The effect of active learning applications on students’ views about scientific knowledge

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Abstract

The purpose of this study was to explain the effect of the active learning applications on eight grade primary school students’ views about scientific knowledge. This research was conducted in a quasi-experimental design. 34 students participated in the student study group in all, consisting 31 students in the experimental group and 33 students in the control group. The study lasted for 10 weeks. “Views about Scientific Knowledge Scale” were used as pre-test and post-test for the experimental and control group. According to post-test grades obtained from “Views about Scientific Knowledge Scale”, there were statistically significant differences supporting the experimental group.

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1. Introduction

In modern education approach, it is accepted that development in the modern science and technology is directly related to achieving success in science. The societies should be able to develop, understand and use the modern technology, and each person in the society should be literate of science. Since, the science and technology is developing fast, people should change their peculiarities which they should have in the future.

In primary education, the students are very active and energetic because of their age (Cratty, 1971; Gökçe, 2004). The aim of primary science course is to improve students’ scientific investigation of the environment and the world where they are living. Therefore, the students can adapt themselves to the life very easily, observe the environment effectively, and they can detect the cause-effect relations between different events and facts to achieve a conclusion.

In the traditional course, learning is equated with recalling or memorisation. The instructor lectures, and the students memorise the material covered in class for the exam (Hernandez, 2002). During the use of active learning, students move from being passive recipients of knowledge to being participants in activities. Active learning, through which students become active participants in the learning process, is an important means for development of higher level thinking (Bonwell and Eison, 1991).
Analising the research literature, there is no common agreement definition about active learning. A documentary scan of learning – teaching literature shows that there is not a precise and commonly accepted definition of active learning. Most of the educators' usage of the term "active learning" has relied more on intuitive understanding than a common definition. It is because of the fact that many educators assert that all learning is inherently active and students are therefore actively involved while listening to formal presentations in the classroom. But recent researches suggest that students must do more than just listening; Students must do something including discovering, processing, and applying information. They must read, write, discuss, or be engaged in solving problems. In this sense, it is proposed that strategies promoting active learning are defined as instructional activities which involve students in doing things and make them think about what they are doing (Bonwell, Eison, 1994; McKinney, 2006).

Active learning forces the students to contemplate and to make comments on applied information by involving them in activity-based research practices. In this approach students not only listen to the presentations, but at the same time, they improve their skills through their practices, and analyse, integrate and evaluate the knowledge which they have acquired by asking and writing at the end of the peer-work. In short, according to this approach, the students are forced to demonstrate their ideas and how they use them by means of research-activities (Prostko, 1993). Students can utilize some active learning activities after having little faculty preparation and they can do them spontaneously. Active learning can occur in class or outside of the class (e.g., computer simulations, internships, WWW assignments, class Internet discussion lists, independent study research) (McKinney, 2006).

In active learning, instructors are seen as designers of learning environments who improve the quality of student learning rather than delivering content knowledge (Barr and Tagg 1995).

2. Method

This research was conducted in a quasi-experimental design by using pre-test and post-test design with a control group during the academic year of 2008-2009, in Turkey. The students in the experimental group were instructed by the active learning applications which were adapted according to the purpose, content and acquisition of Turkish National Science and Technology Curriculum prepared by The Ministry of Education in 2005. On the other hand, the control group was instructed according to Turkish National Science and Technology Curriculum. The topic was “Matter and Energy for the Living Creatures” and “States of Matter and Heat” for eight grades in both groups.

At the beginning of the study, an awareness-raising program was applied to the experimental group in order to assist with their adaptation to the active learning applications. This awareness program also covered activities helping students in the experimental group to develop behavior appropriate for the method applied during the experimental period.

2.1. Participants

The participants are 8th grade students from a public school in İzmir, Turkey. Among the 8th grade classes, two classes having equal performance grading based on previous year science and technology course and pre-test results were chosen randomly. After choosing the two classes, they were randomly assigned to the experimental (n = 31) and the control group (n = 33).

2.2. Purpose

The main purpose of this study is to investigate the effectiveness of active learning applications on views about scientific knowledge of eight grade primary school students. In the study, dependent variables are students’ views about scientific knowledge.

The questions associated to the main purpose are as follows:
1. Is there a statistically significant difference between pre-test scores of experimental and control groups in terms of views about scientific knowledge test?
2. Is there a statistically significant difference between post-test scores of experimental and control groups in terms of views about scientific knowledge scale?
2.3. Data Collection Tools

“Views about scientific knowledge scale” were used as data collection tool for the experimental and control group. “Views about Scientific Knowledge Scale” was developed by Küçük (2006). The scale consists of 16 items and The Cronbach Alpha value are .65.

2.4. Data Analysis

Data analysis was made according to the purpose and subpurposes of the research. For the analysis of the data, SPSS computer programme was used. The t-test analysis technique was used to analyse the data. 0.05 meaningfulness level was taken into consideration during the data analysis.

3. Results (Findings)

According to the results of t-test analyses of “Views about Scientific Knowledge Scale” before the instruction, there was not any significant difference between the scale scores of the experimental group ($M = 37.46$, $SD = 2.36$) and the control group ($M = 37.36$, $SD = 3.23$), $t(.15) = 0.01$, $p = .88$ (one-tailed). This result showed that the experimental group and the control group were identical before the instruction.

To understand the affect of active learning applications on students’ views about scientific knowledge, independent group t-test analysis was concluded examining its affect on post-test scores and results were presented on Table two.

Table 1. Control and experimental group students’ “Views about Scientific Knowledge Scale” pre-test scores

<table>
<thead>
<tr>
<th>Groups</th>
<th>$\bar{X}$</th>
<th>SD</th>
<th>$t$</th>
<th>$p$</th>
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<tbody>
<tr>
<td>Experimental</td>
<td>36.09</td>
<td>2.67</td>
<td>.13</td>
<td>.84</td>
</tr>
<tr>
<td>Control group</td>
<td>37.27</td>
<td>3.33</td>
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The results of t-test analysis about “Views about Scientific Knowledge” questionnaire after the instruction show that there was a significant difference between the experimental group ($M = 37.54$, $SD = 2.37$) and the control group ($M = 36.0$, $SD = 2.26$), $t(62)= 2.64$, $p= .01$. The mean scores of ‘Views about Scientific Knowledge’ post-test results in the experimental group have increased more significantly than the mean scores of the control group. Thus, it may be said that the use of active learning applications in science course affected students’ ‘Views about Scientific Knowledge’ meaningfully. Related graphics with this scale are shown as follows:
Figure 1. Bar graphics for mean scores of research groups’ “Views about Scientific Knowledge” scale scores

4. Conclusion and Discussion

Analysis of the data indicated pre-test grades obtained “Views about Scientific Knowledge” scale, there were no statistically significant differences between research groups. According to post-test grades obtained from “Views about Scientific Knowledge” post-test there were statistically significant differences supporting the experimental group.

There are same research which support to our research in Turkey. Küçük (2006) investigated the influence of nature of science teaching activities based on explicit-reflective inquiry oriented approach on seventh grades students’ opinions about nature of science concepts. As a result nearly all of the students’ nature of science views was changed positively. Nature of science activities had also hanged students’ attitudes toward science lessons. This results supports to our research results.

References


