The Effectiveness of The Learning Cycle Model to Increase Students’ Achievement In The Physics Laboratory

Hasret NUHOĞLU¹, Necati YALÇIN²

¹ Research Assist. Dr. Ahi Evran University, Education Faculty, Department of Science Education, Kirşehir
² Prof. Dr. Gazi University, Gazi Education Faculty, Department of Science Education, Ankara

Received: 17.10.2005 Revised: 11.04.2006 Accepted: 28.11.2006

The original language of article is Turkish (v.3, n.2, December 2006, pp.49-65)

SYNOPSIS

Introduction

Curiosity of the children towards science requires an effective method for teaching science topics. The method should facilitate learning of scientific knowledge and assist children to extend the knowledge by applying it in the daily life. Moreover it should prepare and organise the knowledge in children’s mind in a persistent form. “Learning Cycle” is a teaching model based on the knowledge organisation process of the mind. It helps students to apply concepts and to make their scientific knowledge persistent. Applying the model in the science lectures, especially in the laboratory courses, will be useful for students.

The learning cycle is a well established inductive approach to learning science (Renner, Abraham & Birnie, 1988). Atkins & Karplus (1962) formulated the learning cycle during the development of the Science Curriculum Improvement Study (SCIS) in the early 1960’s. The learning cycle as a curriculum framework was designed after the mental functioning model developed by Piaget. As a curriculum framework, the learning cycle provides experiences from which learners construct meaning. The literature contains a number of research studies stating the benefits of learning cycle on student attitude, academic achievement and acquisition of science process skills.

The learning cycle model consists of exploration, concept introduction and concept application. Exploration phase is known as the data-gathering and the exploring concept phase. This phase serves to stimulate curiosity, establish a need to know, raise questions, cause cognitive dissonance, or otherwise set the phase for more formal treatment of the concept, principle or relationship that is the focus of instruction (Abraham ve Renner, 1986). In the concept introduction phase, students share and discuss the data they have collected during the exploration phase. The sharing and discussion of student data is a crucial part of the theoretical basis of the learning cycle. It has also been called discovery, expanding concepts and expansion (Marek, Eubanks & Gallaher, 1990). In concept
application, the teacher facilitates the use of the concept in different contexts. These applications help extend and expand students’ understandings and apply the concept to everyday experiences. Different concept activities may include, but are not limited to, additional laboratory investigations, selected readings, relevant problems, computer applications, field trips, audiovisuals and demonstrations. The purpose of the application activities is to provide students with experiences that help them organize the concept (Marek ve Cavallo, 1997, Akt: Scolavino, 2002).

The aim of this study is to compare “Learning Cycle Model” with the “Traditional” Teaching Method. What is the effect of these methods on the attitude of the teacher candidates towards the physics laboratory? Which method is more successful?

In the first section of the study the learning cycle model is introduced and examined the importance of this method in the literature. In the second section, experimental design and research model of the study is determined. After the assessment tools used in order to collect the data from pre-service teachers are introduced, the statistical analysis is applied. The findings obtained from this study are compared with former studies. Some suggestions consist of the results are presented in the end of the study.

Methodology

The experimental design with pre-post test is applied in this study. The Learning Cycle Model and the Traditional Teaching Method is applied in the laboratory courses of “electricity and magnetism” topics in the first year basic physics course of the university. To compare both models, a group of 34 was selected as control group. The control group was taught with the traditional teaching method. The experimentation group had 35 members. Their laboratory courses were done according to the learning cycle model. The study is done in 2003-2004 semester with the first year students of the Gazi University Kirsehir Education Faculty Primary School Education Department Science Education Program.

In order to assess the subproblems of the study, two assessment tools are used: First tool is physics laboratory attitude scale. The tool is used in order to test whether the attitude of the candidate teachers is related to the teaching method. The sample related to the development phase of the scale consists of 318 science pre-service teachers studying in the Department of primary science education at the Faculty of education, Kirsehir at Gazi University. There are 19 positive and 17 negative attitude factors in the scale. The Cronbach-Alpha internal integrity coefficient of the final version of the scale was found to be 0.8930 after factor analysis was carried out. Science pre- service teachers’ attitudes towards physics laboratory were explored by a five point Likert scale.

The second tool is the scientific success test (SST) that includes electricity and magnetism subjects. The tool is used to compare the success degrees of the candidate teachers in the control and experiment groups. The data obtained through these evaluation tools are analysed by using SPSS. The statistical models used to analyse the data are descriptive statistics, dependent and independent t-tests and Pearson correlation analysis.

Findings

The statistical analyses show that the candidate teachers’ attitudes towards the physics laboratory did not have a meaningful difference between the control and experiment groups with regard to the teaching method. But the scientific success test shows a difference between the teaching methods. Before beginning the semester, the
control group had a higher success rate than the experiment group. At the end of the semester, the experiment group had a higher success rate. Moreover there is a positive, medium level of relation between the success rate and attitude towards the physics laboratory in the experiment group whereas the relation in the control group is in a much lower degree.

**Results and Suggestions**

Thus the results of this study show that learning cycle model is an educational model that helps to resolve the main problems in teaching the scientific knowledge. It facilitates students to learn effectively and organize the knowledge in a meaningful way. It achieves to make the knowledge long lasting. Students become more capable to apply their knowledge in other areas outside the original context. In addition that learning cycle model is designed to assist teachers in revealing student's preconceptions and misconceptions. Therefore during the exploration phase, the teacher implements the questioning strategies while students carry out their experiment. In the concept introduction phase, students construct their knowledge. Then the students expand their knowledge while they apply the topic to other cases.

**References**


