	9.20	70.00	10.21	4.29	0.01

Examining the p values in Table 1 according to a significance level of 0.05 shows that there is no difference between the Experimental Group and Control Group in terms of the LAT pre-test scores obtained ($p>.05$). According to these data it is possible to assert that the foreknowledge on the subtopics of the 'Light' unit of the students in both groups were in the same level.

On the other hand, examining the p values in Table 1 according to a significance level of 0.05 indicates the presence of a statistically significant difference between the Experimental Group and Control Group in terms of the LAT post-test scores obtained ($p<.05$). Examining the scores obtained

from the LAT post-test implemented to both groups following the completion of the courses pointed out that a statistically significant difference between the two groups was established in terms of the students' academic achievement levels on the subtopics of the 'Light' unit (Experimental Group = 81.92; Control Group = 70.00). With this, it was determined that Experimental Group was superior to the Control Group in increasing their academic achievements.

In order to determine the level with which the groups increased their academic achievement levels by examining the pre-test and post-test results of each group separately, the data obtained from the matched group *t* test analysis of the point averages obtained by both of the groups from the pre-test and post-test are presented in Table 2.

Table 2. Paired sample *t* test analysis of the LAT pre-test and LAT post-test point averages of both groups.

GROUPS	LAT pre-test		LAT post-test		*t*	p
	X	SD	X	SD		
Experimental Group	60.83	9.51	81.92	9.20	7.28	0.01
Control Group	58.60	12.29	70.00	10.21	3.82	0.01

With the examination of the LAT pre-test and LAT post-test point average data presented in Table 2, it was determined that the group investigation teaching technique applied to the Experimental Group resulted in a significant difference in terms of increasing students' academic achievements concerning the subtopics included in the 'Light' unit. It was also determined from considering the LAT pre-test and LAT post-test point averages presented in Table 2 that, also the traditional teaching methods applied to the Control Group caused a statistically significant difference in terms of increasing student's academic achievements in the 'Light' unit. However, with the examination of the p values, it was determined that the Experimental Group increased its academic achievements in a much greater level than the Control Group.

CONCLUSION AND SUGGESTIONS

In the focus of this evidence, it appears that some learning methods may be necessary in science education at all levels to facilitate students' understanding of 'Light' unit. In cooperative learning, students spend more time on these subtopics of 'Light' unit combined with more discussion on light subtopics by defending or arguing their positions. It is necessary for primary science students to understand these subtopics before moving on to more advanced ones [16].

With the examination of the data obtained from applying the LAT pre-test to both Experimental Group and Control Group, it was determined that the achievement levels of both of the groups were above 58%, and that there was no significant difference in the foreknowledge of the students of the two groups concerning the subtopics of the 'Light' unit (Table 1). It is believed that the absence of a significant difference between the foreknowledge of the Experimental Group and Control Group were due to the fact that the students of both groups received the same education curriculum in the past. Also, high levels of foreknowledge in science and technology courses facilitate teaching, comprehension of related activities and experiments, and creation of solutions to the problems that may

be experienced. It is also observed from other studies that the foreknowledge of students that received the same education curriculum are on the same level [17-21].

When the results obtained from the LAT post-test analyzed, it is seen that the students in the Experimental Group are more successful in 'Light' unit than the students in the Control Group. In this study, the findings that group investigation teaching technique has stronger effects on academic achievement than the traditional learning method are in line with the results of the studies [22-25]. In this study, the reason that the group investigation teaching technique was more effective than the traditional teaching method can be attributed to differences in the application processes of this method and to the fact that students are directed and encouraged to express their ideas in a warm atmosphere, to convey their ideas and to cooperate with their friends. The reason why the students in the Experimental Group were more successful than the students in the control group in LAT post-test is that in the Experimental Group the subjects were divided into 4 subtopics, the students studied these subtopics, and discussed them with their classmates out of class first. They then participated in the discussion between the groups in the class and used the group investigation teaching technique, which created a successful discussion environment.

It could be implied that dividing the 'Light' unit into 4 subtopics and having the students in the groups (four members for each group) in Experimental Group deliver the subtopics and prepare and discuss these subtopics out of class and also present them was of great benefit to the students who had difficulty in understanding 'Light' unit. In addition, groups consisted of the students in Experimental Group, which means that the students discussed these sub-topics with different students who had researched the topic, and this helped to remedy their lack of knowledge.

It was determined that, after completion of the teaching activities both of the groups increased their academic achievement levels on the subtopics included in the scope of the study in terms of their LAT pre-test and LAT post-test point averages (Table 2). The p values provided in the table for the 7th grade science and technology course 'Light' unit, indicate that the educative process were useful at high levels for both of the groups.

In conclusion, this method will be beneficial for the academic achievement of the students and it will make students more active in lessons. The fact that the students in the Experimental Group were more successful that students had the chance to contribute their knowledge on the subjects as they did research and benefited from previous investigation, and they took part in the learning process actively in both in-class and out-of-class discussions.

We consider that group investigation technique has to apply to all science courses and the other course in primary education curriculum. In addition, experiments in science and technology book have to be collected in a book like "7^{th} Grade Science and Technology Course Experiment Applications" and we think that this have to be present as a different course. Via this application, students will adapt more, and their success will increase. However, it is accepted that only cooperative learning is not enough to increase the success. For that reason, we think that, in studies group investigation technique of cooperative learning model have to be supported with other learning methods and teaching media have to be designed for students' requests.

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