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The investment effect of using WebQuest on logical thinking ability in science education

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Abstract

Access to information from the learning environment is one of the basic conditions of constructivist educational philosophy. Nowadays, internet is the most commonly used method for achieving knowledge. This information resource should be aligned with educational activities and objectives for efficient use of educational environment. WebQuest is a teaching method which was developed with this aim, was based on constructivist educational philosophy and it was preparing the environment for students working in collaboration. The aim of this study investigates the effect of using WebQuest on the students’ logical thinking ability. Pre-test and post-test trying model was used in this study. As a result of research the learning with WebQuest is be effective on students’ logical thinking ability.

Keywords: WebQuest; science education; logical thinking; learning; internet.

1. Introduction

Educational activities are restructuring within the cultural, scientific and technological effects in the current era. Look from a cultural perspective to this restructure, it is also a fact that a transition when the period of individual's learning from passive learner to creates its own information. Knowledge creation process and philosophical approaches that including to this process, have an important role in this transition. Nowadays, constructivist philosophy has been adopted in education. Constructivism that is an epistemology contains numerous descriptions about the knowing, known, information configuration process and the factors influencing to this process. According to constructivism, information is not taken as passively with our senses or various communication channels to outside world. Against, information was configured and produced by learner (Açıkgöz, 2005). Teaching methods and techniques were developed in this direction. Constructivism is concerned with the individual learning rather than teaching. Therefore, access to information and using that has become important. Reach to information, studies in physical activity such as the research and actively using cognitive items in this process, not to be found literal. Alternative sources as well as textbooks that should be offered for students reach to information. This reveals need to accordance classroom environment regulation in constructivist approach and information and communication
technologies were included in the learning process. The classes which applied constructivist approach are one of useful, spacious and comfortable learning space that has wealthy resources and material (Yıldırım ve Dönmez, 2008). In addition, learning - teaching activities which based on constructivist approach were required active participation. Because constructivist teaching practices provides the rich and interactive learning environment where based on complex and real-world problems, solve the problems within student access to information through cooperative learning activities receive information and analyze it (Gültekin, Karadağ and Yılmaz, 2007).

Nowadays internet is one of the important ways to reach of information. This unlimited information source used in the training and it provides interactive, collaborative study and configuration students’ own knowledge in use as a research tool (Förclier, 1999). Today's classrooms have changed direction to use for internet-supported information sources than accept the authority teachers and textbooks in the classes. As a result, students need to evaluation of the information and selected useful information for obtaining reliable information from the Internet (Clark, 2000). This also reveals the necessity the development of training materials that including teacher guidance for efficient use of the internet in the educational environment.

There is emerging necessity for effective use of the internet as well as contributing internet to the educational environment. WebQuest that have developed on this purpose in 1995 by Bernie Dodge, is an inquiry-oriented lesson method in which most or all the information that learners work with comes from the web (Dodge, 1997). This method that is based on constructivist approach, including pages which previously prepared by teachers and students will conduct research as outlined, access through internet, requires to problem solution related daily living and allowing students to work in cooperation. This inquiry based teaching method is provided the students were able to distinguish information in a meaningful way, developed their own problem-solving applications and was an interactive way to use internet resources (Lim ve Hernandez, 2007). WebQuests are includes activities that students require work individually or in collaboration over the Internet. There are introduction, task, process, resource, evaluation and conclusion pages for students required to follow when performing the activities. WebQuest is a web page which containing these steps.

Students work in groups with WebQuests. They are providing to do activities around a specific scenario while this working. They also research in prepared sources while completing steps around specific scenarios for put forward more than one solution method. A good WebQuest should have educational web resources determined through the internet, an authentic working process which motivating students, open-ended questions which must be investigated, developing individual skills, require groups to works, allows obtaining the actual information for learner and a structure contributes to the development of learning in this process. Also students see the connection between rich subject content and the daily living in a good WebQuest (March, 2003).

While students using these teaching methods, they are researching within the given sources. They are trying to achieve information which related to problems within activities. Thereby students' cognitive skills such as analysis, synthesis and evaluation were provided. Also logical thinking is intellectual skill which more used in problem-solving. Logical thinking is one of the features which in the Piaget's concrete operational and formal operational stages. In other words, logical thinking is the ability to show behaviours like effective use of numbers, generation scientific solutions to problems, analysis relationships between the concepts, categorize, generalize, express to a mathematical formula, calculating, hypothesize, examine and assimilate (Bozdoğan, 2007). Concrete operational stage is a term for used and determined logical thinking skill. Students are capable different levels of logical thinking skill in this stage. Certain age levels (16-18) are important for develop students logical thinking skills (Bektaşlı 2006). Most commonly used method of problem solving was applied to development of logical thinking skill. Logical thinking processes must be used for learning of concepts such as atomic structure, energy, power and motion in science education (Corvin 1987).

WebQuests are provided students to working with co-operation in learning. While the students learn with this method it required to using produced scientific solutions to the problems, generation, analysis, consolidation and logical thinking skills such as questioning and evaluating. Elwan (2007), in their study made with pre-service teachers, found that a significant increase development of problem-solving skills. However, it was necessary to determine the effect on students' logical thinking skills with the teaching of the WebQuest. For this purpose, statistically significant difference in terms of logical thinking ability were investigated between experimental group students who studying with WebQuest and control group students who studying according to revised primary school program.
2. Method

In the study, aimed to detect a difference in terms of logical thinking ability were investigated between teaching with WebQuest and studying according to revised primary school program. For this purpose, pre-test, post-test control group experimental design was used. Study conducted with sixth grade students who were determined experimental group (71) and control group (65). A WebQuest was prepared according the light concepts for teaching with the experimental group. Students never seen before in this subject and the use of this abstract concept does requirement mental skills have been influential selecting light concept in study. Students’ logical thinking abilities were determined by their scores from “Group Assessment of Logical Thinking” (GALT) (Zapponi and Zapponi, 2006). The test that used in this study was developed by Roadrangka, Yeany and Padilla (1982). Vantipa (1985) was calculated the tests’ cronbach alfa (.85) in his study that studying with 628 sixth grade students. This test has been adapted into Turkish by Aksu, Berberoğlu and Paykoç (1990) and they were calculated cronbach alfa .88 using ITEMAN (Akkuş, 2004, cf. Ören and Tezcan 2008). GALT as pre-test was applied to both groups at the beginning of the study. Study has continued during the two weeks. GALT as a last test was performed again both groups at the end of the study.

3. Findings

GALT as a pre-test and post-test was applied to experimental and control groups before and after the study. T test were conducted for determined differences between experimental and control groups’ pre-test scores and the results also given in Table 1.

| Groups            | N  | X    | Sd   | t    | p  |
|-------------------|----|------|------|------|----|
| Experimental Group| 64 | 1.94 | 1.75 | -1.84| 0.67|
| Control Group     | 71 | 1.42 | 1.49 |      |    |

p<.05

As seen in Table 1, there is no statistically significant difference between experimental (X=1.94) and control(X = 1.42) groups’ pre-test GALT mean scores (p>.05). It can be said to experimental and control groups GALT scores were equivalent at the beginning of the study. In addition, student scores at the beginning of the study show that all of the students were in the period of concrete operational. GALT as a post test was performed again experimental and control groups at the end of the study. Groups corrected post-test mean which according to pre-test also given in Table 2.

| Groups            | N  | Mean | Corrected Mean |
|-------------------|----|------|----------------|
| Control Group     | 65 | 1.38 | 1.51           |
| Experimental Group| 71 | 2.96 | 2.82           |

Experimental and control groups’ post test mean which according to pre-test also given in Table 2. GALT pre-test scores as control variables were taken into analysis and groups post-test scores were investigated. As it can be seen, experimental group corrected mean score (2.82) was higher than control groups (1.51). Table 3 also given, the difference between groups corrected post-test mean scores statistically significant concerning the Ancova results.

| Sources   | Type III Sum of Squares | df | Mean Square | F    | p    |
|-----------|-------------------------|----|-------------|------|------|
| Pre-test  | 97,540                  | 1  | 97,540      | 34,395| .000 |
| Groups    | 56,332                  | 1  | 56,332      | 19,864| .000 |
| Error     | 374,334                 | 132| 2,836       |      |      |
| Total     | 1214                    | 135|             |      |      |

p<.001
There were statistically significant differences observed (F = 19.864, p < .001) between GALT scores of experimental and control groups after the study. It can be seen, experimental group corrected the post-test mean (X = 2.82) score was higher than control group score (X = 1.51) and this difference is statistically significant. 13% of the variance on the experimental group has been explained by the applied methodology in study. It has been observed between post-test GALT scores and experimental group teaching method that used WebQuest.

4. Conclusion

There is no statistically significant difference between two groups’ pre-test GALT mean scores. Experimental and control groups GALT scores were equivalent at the beginning of the study. Experimental group students GALT scores was increased and control group students scores was a small percentage decreased after the study. It was observed that the experimental group GALT scores increased %96 between pre-test (1,75) and post-test scores (2,96). Statistically significant differences have occurred in favour of the experimental group in term of logical thinking ability after the study. It shows that WebQuests have a positive impact in the development of logical thinking ability of students.

It was seen according to the results of the test scores, students were in the stage of concrete operations. Students who ages of between 6-13 have higher logical thinking skills and they were at the beginning of the development in this period (Shapiro, Brien, 1970). Students have to use logical thinking skills within learning activities for the development of this ability. If teachers used the presentation method in laboratory for a long time than students were passive in learning and their logical thinking skills were not development (Cizkova, Ctrnactova, 2003). Therefore, used methods and techniques that students to be active in teaching and will put out the use mental skills, can support higher-level thinking. Student's take responsibility for learning and required to use higher-order thinking skills in learning with WebQuest (Donovan, 2005). The use of teaching activities related WebQuest needs to be increased for the development of logical thinking ability in the primary education period.

Logical thinking is one of the features which in the Piaget’ concrete operational and formal operational stages. This feature requires functional thinking, student participation and learning to interact with the environment for to participate in the primary program (Newby, 1972). While student learning with the WebQuest, they product independent ideas for the problem solving or learning products, takes responsibility for learning, are actively involved learning process and complete learn together with the study group. When these features were taken into consideration, that can be seen WebQuest as an ideal teaching technique for the used logical thinking ability in training programs and development of these ability.

Allan and Street (2007) study with the graduate and postgraduate students and in their studies, they put forward as the use of WebQuest developed higher-order thinking skills in education. Segers and Verhoeven(2009) study 229 sixth grade students during the 3 months. In their study, they investigate use of internet based learning and teaching purposes WebQuests effect on learning. They have determined among a statistically significant relationship between verbal-cognitive skills and students’ success with the use WebQuests. They have informed students’ higher-order thinking skills such as analysis, synthesis and evaluation emerged study with the WebQuest.

WebQuest were developing students’ problem-solving skills with its contained problems solving activities. In addition, it allows students to work systematically for activities to be done in task steps given a certain order. Students working at this stage, they were given analysis, synthesis and evaluation levels answers instead of short answer such as yes or no. Thus, will be supported the development of students' higher-order thinking skills. Besides, students used computer-based learning materials have affected the concept learning and development of cognitive field (Çepni, Taş and Köse, 2006). Students establish the relationship between rich contents and daily life within the learning WebQuest and learn by contributing to real world so that students put into cognitive structures during the learn process (March, 2003). These also contribute to the development of students’ mental skills.

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