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The Effect of Think-Explain-Apply Teaching Method on the Success of Learning-Teaching: A Laboratory Study

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Abstract: The purpose of the present laboratory study is to make it possible to internalize the concepts, principles, theories and the laws of chemistry taught in the courses by observing the experiments, give information about the methods used and various techniques and tools applied and introduce some substances and their characteristics. The purpose of the laboratory courses help students realize real and meaningful learning by forming relations between theoretical knowledge learned in the courses and laboratory studies. The purpose of this study is to look at to what extent experiments conducted in laboratory setting are influential on students' learning and emphasize the importance of think, explain, apply method. From the two groups of students of Science Teaching department four groups were constructed as Control 1 (C1), Experimental 1 (E1) and Control 2 (C2), Experimental 2 (E2) in two separate terms. Pre-test was administered to the groups and according to the results of this test, it was found that there is no significance difference between experimental groups and control groups ($p<0.70$). Success scores obtained from the post-test, on the other hand, indicated a significant difference in favor of the E2 group where think, explain, apply method was used ($p<0.85$).
Key words: Science teaching, think-explain-apply teaching method, laboratory study, traditional approach

INTRODUCTION

Active learning can be defined as students' engaging in learning activities giving remarkable control to the students during learning. As the learning is active, most of the work is performed by students. They use their brains, they think, they solve problems and they apply what they have learned. Active learning is fast, entertaining and supporting as well (Meyers and Jones, 1993; Schoon and.Boone, 1998; Çetin, 1998).

Nearly 2400 years ago, Confucius remarked: "I forget what I have heard. I remember what I have seen. I understand what I have done". If we translate the statement of Confucius into active learning, the result can be stated as follows: I have forgot what I have heard. I remember a little what I have heard and seen. I gain knowledge and skill form what I have heard, seen, discussed and done (Angelo, 1993; Silberman, 1996) .

Active learning teaches students the ways of having access to information from different sources in their research and allows them to evaluate and present the obtained information. Apart from these, students take responsibility in individual and group projects, they share and co-operate for the production of common information (Schoon and.Boone, 1998; Çetin, 1998; Özer, 2002). Much of the scientific discovery has been done by scientist group of people rather than one person. When scientific publications are perused quickly, it will come into light that majority of the scientific research has been done by scientist groups (Johnson and Johnson, 1991). The point that to be reached by science education must be to provide an active learning process in which students are accustomed to behave like a scientist and being student at the center. Students' constructing a cooperative learning environment by studying in groups give a possibility to a student centered teaching structure that modern education system requiring (Tatar and Oktay, 2008).

The most important reason behind the phenomenon of students' forgetting the learned information is the difference between students' speed of listening and speed of teacher's speaking. While a teacher uses 100-200 words while speaking, a very careful student can listen to 50-100 words in a minute because students think more than a teacher while listening. No matter how interesting the subject taught, no matter how careful students listen to, and no matter how slowly the presents the subject in an appropriate order, learning by listening is limited (Açıkgöz, 2000; Özer, 2002). Human beings , as of the birth, are in a process of being educated. Learning is process starting in the family (Calderhead, 1997). The efficiency of an education system is evaluated through the behavioral changes taking place on students. In learning the necessity of students' participation should be taken into consideration for students to learn scientific reasoning,

Table 1. Pre-test and post-test achievement scores of the study groups

Study Group	Tests	Groups	Achievement	Student number
First study group	Pre-test	Control 1 (C1)	18.50 ± 5.71	19
		Experimental 1 (E1)	19.00 ± 4.31	20
	Post-test	Control 1 (C1)	25.00 ± 2.30	19
		Experimental 1 (E1)	35.30 ± 3.80	20
Second study group	Pre-test	Control 2 (C2)	20.00 ± 5.10	19
		Experimental 2 (E2)	20.05 ± 3.10	20
	Post-test	Control 2 (C2)	34.00 ± 3.10	19
		Experimental 2 (E2)	56.65 ± 4.10	20

establish scientific communication; in short, transfer science into their lives. Moreover, it should be considered that students learn through different ways and at different speeds and learning is a process realized individually and within groups (Bonwell and Eison. 1991. Angelo and Cross, 1993). The purpose of effective learning is to enable student participation. Within the framework of the study carried out to determine how strong this participation is, the performance through which the students can show that they can take the responsibility for their own learning is attempted to be determined (Sahinel, 2007; Açıkgöz, 2000; Silberman, 1996; Bonwell and Eison, 1991; Morgil and Yörük; 2004). For this purpose, an experiment was conducted on the students of Science Teaching Department of The Faculty of Education, Muğla University.

METHODOLOGY

The study group of the study consists of total 78 first year students of the Science Teaching Department. These students are divided into two groups; (20+20) experimental group and (19+19) control group; taken from two academic years

In order to administer to working group, an achievement test was developed. An achievement test consisting of 30 classic lecturing questions was administered to the first year students of Science Teaching Department. In classical written explanation, the first year students of the science teaching department are asked questions as to how to explain any subject in the primary school curriculum to students and how to get the primary school students to conduct an experiment.

In 2001-2002 academic year, first year students of Science Teaching Department (n=39) were divided into two groups. Both of the groups performed the experiment with the guidance of the same teacher. Information was provided for the students and a pre-test was administered. The Experiment that can be conducted with primary school students was only explained through classical lecturing to Control 1 (C1) group. On the other hand, together with the lecturing, a demonstration of the experiment was performed by the teacher. And students were asked to write a report individually. The students in the control group write the results of the experiment in a classical way. Then, a post-test was administered to the students in 1st working group.

In 2002-2003 academic year, the students of the 2nd study group was informed about the experiment they would conduct and a pre-test was administered to them. The students in Control 2 (C2) group were subjected to the same procedure used for the students of E1 in the first working group. On the other hand, the students of Experimental group 2 (E2) were asked to search the given experiment, think about it and perform it using simple devices on their own. Then, all the students in second study group were asked to report the results of their experiments individually. Post-test was administered to the students of second working group.

RESULTS

Before the experiments were conducted, both study groups were administered pre-test, and no statistically significant difference was found between achievement scores of experimental groups (E1 and E2) and control groups (C1 and C2 ($p<0.70$). When the achievement test scores obtained from the post-test

were compared for 1st and 2nd study groups, no significant difference was found between them. Yet, statistically significant difference was found between D1 and D2 groups (Table 1).

As can be seen from Table 1, the achievement score obtained from the pre-test for group E1 is 19.00±4.31 but academic achievement score obtained for C1 is 18.50±5.71 and achievement score obtained from the pre-test for D2 is 20.05±3.10, yet for C2, it is 20.00±5.10. In both study groups, between the achievement scores of the both groups (control and experimental) obtained from pre-test, no statistically significant difference was found. While the post-test achievement score of C2 was found to be 50.65±4.10, the same score was found to be 34.00±3.10 for C2, and for E1, it was found to be 25.00±2.30. Here the difference between E1 and C1 and between E2 and C2 was found to be significantly significant ($p<0.85$).

CONCLUSION

As a consequence, think, explain and apply method can contribute to the meaningful learning and teaching of the students. Hence, It plays an important role in equipping students with research skills, problem solving skills and observation skills, and the ability to establish a connection among them (Schoon and Boone, 1998). In order to be able to use laboratory courses as a real learning setting and get rid of traditional approach of memorizing, it is necessary to draw on think, explain, apply learning approach. In addition, the students gain the ability of using their imagination and knowledge about how to use it in the future through this approach.

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