ONLINE SEARCHING IN PROJECT-BASED LEARNING IN CHEMISTRY EDUCATION AND THE EVALUATION OF THE RESULTS

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ABSTRACT

In Project-based learning, students perform learning process by preparing a project in a chosen subject. The basic steps in this process are; determining the target question, determining the main aims of the study, forming the teams, determining the properties and presentation type of the result report, forming the working agenda, determining the control points and evaluation criteria. According to the working agenda, team collect data, organize them and prepare a presentation report. In the study; the students attend the 5th class of Hacettepe University, Faculty of Education , Department of Chemistry Education and were requested to prepare related with a chosen subject in the science education curriculum as well as evaluate the knowledge and data that they collected online. Students prepared 12 projects in groups of 3. After the Project presentation completed, the advantages of online data collection was discussed. After this, in the evaluation stage, an "Online Searching Questionnaire in Project-Based Learning" was used. The questionnaire consists of questions such as: Did you use search engine tools when you were searching the Internet about Project-based learning? Did you use scientific databases when you searched on the internet?; Did you use the government websites? Did you use personal web-sites, when you ….?After the evaluations, it was observed that computer-assisted applications in the Project-based learning model made students fully prepare for high level projects. The project achievement points of the students were above 90%.

INTRODUCTION

In 21st century, in our world which develops quickly, technology usage spreads gradually in every part. One of these parts is Chemistry Education. In European countries which caught the knowledge age, thanks to technology usage, knowledge became universal in chemistry part and other branches. Technology is a transformation of science into a practical art. In education, the function of technology is to support and facilitate learning. In teaching, technology must undertake a helping role; it should not be a goal of teaching. To develop learning, specialists successfully find usage of technology as a tool (Warger, 1990). Technologies which are used as a tool provide more meaningful thinking. Learners use technology as a tool to analyze the world, to reach information, to comment on their information, to put in order their information and to share their knowledge with other people. In our country in Chemistry Education: Computer Supported Education, Internet Usage, and Project Based Learning Model are used widespread in practices supported by technology.

Computer Based Education
Computer Based Education can be described as activities that students interact with a programmed lecture in a computer. Computers may be used as an educational strategy to improve overall learning and computer literacy in students. Many science teachers are currently using computers to produce tests and worksheets; record, calculate, and post student grades; develop tests and worksheets; and produce

supplementary items such as crossword puzzles, posters, and diagrams to support instructional activities The major factor inhibiting computer use is budgetary constraints (Morse, 1991). Computer Based Education saves time. It increases the production of learning. It removes difficulties which appear from individual differences. It verifies student centered education. It makes the learning easier. It motivates the student. It increases the quality and the efficiency of teaching. It makes lessons attractive. It creates a flexible learning environment.

Internet Usage
Internet recently is the most important development in a chemistry field. Internet usage is a method that provides right information in a short time. Internet supported learning provides to learners interaction and collaborative environments. Tools such as chat rooms, discussion groups, video-sound conference and e-mail groups provide to students chance to share and discuss their ideas and opinions (Holmes, 1996). This learning that takes part in unity atmosphere is one of an element of a successful science education. (Penhale, 1994). The recent introduction of the Internet into classrooms provides an opportunity for learners to access a wide range of digital resources on the World Wide Web (Hoffman, 1997). For teachers, students, and parents, this means access to information not in textbooks or the local library (Haury, 1996). The Internet also enables teachers and students to quick access to primary sources. Introducing and using primary sources in the classroom leads to active learning and to development of critical thinking and enhancement of learning process by allowing students to construct their own understandings (Shiroma, 2000). The teaching methods of an on-line chemical database research must be presented to chemistry teachers to encourage them to integrate an on-line searching into their chemistry programs (Carr, 1989). Students must be encouraged to execute the computer based interactive researches through various databases (Cooke, 1991). What a database is and how to use it, types of databases must be described. By creating and using databases, students develop research and organization skills. By searching databases, they learn to identify information needs, make problem statements, retrieve and sort information, and design strategies for organizing data (Parisi, 1985). Also information about internet usage must be provided to teachers to enhance learning (De Dicco, 1998).

Project Based Learning Model
Project based learning model is a basis teaching model of computer based education applications that emphasizes a technology usage as a tool. It accepts a project as an underside element. In a project based learning model students prepare a project relevant to their selected topic. Students determine the calendar of a project. Generally a project is prepared as a group. The presentation of a project is made with the power-point. Project based learning that uses a technology activates student centered education. It strengthens the social contacts of students in a group work. It encourages students to research. Students themselves reach the information. It includes upper level cognitive activities. It supports a usage of various tools and sources. It provides a possibility to control the process.

Web-Based Learning
Web-Based Learning is a method of the computer supported teaching. It is a learning model that supports an individual learning. In a Web Based Learning Model teacher and student are at the different places. It prevents the difficulties which appear from individual differences. It doesn't contribute to the social development of student because it prevents a communication of student-student, student-teacher. Web based learning is available anyone who wishes. There are no limitations on how many students can be accommodated. Neither students nor trainers incur the costs and time to travel to and attend a training class. Difficulties of finding a training site in a geographically area are eliminated. Training can be scheduled whenever and wherever a student wishes and for as long as desired. Web based learning technology allows testing and tracking students' progress (Hawkins, 1997).

The Purpose of the Study
The aim of this study is student's preparing a project related with a chosen subject in the chemistry education curriculum as well as evaluating the knowledge and data that they collected online.

METHOD

Sample
The sample of this research is the 33 students who attend the 5th class of Hacettepe University, Department of Chemistry Education in the 2003-2004 Spring terms.

Data Collection Tool
In this study, 'Online Searching Questionnaire in Project-Based Learning' was used as a data collection tool and presented to students. While students were preparing their projects and collecting data, whether they used searching motors, scientific databases, government websites, personal web pages were investigated in this questionnaire. While they were searching, whether they reached knowledge and which difficulties they had in the mean time were asked. Obtained data from students were transferred to computer medium with SPSS program and percent frequency was calculated. This questionnaire and the answers of students are shown in Table 3A, 3B, 3C, 3D.

FINDINGS

12 project target problems that were prepared by 33 students in project-based learning applications are showed in Table 1.

Table 1. Project Target Problems in Project-based learning Applications in Environmental Chemistry

1	What are the assignments of media and willing foundations to make the public opinion consciousness about environmental education and national environment policy?
2	What are the renewable energy resources?
3	Are students sufficiently consciousness in environmental education?
4	What is the global warming? What are the consequences of the global warming?
5	What are the environmental effects of chemical wastes that exist in the laboratories of high schools, universities and faculties which were presented chemistry education in Turkey? What are the necessary steps to reduce these effects to minimum level or remove these effects?
6	What are the advantages of clean energy resources?
7	What are the disadvantages and advantages of agricultural crops which are gene transferred?
8	What are the disadvantages of radioactivity wastes?
9	How can be taught to the students the hazardous chemicals within the products that were used in daily life and the protection methods from them?
10	How do toxic chemicals affect the environment?
11	How can be benefited from wastes as a raw material?
12	What are the solid wastes, hazardous wastes, waste water belong to the home or industry?

The student teams realized these projects within one month. The study process is shown in table 2.

Table 2. Study Calendar

Information about project and forming team	2 day
Planning of team works	2 day
On-line searching and data collection	10 day
Assessment of collected knowledge	4 day
Preparation of report and presentation	4 day
Discussion of works with other teams	2 day
Preparation of the presentation	3 day
Presentation	2 day
Assessment	1 day

RESULTS

The knowledge that was collected with a data collection tool from students who were participated to research was shown in Table 3.

Table 3A. Information which was determined in the extent of study

A)Did you use searching motors when you were searching the Internet about Project-based learning?	Number of Student	Percent frequency
• Yes	33	%100
1.Which searching motors did you use mostly? (www.google.com, www.arama.com ...e.g.)		
• www.google.com	33	%100
• www.arabul.com	4	%12,1
• www.yahoo.com	6	%18,2
• www.altavista.com	2	%6,1
• www.arama.com	1	%3,1
2.How much information did you reach from these web sites?	Number of Student	
• Most of them	16	%48,5
• All of them	13	%39,4
• Sufficiently	4	%12,1
3.Which projects, publications, scientific articles, research and reports that were prepared in abroad and homeland did you reach?	Number of Student	
• Generally to the publications of university	13	%39,4
• To the publication of foreign university	4	%12,1
• To the publications of foundations	10	%30,3
• To the publications of education sites	6	%18,2
4.Did you have any difficulties if you don't know foreign language?	Number of Student	
• I didn't have	7	%21,2
• I had	26	%78,8
• I didn't solve this problem and I didn't use foreign publications	14	%42,4
• My friend translated	7	%21,2
• I translated	4	%12,1
• We solved this problem as a group	4	%12,1
• I used dictionary	3	%9,1
5.Did you have any difficulties while you are using these engine tools? What are these difficulties?	Number of Student	
• I didn't have	14	%42,4
• We didn't reach some pages	6	%18,2
• Density of internet	4	%12,1
• Membership problems	2	%12,1
• Identification of the sites that are related to the topic was difficult	7	%21,2

All students have used these web sites and they have reached most of the information. At this time they have faced with foreign language problems because most of the sources were prepared in foreign language. They have overcome these problems with a usage of dictionary, with a cooperation of friends or with a translation as the groups. Some of the information has not been understand by some students who didn't have sufficient information of foreign language. Also they have faced with membership and download problems. Some of the students have not selected the information within all results because they didn't find the right key words.

Table 3B. Information which was determined in the extent of study

B)Did you use scientific databases when you searched on the internet?	Number of Student	Percent frequency
• No	30	%90,9
• Yes	3	%9,1
1.Which scientific databases did you use mostly? (ERIC, Wiley-Interscience, Kluwer...e.g)	Number of Student	
• ERIC	3	%9,1
2.How much information did you reach from these web databases?	Number of Student	
• Most of them	3	%9,1
3.Which projects, publications, scientific articles, research and reports that were prepared in abroad did you reach?	Number of Student	
• We reached the publications of universities	3	%9,1
4.Did you have any difficulties while you are using these databases? What are these difficulties?	Number of Student	
• I didn't have	2	%6,1
• Foreign Language	1	%3,1

Most of the students have not used scientific databases and have not reached the sufficient information because they didn't visit scientific databases. Also they have faced with foreign language problems. Some of the students who used scientific databases have reached some publications of universities and have used this information.

Table 3C. Information which was determined in the extent of study

C)Did you use the government websites, when you were searching the Internet about Project-based learning?	Number of Student	Percent frequency
• No	3	%9,1
• Yes	30	%90,9
1.Which government web sites did you use mostly?	Number of Student	
• TUBITAK (Turkish Scientific and Technical Research Foundation)	21	%63,6
• Environment Ministry	11	%33,3
• Education Ministry	12	%36,4
• Universities	6	%18,2
• Forest Ministry	5	%15,2
• TEMA Foundation	13	%39,4
2.How much information did you reach from these web sites?	Number of Student	
• All of them	5	%15,2
• Most of them	20	%60,6
• Partly	5	%15,2
3.Which projects, publications, scientific articles, research and reports that were prepared in abroad and homeland did you reach?	Number of Student	
• Projects and Publications of universities	15	%45,5
• Publications of Environment Ministry	15	%45,5
4.Did you have any difficulties while you are using web sites? What are these difficulties?	Number of Student	
• I didn't have	13	%39,4

• Membership problems	10	%30,3
• Information was not understood	3	%9,1
• Information was limited and little	3	%9,1
• Download problems	1	%3,1

Most of the students have used government web sites and they reached most of the information. They have reached publications and projects of universities and some of the Ministries and they have used this information. At this time they have faced with membership and download problems. According to some students this information was insufficient.

Table 3D. Information which was determined in the extent of study

D)Did you use personal web-sites, when you were searching the Internet about Project-based learning?	Number of Student	Percent frequency
• No	14	%42,4
• Yes	19	%57,6
1.Which personal websites did you use mostly?	**Number of Student**	
• Apple bilkom	1	%3,1
• Fondations of environment	9	%27,3
• www.sanalhoca.com	7	%21,2
• www.kimyaokulu.com	11	%33,3
• www.fenokulu.com	5	%15,2
• www.elma.net.tr	2	%6,1
2.How much information did you reach from these web sites?	**Number of Student**	
• All of them	3	%9,1
• Most of them	10	%30,3
• Partly	6	%18,2
3.Which projects, publications, scientific articles, research and reports that were prepared in abroad and homeland did you reach?	**Number of Student**	
• Projects that are related to the environment	6	%18,2
• Publications that are related to the technology of Education	4	%12,1
• Environmental Education	4	%12,1
• Analogies	3	%9,1
• I didn't reach.	2	%6,1
4.Did you have any difficulties while you are using web sites? What are these difficulties?	**Number of Student**	
• I didn't have	14	%42,4
• I didn't reach the sufficient information	2	%6,1
• Slowness of internet	2	%6,1
• Membership problems	1	%3,1

About half of the students have used personal websites and they have reached some of the information. Also they have faced with membership and download problems. According to some students these sites were insufficient.

DISCUSSION

Students reached the differently information because internet resources were various. According to the students, sometimes this information was sufficient and right, sometimes insufficient and wrong. Therefore students must be encouraged to a usage of appropriate databases. At the beginning, these

databases must be introduced to students and must be thought them to search with the right keywords. With this aim, an application that takes 2 hours is suggested as an access to on-line searching in project-based learning. As a solution of foreign language problems in an on-line research, web sites that are in native language of students must be prepared and studies in this topic must be supported.

In PBL, applications which was supported by an on-line searching provide advantages in enhance of student's performance. Namely,
- Learning of search: The project requires use of research skills and helps students to improve their research skills.
- Enhance of higher order thinking skills: The project has a focus on students improving their higher-order thinking skills.
- Learning of on-line searching: On-line searching in Project-based learning increases student's knowledge and skills.
- Performing group working: Students and teacher woks together and learn from each other.
- Learning of searching in Internet: The Internet provides a valuable learning environment and can be a major vehicle for school improvement.

Finally, in the extent of this study, relational learning directed to the specific goals realized with the projects which were prepared with collected information as an on-line. At the same time, student-centered learning appeared during the process of project preparation. Working in groups provided positive contributions because of motivation and sharing of the study. Especially, on-line collection of information in the collection and assessment of information step provided a contribution to learning process of the topic. Also consciousness of students who prepared projects related to the environment and the protection of environment about environment enhanced (Morgil, Arda, Seçken, Yavuz and Oskay, 2004).

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