The Effects Of Concept Mapping On Primary School Students’ Understanding Of The Concepts Of Force And Motion

Aysel CANDAN¹, Lütfullah TÜRKMEN², Osman ÇARDAK³

¹ Primary Teacher, Ministry of Education, Ankara
² Assist. Prof. Dr., Afyon Kocatepe University, Uşak Faculty of Education, Uşak
³ Assist. Prof. Dr., Selçuk University, Faculty of Education, Konya

Received: 29 June 2005 Revised: 13 February 2006 Accepted: 01 March 2006

SYNOPSIS

Introduction

Since 1980, the importance and place of concepts have gotten the attention of many science educators and researchers in science education area. The reason of this attention is that learning and teaching science in schools are closely related to scientific concepts. On the other hand, studies have shown that students have serious problems to conceive science concepts. One of the expected results of these problems in science education could be easily seen in the nation-wide exams in Turkey that every year in the high school placement and university placement exams the general average of science achievement is almost equal to one to ten questions.

Science educators and researchers have begun to scrutinize what are the behind of these results and how the problems could be solved in the mean of the student low achievement and in the difficulty of conceiving the science related concepts. Concept maps have come to help to teach and learn concepts as well as to reveal misconceptions in science education. It is widely concerned that students in early grades have difficulty to comprehend the concepts of force and motion.

The Purpose of Study

The purpose of this study was to reveal fifth-grade primary school students’ misconceptions about the concepts of force and motion and to compare the effects of traditional teaching methods and concept maps in remedying these misconceptions. The following research questions were specifically addressed;

1. What were the misconceptions held by the sample of study concerning the concepts of force and motion?
2. Would training with concept maps or traditional introduction be more effective in improving students’ understanding of the concepts of motion and force?

Materials and Method

The research was designed as a quasi-experimental approach that concept maps and traditional teaching methods were applied to the experimental and control groups, respectively. The study approximately took six weeks. A thirty-item test was constructed for the purpose of identifying the students’ understanding and misconceptions concerning the concepts of force and motion. Each item in the test included one scientifically acceptable answer; one common misconception revealed during the interview sessions, and two reasonable and plausible distracters. The test was examined by a group of experts consisting of three science educators for its validity. The alpha reliability coefficient of the test was found 0.83. The test was used to collect data before and after the study as pre-test and post-test. Independent and paired-samples t-tests were used to answer the research questions of the study.

Findings

The interviews made with the students disclosed that fifth grade primary school students held misconceptions concerning the force and motion. The study indicated that the students in the experimental group, taught with the concept maps, showed greater achievement in the unit than did the students in the control group training with the traditional method. For example, according to the post-test results, the mean of experimental group was 22.44 but that of control group was 14.88. Independent t-test analysis showed that there was a statistically significant difference between the mean scores of experimental and control groups (t(48)= 5.907; p<0.05) with respect to their understanding of the concepts of force and motion after the treatment. On the other hand, there was no statistically significant difference observed between genders based on the pre and post-test results (P<0.05).

Conclusion

The results of this study provided further evidence to support the findings in the related literature indicating that concept mapping is still an effective tool to reveal misconceptions and to teach scientific concepts in fifth grade science courses. In addition, concept mapping can provide alternatives to traditional methods to remedial misconceptions.