THE EFFECT OF USE OF WEBQUEST IN SCIENCE EDUCATION ON SUCCESS, SELF-EFFICACY AND WEB-BASED EDUCATION ATTITUDES OF PRIMARY SCHOOL STUDENTS

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The aim targeted of the education is to raise specialists individuals open to information technologies, searching, following technological progresses, adapting changes fast. In accordance with this aim, diversification is seen in education environments. Web-based science education is a product of this diversification. Materials used to teach concepts are important in science education. Especially, considering mental, physical and psycho-social characteristics of children at the age of primary school, the significance of supporting science and technology class with teaching material will be understood. Web-based teaching being of a highly dynamic structure compared to traditional methods took its place in both subject and method concept in curriculums. Many approaches were developed for the computer to be used in education-teaching activities. One of these approaches is the "WebQuest" approach created by Bernie Dodge from San Dieago University in 1995. WebQuest model consistent with constructivist approach, prepared by teachers easily offers important benefits for using information technologies for education purpose. In this study, while WebQuest one of the techniques of web-based teaching method, success, attitude and perception of self-efficacy of students were discussed and it was aimed to introduce a different dimension to these discussions. For this reason, affect of use of WebQuest for the unit of light on academic success, attitudes of web-based teaching method and levels of self-efficacy of science and technology class of seventh-grade students was examined. Pre-test and post-test group semi-experimental pattern was used in the study. Number of participants is total 34 persons student groups as 17 persons of whom are control group attending to a private school, 15-persons are experimental group. In this study, lesson was taught to experimental group by WebQuest technique and was taught to control group based on constructivist approach. "Test of academic success in science and technology lesson" and "attitude scale about web-based education" and "scale of self-efficacy of science and technology lesson" applied before and after the study were used for collection of data. Data obtained were analyzed with the test of Mann Whitney-U. As a result of study, it was found out that Webquest technique in web-based

teaching method had important effect on academic success, self-efficacy of students and their attitudes for web-based teaching method.

Keywords: web-based teaching, science and technology teaching, WebQuest, academic success, attitude, self-efficacy

In the twenty first century information age, information is accessed fast, information accessed can be easily reproduced. Information technology has absolutely the biggest share for them. Significance of information technologies for societies is becoming more and more important (Şahin & Akçay, 2010). Such fast progress of technological advancement and change shows itself in education and training as well as all areas. Computer comes to the prominence in the progresses of education- training (American..., 1993). As computers and technology became widespread, Internet use emerged in line with the requests such as "accessing to information produces, information storage and easy access to the information" (Aggarwal, 2000). Recently use of Internet in schools, universities, social environments have obviously increased. While the prior aim of Internet use in academic sense was searching and learning, it has became an important part of lives of students (Chou, Condron & Belland, 2005). Internet is important for both teachers and students in terms of education. Learners on Internet can learn simultaneously and can interact with the other learners. In addition to this, other benefits of Internet include individuals requesting to receive education can obtain knowledge independently from other education groups, search and reinforce the subjects learnt (Seng & Mohamad, 2002). Basic science covers searching, asking questions, analyzing and thinking. One of the deficiencies of science deduction is that it does not support unique digital technology teaching (Linn 2003; Lunetta, Hofstein & Clough 2007).

Use of technology has positive effect of the process of science teaching and learning. Use of computer improves the attitude of students positively (Zucker, Tinker, Staudt, Mansfield & Metcalf, 2008). Researchers seek for new ways to correlate science and relevant concepts and subjects with daily lives of students by means of technology and research-based activities within this scope. As a result of this, the question of how we can integrate the technology in education appears. (Gaskill, Mcnulty & Brooks 2006). One of the possible answers of this question is the webquest approach enabling use of technology being in every areas of student's life in teaching-learning process.

Webquest was created by Bernie Dodge from San Diego State University in 1995. Webquest means that university students' using Internet sources and structuring knowledge by research-based activities (Dodge, 1995).

Webquest is a method based on research that student participates in learning fact actively, work alone or in groups to complete the attractive tasks and use Internet as a library (Kurtuluş & Kılıç, 2009). Webquest has been used by the teachers for contemporary learning- teaching process for the last decade (Wang & Hannafin, 2008). Webquest activities also means that students use web sources and reinforce the concepts learnt at school. This technique being the learner-centered is a method convenient for constructivist approach. According to constructivist approach, new knowledge should be made sense and old knowledge should be constructed with the new knowledge (Alesandrini & Larson, 2002).

Webquest is divided into two as short and long-term. The aim of Webquest for education-training is the acquisition and constitution of knowledge. In the end of short-term Webquest, the student will have acquired and make sense of the new knowledge. Long-term Webquest requires analysis of construction of knowledge in details by the student, interpretation and sharing these interpretations with the peers.

So the knowledge of the student increases. Long-term Webquest lasts one week to four weeks in the classroom while short-term Webquest lasts for one to three classes (Dodge, 1997). Webquest introduces critical thinking skill for the student and also contributes to think deeply and develop these opinions (Ikpeze & Boyd, 2007). Webquest allows students to search with learning affects, asking question, evaluate themselves, sytnhesi, construct the knowledge and improve skill of decision-making positively (Ridgeway, Peters & Tracy, 2002). Webquest supports constructing various theories, thinking critical and creative, permanent learning by interacting with surrounding, learning in cooperation, correlating learnt with the daily life during the process of teaching and learning with student-centered and project- based approach (Lamb & Teclehaimanot, 2004).

Two models are applicable in Internet and web technologies today. The first one is the synchronized model allowing teacher and the learner being in different locations physically to spend education experience simultaneously and be in interaction with each other. The other one is the unsynchronized model enabling the learner and teacher being in different location and in different times and the learner to learn at his/her own learning rate (Horton, 2000; Rosenberg, 2001; Driscoll, 2002). One of the major problems of formal education is that training activities are restricted to the school and activities of out of school are insufficient. As a result of this, occurring permanent behaviour changes for the student becomes difficult. Formal education by means of web technology does not only restrict to school activities but also it can make the behaviour changes of student permanent outside the school (Eşgi, 2006). Synchronized model and also unsynchronized model allowing the student to benefit from Webquest method while at home were used in this study.

The aim of this study is to test whether there is difference of "academic success of science and technology, attitude about web-based teaching and self-sufficiency of science and technology class" of the students of experimental group for whom webquest is used with the present teaching method (constructivist approach) and control group for whom present teaching method (constructivist approach) is used for "the unit of light" of 7.class science and technology subject or not. The answers of following questions were sought within this scope.

1- Is there a significant difference between science and technology achievement test (STST) pre-test scores of the experimental group and STST pre-test scores of the control group?
2- Is there a significant difference between STST final test scores of experimental group and STST final test scores of control group?
3- Is there a significant difference between attitude of web-based teaching (AWBT) pre-test scores of experimental group and AWBT pre-test scores of control group?
4- Is there a significant difference between AWBT final test scores of experimental group and AWBT final test scores of control group?

5- Is there a significant difference between science and technology self-sufficiency (STSS) pre-test scores of experimental group and STSS pre-test scores of control group?
6- Is there a significant difference between STSS final test scores of experimental group and STSS final test scores of control group?

Method

Research model

Two group as experimental group and control group was formed by objective assignment in the study. While present teaching program (constructivist approach) was taught to experimental group selected randomly as webquest-aided, control group was instructed by only present teaching program. In the end of experimental process, variables to be studied were applied as pre-test and final-test. For this reason, the model of study is the pre-test, final-test control group random pattern (Büyüköztürk, Çakmak, Akgün, Karadeniz & Demirel, 2011). This pattern is one of the patterns used to search the affects of innovations and changes widespread in education (Dugard & Toldman, 1995).

Research group

A research group was applied in this study as it could offer facilities in terms of time and accessibility. 32 students as 15 of them are the students attending to a private primary school in Antalya as the experimental group and 17 of them as the control group constitute the research group.

Data collection tool

Academic achievement test of science and technology. At the first stage of development of test, acquisitions of the unit of light of primary school seventh class science and technology program was taken into consideration. 2 multiple choice tests with total 36 questions to meet each acquisition were prepared. Questions prepared got reviewed by science and technology teachers, two academicians specialist in science and assessment and evaluation specialist. While preparing question items, development levels of seventh class students were considered. Before pre-implementation of the test, it was got read by four eight class students loudly.

Pre-implementation of the test was carried out with 150 students having similar socio-economic levels. Pre-implementation was analyzed and 1 test with total 18 items meeting each acquisition and distinctiveness of which were the lowest were eliminated from the test. The validity of 18 items was found high, average difficulty was 0,65 and reliability was found as 0.94. The test is a little easy and its distinctiveness is high.

Attitude scale of web-based teaching. To determine the attitudes of students about web-based teaching, "Attitude scale of web-based teaching" developed by Çetin (2010) was used in the study. The scale comprises of 20 attitude expressions. Cronbach Alpha's reliability coefficient of scale is 0,79r.

Self-sufficiency scale of science and technology. "Self-sufficiency scale of science and technology" developed by Tatar, Yildiz, Akpinar and Ergin (2009) was used to determine self-sufficiency of science and technology

course of the students in the study. The scale comprises of 27 attitude expressions. Cronbach Alpha's reliability coefficient of the scale is 0,93.

Analysis of data

To determine the difference between scores of experimental and control groups in terms of variables, statistical analysis was performed in "Mann Witney U test" SPSS program in the study. This analysis technique tests whether two unrelated groups have similar distributions in terms of variables studied (Büyüköztürk, 2002).

Experimental process

The researchers modelled the use of WebQuest in teaching and developed a WebQuest in science lesson. The WebQuest activity was carried out by researchers, who attended preparatory meetings specifically designed for purpose of this study. The meetings focused on familiarizing the students with the WebQuest's content, the tools of the WebQuest platform. The key feature of this instruction was to provide students with clear and detailed instructions and explanations. The teacher undertook the task of teaching content to students. In addition, class discussions between the teacher and student and among students after the WebQuest activity were embedded in the teaching format.

Following stages are applicable for basic parts of WebQuest: Introduction, tasks, process, information sources, assessment and conclusion steps are applicable (Dodge, 1997; Ikpeze & Boyd, 2007).

*Introduction :*At this stage a problem was presented by considering pre-knowledge of students about the unit of light. It was explained that the students could benefit from Webquest to solve the problems.

Tasks :Brief information was provided about what the students could do about unit of light at this stage.

Process : At this stage, what activities the students should perform and problems were explained clearly. For the students to solve four different problems about the unit of light, the students were asked to search, design an experiment in the end of research and implement the experiment and report the conclusions of experiment.

Information sources : At this stage some pdf files and links relevant to unit of light pre-determined by the researcher as in conformity with the age of participants. These links and pdf files were used to help students realize Webquest and reach the conclusion. The participants will search and acquire new knowledge and learn the questions in their mind by means of sources by clicking these links. Students to click the link in this part will access documentary videos about the unit of light, sources with subject explanation and much information about the subject.

Assessment : At this stage an explanation was presented about how the studies of students were evaluated. Table was used for assessment. Scores were assigned as per the level of sufficiency of tasks required to be completed. Scoring by level of sufficiency of participants is presented in Table 1.

Table 1. *Score key of assessment of Webquest-aided light unit*

	Required to be developed (10)	Average (15)	Good (20)	Very good (25)
Definition	Name, aim of the experiment, sentence of problem, hypothesis is incompatible with the study.	Name, aim of the experiment, sentence of problem, hypothesis is incompatible with the study partially.	Name, aim of the experiment, sentence of problem, hypothesis is compatible with the study.	Name, aim of the experiment, sentence of problem, hypothesis is compatible with the study and also expressions and approaches are quite unique.
Search	Theoretical information used is irrelevant with the study.	Most of theoretical information used is relevant with the study.	The whole of theoretical information is relevant with the study.	The whole of theoretical information used is relevant with the study. Moreover, a correlation is present between information acquired.
Practice	Steps of practice do not meet the aim of the study, material selection is not good, findings are not presented in good order.	Steps of practice meet the aim of the study, material selection is good, most of findings are presented in good order.	Steps of practice meet the aim of the study, material selection is good, all findings are presented in good order.	Steps of practice meet the aim of the study, material selection is good, all findings are presented in good order. The experiment is unique, visual materials are used for presentation of findings.
Presentation	The conclusion is not presented in conformity with the findings, references are not sufficient.	The conclusion is presented in conformity with the findings, references are not sufficient.	The conclusion is presented in conformity with the findings, references are sufficient.	The conclusion is presented in conformity with the findings, references are sufficient. Interpretations conforming to the conclusion are present, suggestions are made.

*Conclusion :*In the conclusion part, acquisitions to be reached within the curriculum were presented when the tasks assigned by the researcher are completed successfully. Participants performing tasks were congratulated.

Findings

Findings of the study are reviewed under six problems. Findings are presented in tables.

In table 2, "Mann Witney U Test" analysis results of scores of Science and technology achievement test (STSS) pre-test of experimental group and control group students were presented.

Table 2. *Mann Whitney U-Test results of science and technology achievement test (STSS) pre-test by the group*

Group	n	Mean Rank	Mean Rank Total	U	P
Experimental	15	17.93	269.00	106.00	.410
Control	17	15.24	259.00		

P>.05

In table 2, analysis of STSS pre-test scores of experimental and control group students, Mann Whitney was found as U: 106, p>.05. No statistical difference was found between STSS pre-test scores. STSS scores of experimental and control group are equivalent before th experimental process.

Results of "Mann Witney U test" analysis of scores of STSS final tests of the participants of Webquest- aided program (Constructivist approach) and present program (constructivist approach) of seventh class students and the ones only carrying on the present program (constructivist approach) are presented in Table 3.

Table 3. *Mann Whitney U-Test results of science and technology achievement test (STSS) final test scores by group*

Group	n	Mean Rank	Mean Rank Total	U	P
Experimental	15	21.27	319.00	56.00	.006
Control	17	12.29	209.00		

P< .05

In the end of four-week experimental study, a significant difference was found between STSS final test scores of students of present program (constructivist approach) and Webquest-aided education method and students of only present program (constructivist approach) as per table 3. U= 56.00, P< .05. Considering mean rank, it is seen that STSS final test scores of students being instructed by present program (constructivist approach) and Webquest-aided program and students being instructed by only present program (constructivist approach) is high. This finding shows that Webquest-aided education method is effective on increasing the success of science and technology class of students.

Mann-Whitney U test was applied to determine whether there is difference between AWBT scores of experimental and control group students for science education as shown in Table 4.

Table 4. *Mann Whitney U-Test results of Pre-test scores of attitude of web-based teaching scale by group*

Group	n	Mean Rank	Mean Rank Total	U	P
Experimental	15	17.20	258.00	117.00	.691
Control	17	15.88	270.00		

P>.05

As it is seen in Table 4, U value for difference between pre-test scores of AWBT of experimental and control group is 117.00 and it was insignificant as per p>.05 significance level. This finding shows that there is no difference between pre-test scores of AWBT of experimental and control group students.

Mann-Whitney U test was applied parametrically to find the difference between final test scores of attitude of web-based teaching of experimental and control groups as seen in Table 5.

Table 5. *Mann Whitney U-Test results of attitude of web-based teaching scale final test scores by group*

Group	n	Mean Rank	Mean Rank Total	U	P
Experimental	15	20.83	312.00	62.50	.014
Control	17	12.68	215.00		

P<.05

Mann Whitney U test conducted to test the difference of AWBT of experimental and control group is summarized in Table 5. It is seen that there is a significant difference between AWBT final test scores in favour of experimental group in Table 5 (U= 62.50, P<.05). Accordingly Webquest-aided method is effective to increase AWBT of experimental group students.

Data of pre-tests scores of experimental and control group of STSS scale before the test are presented in Table 6.

Table 6. *Mann Whitney U-Test results of science and technology self-sufficiency scale pre-test scores by group*

Group	n	Mean Rank	Mean Rank Total	U	P
Experimental	15	15.07	226.00	106.00	.416
Control	17	17.16	302.00		

p>.05

It is seen that there is no significant difference between STSS pre-test scores of experimental and control group in Table 6 (U= 106,00 p>.05). This finding shows that no significant difference at the level of p>.05 of STSS is present for experimental and control group students before the test.

Findings about STSS scale final test difference of experimental group for whom Webquest-aided teaching was used and control group for whom Webquest-aided teaching was not used are shown in Table 7.

Table 7. *Mann Whitney U-Test results of science and technology self-sufficiency sale final test scores by group*

Group	n	Mean Rank	Mean Rank Total	U	P
Experimental	15	22.00	330.00	45.00	.002
Control	17	16.65	198.00		

P<.05

Finding about variance of difference of STSS final test scores of experimental and control group of the study are presented in Table 7. Based on this finding, there is a significant difference between STSS scale final test scores of control group to whom Webquest-aided teaching method is not applicable and experimental group to whom Webquest-aided method is applicable based on this finding (U= 45.00, P<.05). It can be concluded by the mean rank total in the table that Webquest-aided method increases STSS of the students.

Conclusion

A significant difference between final test scores of "Science and technology academic success, attitude of web-based teaching and science and technology class self-sufficiency" of experimental group students to whom Webquest-aided teaching method is applicable and control group students to whom the program is not applicable was found. Based on this conclusion, it is seen that Webquest-aided teaching method increases academic success of science and technology, attitude of web-based teaching and self-sufficiency of science and technology class of participants.

Discussion

No statistically significant difference is applicable between AWBT, STSS, STST pre-test scores of experimental and control group participants in the study. In the end of activities of Webquest-aided teaching method applied to participants, it is seen that final test scores of AWBT, STSS, STST of participants are higher for experimental group participants than control group participants. Thus, Webquest-aided teaching method has a positive contribution to science education.

These findings also are similar to those found in previous studies (Chang, 2002; Finlay, 2009; Laborda, 2009; Lipscomb, 2003; Schofield, 1995; Wang & Reeves, 2006), which demonstrate that use of technology in teaching-

learning process has positive affect on motivation, attitude and success of students if we look at the literature.

In the study conducted by Gülbahar, Madran and Kalelioğlu (2010) at a private university with teacher candidates, it was found out that technology-aided teaching has a positive effect on feedback and planning works of participants. Moreover, Webquest site was used successfully fit for the purpose and in other studies, it was concluded that technology should be used in teaching-learning process. In the study of Kurtuluş and Kilic (2009) with fifth class students it was concluded that Webquest-aided cooperative learning method affects the mathematics learning level of students positively. Moreover, it was seen that scores of "Maths achievement test" of experimental group are higher than control group.

In the study conducted by Horzum and Çakir Balta (2008) with undergraduate students they compared the affect of demonstration, exercise and mixed web-based teaching methods and face-to-face teaching method on success, level of motivation and level of concern of computer. In the end of the study, academic success of students instructed by mixed web-based teaching method is higher and more permanent than other averages. It was concluded that there is no statistically significant difference in terms of variables of motivation and computer concern for exercise, demonstration, mixed web-based teaching methods.

In the science and technology class of primary school eight class of Çetin and Gunay (2010), a group was instructed by web-based teaching method and another group was instructed by present teaching program. In the end of the practice, a significant difference between academic achievement test and attitude scores of experimental group and control group was found. This difference is in favour of experimental group. In the study conducted by Hançer and Yalçin (2009) with primary school students, the affect of computer-aided teaching method and teacher-centered simple instruction method on academic success and permanency of science and technology class was examined. In the end of the study, it was seen that computer-aided teaching method is affective for increasing academic success and permanency of science and technology class. In the study conducted by Gülümbay (2005) with undergraduate students, experimental group to whom web-based teaching method is applicable and other group to whom face-to-face teaching method is applicable is seen. There is a significant difference between success scores of experimental and control group participants. This difference in favour of face-to-face teaching group. In the study carried out by Halat (2008) with classroom teacher candidates, affect of webquest-based practice on mathematics motivation was examined. Based on the study result designed by pre-test and final test control group pattern, mathematics motivation of experimental group students is higher than control group students statistically.

In the study performed by Carter (2002) with high school students, biology laboratory-aided teaching method and webquest-aided teaching method was applied. Webquest-aided teaching method has positive affects for many items in science laboratory environment scale compared to laboratory-aided teaching method. In the study carried out by Zucker, Tinker, Staudt, Mansfield and Metcalf (2008) with primary school students, the affect of technology to increase primary school science success was examined. It was seen that use of technology increased the success of science academic statistically for some units positively while it did not increase for some units.

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