



# THE IMPACT OF PROJECT-BASED LEARNING ON THE DEVELOPMENT OF COGNITIVE ACHIEVEMENT IN THE COURSE OF APPLICATIONS IN EDUCATIONAL TECHNOLOGY AMONG STUDENTS OF THE COLLEGE OF EDUCATION AT NAJRAN UNIVERSITY

Abdellah Ibrahim Mohammed Elfeky<sup>1</sup> and Marwa Yasien Helmy Elbyaly<sup>2</sup>

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## ABSTRACT

*Project-based learning is often seen as a viable alternative to traditional teacher-led teaching. However, little is known about the benefits of using project-based learning to develop cognitive achievement. Therefore, the aim of the current research is to reveal the impact of project-based learning on the development of cognitive achievement among students of the College of Education at Najran University. The research was conducted on a sample of students from the College of Education at Najran University, where they were randomly divided into two equal groups (experimental and control). The research tool consisted of an achievement test in the course of applications in educational technologies. The experimental results showed that there were statistically significant differences between the experimental and control groups in cognitive achievement in favor of the experimental group.*

*Keywords: Project; learning; project-based learning; Cognitive achievement, educational techniques*

<sup>1</sup>Department of Curriculum and Instruction, College of Education, Najran University, Najran, Saudi Arabia  
abdalah.elfeqi@spe.kfs.edu.eg, <https://orcid.org/0000-0001-9208-8537>

<sup>2</sup>Centre for Sharia, Educational and Humanitarian Research Center, Najran University, Najran, Saudi Arabia  
Marwa.mohamed1@spe.kfs.edu.eg, <https://orcid.org/0000-0001-5521-8494>

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## INTRODUCTION

A project term that refers to the process by which something is created over time [1, 2]. Project-based learning is a systematic method of teaching and learning, which engages learners in complex, real-world tasks that lead to a presentation to an audience or the production of a repeatable final product, enabling them to acquire knowledge and skills that help improve their lives [3-5]. Project-based learning not only equips learners with knowledge, but also helps them enhance critical and creative skills, teamwork, continuous learning, self-evaluation, and adaptation to changes [6, 7]. Besides, project-based learning is a new lifelong learning approach oriented towards education for sustainable development [8-10], and thus transferring and building new knowledge is one of the core activities in project-based learning that are related to Constructivism [3, 11]. Moreover, project-based learning also helps shift from teacher/curriculum-centered learning to learner-centered learning [12-15]. Findings from previous studies showed that project-based learning had a positive effect on learning motivation and academic achievement for learners using a topic-related problem in a real situation, compared to direct instruction [16-19]. In addition, project-based learning has been widely used in a variety of subjects, and studies have shown that this type of learning should be used for certain hours each week [3, 20, 21].

In other words, it can be said that project-based learning is an inquiry-based educational strategy that engages learners in constructing knowledge by having them develop real-world products and complete meaningful projects [16, 22]. This educational strategy also helps learners develop their practical skills. In addition, thinking, thereby enhancing their scientific, research and decision-making skills [17, 23]. Project-based learning also allows learners to engage in activities similar to those carried out by professionals in the real world [24]. In a project-based learning approach, learners are divided into groups of different sizes, and all have equal responsibilities and roles in completing the project [25-27]. Besides, project-based learning exercises and processes involve using the mind or the brain to make connections through learning, thinking, and expression to see differences in viewpoints [8, 28]. Thus, project-based learning is grounded in research-based theoretical ideas, active construction, social interactions, and cognitive tools [29, 30]. Project-based learning allows students to learn by asking questions to pursue solutions, communicate with others, discuss ideas, and design plans [31-33]. The first purpose of project-based learning is to enhance learners' ability to systematically research a question based on a problem, the second purpose is to promote self-learning, and the third is content acquisition [18, 34]. In addition, it is expected that project-based learning will

be a solution that learners can enjoy to support their way of thinking and interest in the learning process, and it can also provide a creative space in building the learners' personality [35-37].

It should be noted that some previous research has found that project-based learning can develop a variety of learning outcomes, for example; it has a significant positive effect on the academic success of learners compared to traditional education [3, 35, 36]. Besides, it also has a significant positive impact on the innovative thinking of the learners [6, 38]. Similarly, adopting project-based learning to enhance self-efficacy was more beneficial [17, 31, 39]. However, the relevant literature review did not reveal a rigorous effort to use project-based learning to develop cognitive achievement among students of the College of Education at Najran University. Based on the foregoing, the current research attempts to bridge this gap by studying the impact of project-based learning on the development of cognitive achievement in the course of applications in educational technology among students of the College of Education at Najran University.

### **Research Problem**

The problem of the current research appeared due to the frequent and noticeable decrease in the cognitive achievement of students of the College of Education at Najran University in the course "Applications in Education Technology". Which hinders the achievement of the objectives of the course, and at the same time helps project-based learning to shift from teacher-centered learning/ curriculum to Learner-centered learning [17]. The results of previous studies also showed that project-based learning had a positive effect on learning motivation and academic achievement for learners who use a topic-related problem in a real situation, compared to direct learning [16-18]. However, little is known about whether project-based learning is effective in developing cognitive achievement among students of the College of Education at Najran University. Based on this, the problem of the current research can be formulated in a question about "What is the impact of project-based learning on the development of cognitive achievement in the course of applications in educational technology among students of the College of Education at Najran University?"

### **Research Aims**

The main objective of the current research is to explore the impact of project-based learning on the development of cognitive achievement in the course of applications in educational technology for students of the College of Education at Najran University.

### **Research Importance**

The results of this current research are expected to contribute to:

- Benefiting from project-based learning in serving the teaching and learning processes.
- Employing cooperation and interaction between peers in project-based learning, which helps achieve the course objectives.
- Directing attention to benefiting from project-based learning in higher education institutions.
- Developing cognitive achievement in the "applications in educational technology" course.

### **Research Limits**

This research has a set of limitations, which can be explained as follows:

#### **Objective Determinants**

This research is limited to revealing the impact of project-based learning on the development of cognitive achievement among students of the College of Education at Najran University in the course "Applications in Education Technology". Where the content is presented to the experimental group through virtual classrooms Collaborate Ultra Experience LTI, which is presented through the Blackboard platform Blackboard in an interesting way through a short discussion to activate students' prior knowledge.

#### **Human Determinants**

The sample of this research is limited to students of the Department of Education and Psychology at the College of Education - Najran University.

#### **Temporal Determinants**

The time limits are the second semester of the academic year 2021.

#### **Spatial Determinants**

The College of Education at Najran University represented the spatial determinants of the current research.

## **RESEARCH TERMS**

### **Project Based Learning**

Project-based learning is a systematic method of teaching and learning, which engages learners in complex, real-world tasks that lead to an audience presentation or the production of a repeatable final product, enabling them to

acquire knowledge and skills that help improve their lives [3, 4]. The researcher adopts this definition as a procedural one.

### **Cognitive Achievement**

The degree of acquisition achieved by the individual in a study subject or educational content, and achievement tests are designed to measure the extent to which learners absorb some knowledge, concepts, and skills related to the subject matter or educational content at a specific time or at the end of a certain educational period [26, 40]. It is defined procedurally in this research as the degree of acquisition achieved by the student in the research methodology subject. Achievement tests are designed to measure the extent to which students absorb some knowledge, concepts and skills related to the research methodology subject at a specific time or at the end of a specific educational period.

### **METHODOLOGY**

The methodology of the current research was to use the experimental approach (with semi-experimental designs) in order to find out the impact of an independent variable (project-based learning) on the dependent variables (cognitive achievement and critical thinking skills), and based on that, use the semi-experimental design shown in the following table:

**Table (1):** Quasi-experimental research design

	Treatment	Post-test
Experimental Group	Project based learning	Achievement test
Control Group	Traditional way	

### **Research tool (Achievement Test)**

The vocabulary of the test was formulated based on the educational objectives to be achieved by learning the educational content of the "Research Methods" course, and it was also formulated to suit the scientific level of the sample members. The test consists of (10) complete items, and (10) true and false items. The test was initially conducted on a survey group of students from the Department of Education and Psychology at the College of Education - Najran University, numbering (10) students. The appropriate time for the test was determined (22) minutes, and by calculating the stability of the test using Cronbach's Alpha equation, to reach (0.86), so that the results obtained when applying the test to the research sample can be trusted.

### **Research Sample**

The research sample consisted of (50) students in the seventh level in the Department of Education and Psychology at the College of Education - Najran University during the second semester of the academic year 2021. Moreover, divided them into two equal groups (experimental and control). The experimental group to study the course "applications in educational technology" through learning based on projects, and the control group through the traditional method.

حفظ الترجمة

### **Research Variables**

This research includes a number of variables, as follows:

- The independent variable: project-based learning.
- Dependent variables: cognitive achievement.

### **Experimental Processing Material**

This research was based on the course "Applications in Education Technology" through the Blackboard platform, continued during the second semester 2021. The experimental group was divided into subgroups of 5 students, as proposed by Chen and Yang [3] and Olatoye and Adekoya [41] for the size of the project-based learning group, in order to enable more personal interactions between students. So that the project-based learning process goes through the following steps: First: the lecturer introduces the topic (via the Collaborate Ultra Experience LTI virtual classroom, which is used by merging it with Blackboard platform) in an interesting way through a short discussion to activate students' prior knowledge. Second: Students in each subgroup (in the experimental group) are encouraged to devise a motivation question to help them stay focused on the topic of the project and provide them with motivation to complete it. Third: Determine the tasks and roles of students in each subgroup; where each subgroup member/student is responsible for contributing, and then individually collecting data associated with the leadership question. Fourth: Students in each subgroup should share the information they obtained with each other (via a virtual classroom) to investigate, evaluate and discuss it, then students can devise more sub-questions to further clarify the information. Besides, the lecturer also provides constructive feedback for each sub-group. Finally the product of each subgroup is presented (also via a virtual class) collaboratively to the other subgroups.

On the other hand, the control group learns the course content through (10) separate lectures given through the traditional classroom. In addition, interaction with the students of the control group takes place inside the classroom

to enhance their participation and allow them to establish relationships with their peers to convey their views and discuss. In the end, the achievement test is applied to all students in the experimental and control groups.

### Statistical Processing

To answer the research question, a T. test for independent samples was used to see whether the use of project-based learning produced significant differences in cognitive achievement.

### RESULTS

By extracting the averages of the arithmetic scores for the application of the post achievement test for the two research groups (experimental and control) to answer the first question of the research, in an attempt to explore whether there are statistically significant differences between the experimental and control groups in cognitive achievement due to the use of project-based learning. The following table shows the results of the "T" test for independent samples to compare the average scores of cognitive achievement for both groups.

**Table (2):** The results of the "T" test for independent samples to compare the average scores of cognitive achievement for two groups (experimental and control)

Group	M	SD	M-Difference	T. Ratio	Sig.
Experimental Group	18.6	2.598	3.7	3.7	.039
Control Group	14.9	3.182			

From the previous table, it is clear that the value of "t" for the difference between the mean scores of students of the two groups (experimental and control) in the achievement test was (3.95). Moreover, the mean score of students in the control group was (14.9). While the average score of students in the experimental group was (18.6). Thus we find the value of "t" is statistically significant, and in such cases. The statistical significance is directed in favor of the higher group on average, which is the experimental group, by an increase of (3.7) over the control group. Thus, the statistical significance is directed in favor of the experimental group (higher in average) that is taught by project-based learning, compared to the control group that is taught in the traditional way, and thus the research has answered the first question.

### DISCUSSION

The aim of the current research was to reveal the impact of project-based learning on the development of cognitive achievement in the course of applications in educational technology for students of the College of Education at Najran University. In addition, the results showed that there were statistically significant differences between the experimental and control groups in cognitive achievement in favor of the experimental group.

The result is in line with the results of a number of previous researches such as [3, 35]. This result may be attributed to a variety of reasons, for example, interaction with peers and lecturers and the exchange of knowledge via the Internet also has a significant impact on the participation of learners, which leads to the development of academic performance of learners (Ansari & Khan, 2020). In addition, relying on cooperative learning during the project as a strategy through learning based on inquiry and asking questions leads to enhancing the achievement of learners directly [42].

### RECOMMENDATIONS

In the light of the results of this research, the researchers conclude the following recommendations:

- Training the teaching staff on the skills of using project-based learning within the framework of their various disciplines.
- Developing cognitive achievement using other methods and strategies.
- Paying attention to the development of cognitive achievement in other educational levels.

### SUGGESTED RESEARCH

In the light of the research problem, the researchers conclude a number of proposals:

- Conducting other research at the postgraduate levels, with the aim of confirming the effectiveness of using project-based learning in other environments.
- Conducting more research to reveal the effectiveness of using augmented reality in developing cognitive achievement.
- Conducting research to explore the impact of using collaborative e-learning on the development of cognitive achievement among samples of female students.

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