

Project Based Education System and Presentation of a Project Study

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Abstract

In this study, project based education system, its content and presentation of a project and how student-centered education can be applied in science lessons are presented. This study can be divided into two parts: In the first part, definition of project, key points in a project study and rules of writing a project study are given. Because increasing number of educators believe that project based learning model is an important instructional approach that enables students to develop academic skills and knowledge to overcome world's challenges. In the second part, a sample project is illustrated and covered according to the content and rules of writing. Sample project deals with an important topic which is water pollution and aims to degrade textile dyes from water. Due to the fact that dyes that are utilized in textile industry are carcinogenic, students want to find a way to degrade dyes in order to solve the problem. Students' study is appreciated as one of the model projects that was exhibited in an international project competition in 2009 in Turkey. Since 2009, my students have been doing projects by taking responsibility, studying outside of the classroom environment and have been awarded prizes in different project competitions.

Keywords: *project based education, student-centered, dynamic classroom, science education.*

1. Introduction

The aim of project-based education is to provide improvement in both academic and social behaviour of the student. It is very difficult to say that we can provide researcher, productive and creative behaviour development as a result of the teacher-based traditional ways. What can we do then, how can we find a way out? We can only answer the questions by revealing students' interests, observations and problems, and by giving them the responsibility to produce solutions in the cause and effect relationship. It is the essence of the scientific thought system that the students continue their learning outside of the classroom, take responsibility in learning process, and apply what they learn [1].

Memorization is dominant in our education for centuries. This has prevented us from forming a contemporary culture of science. According to the student profile of the 21st century; students should have the ability of scientific and rational thinking, ability to access, use and share information, ability to communicate, to use technology effectively and efficiently, renew themselves, adopt the common values of humanity, creative, productive, are willing to work, learn to learn and adopt lifelong learning. It is now a necessity to improve the quality of education, to ensure student participation at every stage of the education process for student success, and to organize learning experiences in a way to take account of their interests, demands, skills and needs [2].

Project topics should be determined according to the need, demand and level. In projects with a scientific study; gathering information, investigating the cause-effect relationship between the data obtained, transferring the information and results to the next generations are crucial. Increasing number of educators believe that project-based education is an important instructional approach that enables students to develop academic skills and knowledge to overcome world's challenges, by conducting experiments, using data collection tools, making statistical evaluations, learning to find cause and effect relations with graphical drawings and calculations and analysing the results [3].

2. What is a Project Study?

A project study is an experimental or a theoretical study, which creates a change in a predetermined period of time, with nested objectives and planned application steps, and should provide various outcomes [4,5].

2.1. Stages of a Project Study

The following steps should be applied while performing a project;



- Choosing the topic of the project: Project topic should be selected from the subjects that are of interest.
- Gathering information: Once the topic of the project has been determined, information should be collected from books, e-books, journals, internet, source persons and institutions. All kinds of written, oral and visual materials should be collected.
- Defining the project: The aim, objectives, method, steps, work schedule and expected results should be defined in the light of the information obtained after the emergence of the project idea [4].
- Defining the aim: The aim is a simple explanation of the desired result. Projects usually have only one purpose.
- Defining the goals: Goals should serve the defined purpose. Targets can be multiple. Measurable targets should be set in order to determine whether the targets have been achieved.
- Determining the schedule: The project is prepared in line with the objectives, methods and calendar set.
- Evaluation and report writing: At this stage, the results of the project and the impact of the project are evaluated. The purpose of the study reached is compared with the previous studies [5].

2.2. Key Points in a Project Study

Projects should be scientific, creative, applicable, clear and understandable. A meaningful relationship should be established between the definition, purpose, objectives and steps of the project. Projects must be unique and as a result of the project, it should be scientifically demonstrated that the project objectives have been achieved. The idea of the project should be from the student's interest. It is natural for the students to get support from universities or research institutions during a project including the use of devices or various instruments in laboratories. However, this support should be limited. The cause-effect relationship should be established and clarified in analysing the results [4,5]. Projects that are considered to pose a risk to public health and safety should not be made [5].

2.3. How should the project study be conducted?

Project work begins with curiosity and observation. It is the first step in preparing a project to wonder about what is happening in the environment and to make observations about the issues in this point of view.

During the study; conditions should be kept under a controlled environment. Most of the time, it is preferred and provided to work in laboratory conditions to better monitor and control the variables. All scientific studies are based on the results obtained from the experiments [4,5].

2.4. How should the project report be written?

Results of the observations and measurements should be recorded and the report should be as precise and coincide as possible [5]. The report should include the following titles:

- Project Name: It gives an idea about project as a single sentence.
- Purpose of the Project: What is intended by the project is explained in one or more sentences.
- Introduction: The work of others about the subject of project work is mentioned. This part describes the aspects of the study separated from similar studies and explain how similar studies are used and what the study aims at.
- Method: In this section, the path, observation and scope of the study are written. In experimental studies, the experimental setup clearly should explain how data is collected. The basic properties of the chemical and biological materials are specified including measuring range, sensitivity, etc. The knowledge of where, by whom, and how long the experiments are carried out should be written. Data charts, graphs, analysis and calculations should be given in this section.
- Conclusion and Discussion: The results obtained in the project study are written in this section. Numerical results are given in tables or graphs. Suggestions related to the subject are written in this section and lead to those who are interested in the subject and will do similar studies.
- Reference: In this section, written sources are given according to the author's name [1,5].

3. Sample Project Study

Photocatalytic Properties of Zinc Oxide in Degradation of Methyl Orange Azo Dye

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The textile industry exposes a large quantity of dyestuffs every year and unfortunately, organic dyes cannot be removed from the water by conventional treatment methods. These dyestuffs are organic substances that have a carcinogenic effect, which pose a great danger to the ecosystem, and cannot



be effectively and rapidly degraded by biological, physical and chemical treatment methods [6]. It was observed that the dyes were resistant to aerobic degradation. On the other hand, flocculation has failed in physical methods such as absorption on activated carbon. Chemical methods (chlorine and ozone use) are not preferred because of the high cost [7]. For this reason, advanced oxidation method is preferred. The reason for the advanced oxidation method is that the breakdown is fully realized and the reaction can be carried out under normal conditions. In addition, the catalysts used are cheap and easy to obtain and offer favourable conditions for degradation [8]. In the advanced oxidation methods, UV light was activated with a semiconductor and it was aimed to break down the target material. Titanium dioxide (TiO_2) is the most common semiconductor used. In previous studies, TiO_2 has been used as the best catalyst [9] and in the presence of TiO_2 , dyes such as acid red, acid orange and remazol red were subjected to degradation [8,10]. In this project, ZnO is used as an alternative to TiO_2 , and it was aimed to perform the breakdown of the methyl orange dye with UV irradiation. (This project was exhibited in an international project competition in Turkey which occurs every year.)



Figure 3.1. Students Conducting the Experiments

3. Conclusion

Transferring knowledge into daily life experiences, taking responsibility in learning processes, applying what have been learned are the crucial points in the project-based learning model. Project based education is an important instructional approach that enables students to develop academic skills and knowledge to overcome world's challenges. For this reason, project studies are carried out even at primary schools to improve the skills of students. In a project study, students firstly conduct a literature survey, perform experimental work using necessary data and try to advance their projects one step further by comparing with previous similar studies.

As students perform and share their projects, PBL model develops real-world problem solvers, thinkers, and performers instead of rule followers. I learned that encouraging students to step out of their comfort zones while performing a project study, creates amazing and authentic learning processes when teachers provide the right conditions. Project based learning model is more effective to generate positive learning environment for scientific studies. Students learn how to use the various equipments in laboratory, how to use the chemicals and how to find a result to their main hypothesis. PBL model is a good alternative for teachers to teach science courses, especially in experimental projects. Students take active roles in learning process and they are courage to explore their true potential.

As a result; Supporting the students, motivating them by making a project study, and involving both national and international project competitions are important for their development. The learners have more responsibility and become the ownership of their learning, and are not simply "passive individuals" receiving knowledge from the teacher.

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