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ASSESSMENT OF THE INQUIRY-BASED PROJECT IMPLEMENTATION PROCESS IN SCIENCE EDUCATION UPON STUDENTS' POINTS OF VIEWS

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Aim of the study is to assess how students in 6th, 7th and 8th grades of primary education see the project works made in science education and their implementation processes. The study was fulfilled upon the descriptive survey model to collect data. Participants of the research were 100 students who had project implementation experiences in science education, and they were from 24 primary schools in 7 districts randomly chosen in the city of Istanbul in Turkey. Data of the study were collected by using a semi-constructed interview form offered to students during the 2005-2006 teaching year. In the research, following items were examined: The extent to which students are inspired from the previously made projects during their own project selection process, the level of scientific document survey and the effects of contemporary events, science and technology class topics and students' interest areas. It was seen that internet is the mostly used source to obtain information. For students, one of the most problematic issues faced during the project implementation is the time limits set out by teacher. It was found that the most obvious benefit obtained by students from the project works is their increasing interest towards science and technology class. The most significant change seen by students regarding project preparation is their increasing grades in exams during and following the project works.

Key Words: active learning, inquiry based learning, project work, learning to learn, science education, Turkish sciences curriculum

INTRODUCTION

Contemporary international economic competition and social, scientific and technological developments have significantly changed ways of living all over the world. In the countries aiming at constructing powerful generations, it has been understood that science education plays a prominent role in flourishing scientific thinking and research, in learning how to study scientifically and in structuring attitudes towards natural sciences (AAAS, 1989; European Commission. 2004; NRC, 1996; Bybee, 1997).

Today, the nature of science education, scientific literacy, scientific process skills, scientific, technological, social and environmental understandings, science history and philosophy, socio-scientific and cognitive constructivist learning perspectives have all been considered as an important educational objective (Anderson, 2002; Atkin&Black, 2003; AAAS, 1993; Bell& Lederman, 2003; Akinoglu & Tandoğan, 2007). Science education is of great importance in raising individuals who search, discuss, experience, observe, learn and develop scientific attitudes constantly.

Fundamental objective of science education in primary schools is to enable students to observe their natural environment and to develop skills required to understand and explain both themselves and their environment. In science and technology education, the success of inquiry-based active learning depends on whether the required materials, environment, socio-psychological support and teaching guidance are offered (Bellipanni& Lilly, 1999; Brickhouse, 1990; Bybee, 2000; Chinn& Malhotra, 2002; Cothron, Giese& Rezba, 1996; DeBoer, 1991).One of the most spectacular and effective educational activities allowing learning by doing and inquiry-based active learning in science education is project activities. Projects play a prominent role in enabling students to understand the nature of science and in making students enjoy science classes. The use of project activities in science education is relied on Dewey's new school life and on that students learn how to solve problems by themselves here (Dewey, 1916; Dewey, 1938).

Projects include the searching of a problem through cognitive processes. In science education, project works could be distributed in a teaching year or they could be undertaken in science fairs or project contests at the end of teaching years. During the project preparation process, teacher gives referential books, various materials and equipments to students. S/he shows various measures which should be taken to avoid several problems during the project work. Students solve various problems by undertaking projects and thus, they process information and develop their skills of studying and thinking by themselves or in small groups. In project activities, students' active participation and works

are of major importance (Driver, Newton& Osborne, 2000; Ediger, 2005; Howe, 1997; Lederman, 2004; Minstrell, 2000; NRC, 2000). Project works are relied on planned research, examination and observation. Projects also pave the way for the attainment of report preparation and presentation skills. During project activities, students choose which project will be undertaken, prepare plans to solve project questions, implement these plans and discuss and assess the project process and results.

During the project implementation process, students are expected to develop their skills of thinking, problem solving, creativity, access to information, information processing, questioning, making conclusions, presentation and negotiation (Rutherford& Ahlgren, 1989; Schneider& Lumpe, 1996; Wells, 1994; Wilson, 2004; Yager, 2000). In the process, teacher acts as a facilitator and offers guidance to students. Here, students act autonomously and conceive the whole process. At the end of each project, a concrete output should be produced by students. Project development is basically a long, complex and demanding process. It requires students' high level thinking skills, such as creativity, inquiry, communication and scientific process skills. Both students and teachers face several difficulties when preparing and implementing projects. Through the study, it has been aimed at making a contribution to literature about the inquiry-based science project activities, which have been increasingly important recently, by examining students' perspectives.

Aim of the study

Through the study, it has been aimed to assess the project works made in science and technology education in 6^{th}, 7^{th} and 8^{th} grades of primary education upon students' perspectives, to determine whether the intended outcomes are produced through these projects, and to find out what difficulties are faced by both students and teachers during this sort of projects.

METHODOLOGY

Model of the research

Model of the research is of descriptive survey enabling to see the existing situation clearly.

Application

Participant group of the research was composed of 100 students who were actively involved in project works undertaken in 24 primary schools randomly chosen from 7 districts in the city of Istanbul, which are Üsküdar, Kadıköy, Ümraniye, Kartal, Beşiktaş, Maltepe and Eminönü.

Table 1. Characteristics of the study sample according to gender

Gender	*Frequency*	*Percentage*
	N	***%***
Female	58	58,0
Male	42	42,0
Total	100	100,0

100 students were participated in the research in total. 58 of them were female, constituting 58.0% of the total number of participants. The number of male students was 42, constituting 42.0% of the total number of participant students.

Table 2. Characteristics of the study sample according to grade

Grade	*Frequency*	*Percentage*
	N	***%***
6th	28	28,0
7th	41	41,0
8th	31	31,0
Total	100	100,0

6th graders and 7th graders constitute 28% and 41% of the total number of participant students, respectively. 31% of the total number of participants was in the 8th grade.

Data collection and data analysis

A semi-structured interview form was prepared to examine whether the intended outcomes were produced through the projects made in science and technology classes in primary schools, what difficulties were faced by both students and teachers when making these projects, and what students and teachers thought about the project processes. Being the main data collection tool of the research, the interview form was prepared through literature and project reviews and observations lasting one year. The form was finalized by taking the opinions of five specialists, and then it was applied during the 2005- 2006 teaching year. The data obtained via the semi-constructed interview form were assessed by using SPSS package computer program.

RESULTS

Following findings about the inquiry-based project works in science education were examined and interpreted in tables: the mostly used methods and techniques in science and technology class for students, the sources applied to select the topic of science projects, the mostly utilized sources to gather information, the most common difficulties faced during the project process for students, the most obvious benefit gained through project works for students,

the main problems faced by students when preparing science projects, the changes observed by students in themselves through the project processes, and the deficiencies seen when preparing science projects according to students.

Table 3. the mostly used methods and techniques in science and technology class

The mostly used methods and techniques	*Frequency* ***N***	*percentage* ***%***
Lecturing	20	20,0
Experiments	30	30,0
Trips- observation	3	3,0
Projects	10	10,0
Note-taking	15	15,0
Puzzles	8	8,0
Group works	10	10,0
Play- drama	4	4,0
Total	100	100,0

30% of the students who participated in the research said that the mostly used method in science and technology class is experiments. For 20% of the all participating students, the mostly used method is lecturing. 15% of the all students said that note-taking is the mostly applied technique. And 10% of the students said that the mostly utilized method in science and technology classes is project works.

Table 4. The sources applied to select the topic of science projects

Selection of project topics	*Frequency* ***N***	*Percentage* ***%***
Subject matters in science and technology class	14	14,0
The topics of projects previously made	30	30,0
Contemporary events	26	26,0
Scientific publications	20	20,0
Students' own interest areas	10	10,0
Total	100	100,0

In general, it was seen that students inspired from the topics of projects previously made when selecting their own projects' topics. 30% of the all participating students showed the topics of previously made projects as a main source used in the selection of project topics. This rate is followed by the inspiration from contemporary events and the use of scientific publication with 26% and 20%, respectively. 14% of the all students said that they benefited from the subject matters of science and technology class in selecting the topics of their own projects.

Table 5. The mostly utilized sources to gather information

What sources are being used to gather information	*Frequency* ***N***	*Percentage* ***%***
Books	9	9,0
Journals	6	6,0
Internet	49	49,0
Universities	7	7,0
Scientists	20	20,0
Libraries	9	9,0
Total	100	100,0

It was observed that the number of students who use internet to gather information is quite high. 49% of the all participating students in the research used internet to obtain the required information for their projects. 20% of the students said that they benefited from the works of scientists in gathering information for the projects. Other sources in the table lagged behind these two sources in terms of the use rate.

Table 6. The most common difficulties faced during the project process for students

The most common difficulty	*Frequency* ***N***	*percentage* ***%***
Finding project topic	29	29,0
Finding sources	10	10,0
Presentation of projects	13	13,0
Time-limits	37	37,0
Study environment	4	4,0
School administration	2	2,0
Gathering information	5	5,0
Total	100	100,0

It was detected that most of the students participated in the research saw the time-limits as the most common difficulty in undertaking projects. 37% of the students said that they had problems with project deadlines. This was followed by the difficulty in finding project topics with 29%. 13% of the all students were found to have problems about project presentations required to be made at the last stages of projects.

Table 7. The most obvious benefit gained through project works for students

The benefits of projects	*Frequency*	*Percentage*
	N	*%*
I participated in project contests	3	3, 0
I learned how to work in groups	4	4, 0
My curiosity about science has risen	8	8, 0
I am more interested in science and technology class now	47	47, 0
My self-confidence has risen	11	11, 0
My creative thinking skill has been developed	27	27, 0
Total	100	100,0

47% of the participating students said that they are more interested in science and technology class now. This is followed by the development of creative thinking skills with 27%.

Table 8. The main problems faced by students when preparing science projects

Problems faced when preparing projects	*Frequency*	*Percentage*
	N	***%***
We had no problems	3	3,0
Time is mostly very limited	25	25,0
I did not like the topic	12	12,0
It is difficult to find sources	14	14,0
I have problems in communicating with my teacher	35	35,0
I find topics and the whole project processes difficult	11	11,0
Total	100	100,0

35% of the all participating students said that they had problems with communicating with their teachers. For 25% of the all students, the main problem is time limitations. 14% of the students declared that they had problems with finding sources.

Table 9. The main changes observed by students in themselves through the project processes

Changes in students	*Frequency*	*percentage*
	N	***%***
My class grades increased	38	38,0
My curiosity about science has risen	24	24,0
My exam grades in other classes decreased because I need to work hard for science projects	21	21,0
I learned how to make a scientific work	17	17,0
Total	100	100,0

The mostly seen change in students who undertook science projects is the rise in their exam grades in science and technology class. 38% of the participating students said that their exam grades in the mentioned class increased. This is followed by the rise in students' curiosity about science and the learning how to make a scientific work with 24% and 17%, respectively. Yet, 21% of the students told that their exam grades in other classes decreased because of the demanding nature of science projects.

Table 10. The deficiencies seen when preparing science projects according to students

Deficiencies seen when preparing science projects	*Frequency* ***N***	*Percentage* ***%***
Project durations are short and limited	25	25,0
Teachers are not very knowledgeable about how to prepare science projects	36	36,0
Projects are mainly prepared for contests	23	23,0
Any sort of help cannot be demanded from organizations other than schools	2	2,0
We have acquired very few benefits from the project preparation processes	10	10,0
There are very few project contests	4	4,0
Total	100	100,0

For most of the participant students of the research, the most common deficiency seen when preparing projects is the very limited knowledge level of teachers about project making. This was said by 36% of the participants. 25% of the students told that project preparation durations are short and limited. For 23% of the participants, the main deficiency was that projects are mainly prepared for contests. 10% of the students claimed that they acquired very few benefits from the preparation of science projects. It was seen that 4% of the participating students saw the limited number of project contests as the main deficiency. And for 2% of the participants, the main deficiency was about the absence of any sort of help from organizations other than schools.

CONCLUSION

For the students, the mostly used method and technique in science and technology classes is the making experiments. This is followed by lecturing, note-taking, projects, group works, puzzles, play-drama and trip-observation, sequentially. It was seen that students inspired for the topics of previously made projects when selecting the topics of their own projects. This is followed by scientific publications review, contemporary events, subject matters in science and technology class, and interest areas of students. The main source used by

students to gather information is internet. This finding shows how much contemporary technologies affect science education. For most of the students, main difficulty faced when preparing science projects is time limits. This is followed by the difficulties in finding project topics. According to most of the participant students, the most obvious benefit gained via project works is their increasing interest about science and technology classes. Besides, they said that their creative thinking skills developed and their self-confidence level and curiosity about science and scientific works increased. For most of the students, the main problem faced by them when preparing projects is about the low level of communication and interaction with their teacher. This shows that there is an obvious problem about teachers' guidance in project preparation, project implementation and project management, which seems to be an unavoidable contributing factor for the development of students' scientific perceptions and scientific process skills in science education. To emphasize this point, most of the students said that the most prominent deficiency faced by them when preparing science projects is the very limited knowledge base of their teachers about project implementation and project management. Here, they underlined that they could not get enough support and guidance from their teachers. For most of the students, the main change they experienced is the significant rise in their science and technology class exam grades during and following project works. This finding can be interpreted as an indicator of how the quality of education can be increased and permanent learning could be maintained through the use of adequate educational methods and techniques. When all of the research findings based on the participant students' opinions are assessed as a whole, it is seen that students have problems specifically in finding project topics, finding sources and complying to project deadlines when preparing their projects in science and technology class. Yet despite all these problems, students believe that the project works in science classes bring them many benefits and advantages.

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