Effectiveness on Development of Logical Thinking Skills of Problem Based Learning Skills in Science Teaching

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SYPNOSIS

Introduction

One of the most essential goals of science education is to develop students’ scientific thinking skills. Piaget, Ausebel and Wallot who are important researcher pointed out that students must be active participant in order to acquire those skills in learning process. However, in our country (Turkey) it is clearly shown that teachers tend to teacher centered education rather student centered. In this system, students’ learning which is targeted knowledge and skills is more depended on teachers’ teaching skills than students’ own abilities. Therefore, naturally it can not be reached expected learning outcome especially in science education. Results show that the lowest success is to science education in centeral exams like University Entry Exam. When this situation took into consideraiton, it is unavoidable that alternative approaches must be used in science education.

Science education trains persons who can discover, explore, make right decisions, solve problems, and continuously learn. Problem-based learning (PBL) is one of the approaches in education that helps students to focus on themselves involving these educational environments. Howard Barrows first developed the PBL during 1960s in the field of medicine and later on it has been observed that its applications in other fields are also efficient. The most important features of PBL are; considering students as the center of learning, covering real life experiences, applying cooperative studies, using problem solving, developing communication skills, and promoting logical thinking.

Logical thinking is a skill which is determined in the period of abstract process in Piaget’s cognitive development phase. With logical thinking skills, learners solves the problem by doing various mental practices or reaches principals or rules by doing some abstraction and generalization. In PBL approach, students understand related concepts logically very well and solve problems easily by linking between previous knowledge and targeted knowledge in learning processes. Logical thinking is a skill which is considered important to develop from elementary school to university level. Therefore, studies which will conduct to that end contribute not only science education but also other fields. In this research, it was tried to examine the effects of both PBL method and traditional teaching methods on developing of student teachers’ logical thinking skills.
Aim of the Study

The purpose of this study is to determine whether students acquire logical thinking skills in different teaching methods and strategies which are used during the given the course. To that end, PBL approach was used as an alternative to traditional methods in laboratoruvar applications in this study. In that context, main research problem of this study is “is there any statistically significant between logical thinking skills of prospective teachers who continue education according to PBL approach and traditional teaching methods in science education and their gender and their according to ranking preference of department?”

Method of the Study

The design of this study is quasi-experimental design, because of a combination of the use of naturally assembled intact groups. In the study, pretest posttest control design group were conducted.

This research was conducted at the Gazi Faculty of Education, Gazi University in Turkey. Two hundred and twenty students, who take “Science Laboratory” course in the pre-service elementary teacher education programme, participated in the study. In the experimental group there were 105 and in the control group there were 115 students. All students, in two intact classes, took science laboratory course during second semester of sophomore years. Control group (115 students) received the traditional teaching methods of instruction while PBL from modern approaches for treatment group (105 students) was applied. Moreover The Group Assessment of Logical Thinking (GALT) developing by Roadrankga et al. (1982-83) was applied to measure students’ levels of cognitive development. The GALT consists of 21 questions which 18 of them are not only required student to pick the most appropriate answer, but also required the reason students’ choice that particular answer. The other 3 questions of GALT consist of open ended questions to determine students' logical thinking skills. This test was used by many researchers as a predictor of student’s logical thinking. In addition, this test measures students’ ability to apply logical thinking and scientific reasoning which involves testing hypotheses.

The data obtained in this study were analyzed through quantitatively. In order to determine the difference between the medium points of the experimental and control groups “t-test for independent variables;” to analyze the data obtained in different time frames for the same group, “t-test for dependent variables” have been used. The two-factor ANOVA technique for repeated measurements was used to determine whether pre-test and post-test mean scores of the groups differed statistically.

A Summary of Results

In the present study, it was intended to determine whether PBL is effective to develop logical thinking skills of the pre-service elementary teachers. After the application, it was realized that student teachers’ logical thinking skills developed better in treatment group than the control group. It was determined that, levels of student teachers’ logical thinking skills of the treatment group were significantly (p<0.05) different from the control group student teachers’. Results clearly show that especially PBL approach was effective in the development of logical thinking skills. In addition, gender of student teachers’ does not have meaningful effect on logical thinking skills, whereas their choices of departments have.
Discussion and Suggestions

It may be claimed that in order to implement PBL in science classes successfully and therefore to improve logical thinking skills, student teachers’ need to have higher level reasoning skills. This kind of studies will be beneficial for elementary science education. During PBL, students are mostly involved in gathering information, stating hypothesis, collecting and analyzing data, and drawing logical conclusions. PBL develops collaboration and interaction because it encourages students to study in teams. Therefore, learning outcomes, which occur by using of this approach, contribute the students’ development themselves. This study will also contribute how education can be made more effective. In addition, this study, which conducted in the field of teacher education, will be helpful to student teachers’ who serve in the elementary schools as well as in other educational institutes. Clearly, much additional study is needed to determine how to design an instruction to enhance students’ different skills.