

The effectiveness of project-based learning on students' academic achievement in emergency nursing study

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Abstract

Projects necessitate students to choose and identify constructive models of investigation and materials while employing appropriate strategies for conducting learning activities. However, the

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effectiveness of such methods in the context of nursing-specific education has not been extensively explored. This study aimed to assess the effectiveness of project-based learning in emergency and critical care nursing courses for nursing students. This study employed a pre-experimental design. The research sample consisted of 123 students enrolled in the emergency, critical, and disaster management nursing course at Universitas Jember. The research involved a comparison of students' learning outcomes through written test questions before and after they completed a project. The results of the learning assessment before and after the project intervention were analyzed using the Wilcoxon Test. The results of the bivariate obtained a significance value of 0.0001. The results of this statistical test can be concluded that the project-based learning method is effective in increasing the knowledge of emergency, critical and disaster nursing. The project-based learning method proves to be effective in enhancing students' comprehension of emergency, critical, and disaster nursing. Nursing educational institutions can consider the incorporation of this method in curriculum design to create more effective learning strategies. It serves as a promising alternative for enhancing the quality of nursing education. Further research is necessary to validate these findings and investigate various factors that may influence the effectiveness of project-based learning methods in the nursing context.

Introduction

The lack of active involvement of students in conventional learning, can affect their academic achievement in the field of emergency nursing.¹ Furthermore, given the rapid advancements in medical technology and evolving practices in emergency nursing, there is an increasing demand for college students to attain a profound understanding and enhance their skills. An additional challenge is students' ability to bridge theoretical knowledge to real-world practice, and the necessity to foster robust teamwork skills in urgent medical scenarios.¹ Thus, education will always be a form of investment in human resource development.²

The scientific attitude of the students in the class remains at a very low level. An evaluation, conducted using observation sheets to assess students' scientific attitudes, revealed that approximately 79.31% of students in the class displayed a lack of scientific attitudes. Throughout the learning process, aspects such as interest in acquiring knowledge, critical thinking skills, respect for data and facts, open-mindedness, cooperation, and perseverance remain at minimal levels. Regarding curiosity, only eight students demonstrated enthusiasm in seeking answers when the lecturer posed questions, while the remaining 21 students simply listened without actively seeking answers to the questions raised by the teacher.³ The main benefit of education is as a talent developer with a systematic and focused strategy to make human resources more qualified with insights, attitudes, skills, abilities, and expertise in accordance with their fields both regionally, nationally, or internationally. Learning strategies must be applied to adapt to the char-

acteristics or conditions. Many learning models are used, one of which is project-based learning.^{2,4-6} The application of project-based learning provides opportunities for each student to support active learning, provide teamwork skills, improve critical thinking, and develop communication skills. Project-based learning is known to be more effective than other learning models in improving academic curriculum outcomes. The project-based learning model can be applied to students because this model has great potential to improve the experience of entering the world of work by practicing good collaboration.⁷⁻⁹

Based on previous research, the project-based learning method can improve students' scientific attitudes by increasing students' activity, seriousness, and cooperation in attending lectures, and it is believed that this method is the most effective.¹⁰ The project-based learning model is developed based on learning activities and the development of students' thinking levels, making it easier for them to move according to their learning interests, abilities, and comfort. This model helps students to decide which projects to work on by identifying activities, and topics and formulating questions.¹⁰ Project-based learning supports students in experiencing concepts and principles that will result in a product in the project, thereby significantly extending the learning experience.¹¹ Project-based learning emphasizes choice, responsibility, autonomy, and working time to complete the project appropriately. Project-based learning focuses on problems with concepts and principles to be solved.³ Project-based learning is a learning process to achieve competence in skills, attitudes, and knowledge. In project-based learning, learning activities take place in heterogeneous groups using activities as media. This learning method uses problems to gather and integrate real-world experience with new knowledge. Project-based learning is designed to be used to investigate and understand the complex problems required.^{12,13}

Through this project-based learning, students will learn concepts and learning strategies that match the characteristics of their experiences when receiving lessons that have been experienced. Projects make students choose and find constructive investigation models, as well as materials with appropriate strategies to carry out learning activities. These investigations can be in the form of discovery or problem-solving, decision-making, design, invention, or model-building processes.¹⁴ The model-building process and to be called a project that meets the criteria of project-based learning, these activities must include the transformation and construction of knowledge on the part of students.¹⁴ Learning using the Project-based learning method further improves students' scientific attitudes, because project-based learning can improve students' scientific attitudes.³ However, its effectiveness in nursing-specific learning has not been widely explored. This study aimed to determine the effectiveness of project-based learning methods in emergency and critical care nursing courses for nursing students.

Materials and Methods

Research design

This study employed a pre-experimental approach using a pre-post-test design without a control group. The research was conducted according to the pre-established plan for the emergency nursing, critical care, and disaster management courses, utilizing the project-based learning model.

Study participants

The population of this study was conducted on 5th semester students of the 2022-2023 academic year. The sample was selected using the total sampling method. Specifically, the research sample included 123 students from the College of Nursing specializing in emergency, critical, and disaster management at Universitas Jember. The inclusion criteria for this study required students to be willing to participate in lecture activities from week 1 to week 16 with a perfect attendance rate of 100%. Additionally, they should not have attended BLS, BTCLS, or similar training activities. The students should be actively enrolled in the class of 2020, 2019, or 2018. Exclusion criteria included students who withdrew as respondents before the evaluation of the project-based method.

The research procedure consisted of four stages. The first stage involved action planning, including the preparation of a semester learning plan, planning for project-based learning, preparing relevant learning media and resources, creating a Sheet of Work, crafting an Observation Sheet, and developing evaluation sheets. The second stage encompassed the implementation of the action. Researchers applied the project-based learning model to emergency nursing, critical care, and disaster management courses. Researchers, in collaboration with a partner lecturer, filled out observation guidelines and observation sheets to monitor the learning processes and outcomes. The third stage involved action observation, where researchers conducted observations and recorded all relevant activities during the implementation of the project-based learning program. This program involved a disaster simulation, which was assessed using an evaluation instrument consisting of 14 observation items. These items covered various aspects of students' abilities, including triage, bandaging, evacuation, transportation, primary surveys, respiratory tract clearance, respiratory assistance, cardiopulmonary resuscitation, fluid resuscitation, bronchial hygiene, glucose monitoring, installation of ECG/bed-side monitors, and the use of infusion or syringe pumps. Each item was scored on a scale from 1 to 4, with a maximum score of 4 indicating the ability to perform the actions correctly and sequentially. Lower scores denoted lower skill levels.

Variable, instrument and data collection

The independent variables in this study encompass the implementation of project-based learning models, while the dependent variables include measurable student learning outcomes in the context of emergency, critical, and disaster nursing management courses. Independent variables were assessed using an observation sheet in the form of a checklist, while dependent variables were measured using the project-based learning assessment sections specific to emergency, critical, and disaster nursing management. The preliminary data measurement (pre-test) took place prior to the respondents engaging in project-based learning tasks during the tenth week of classes. Subsequently, from the eleventh to the fifteenth week of lectures, respondents completed project-based learning tasks in the form of simulations related to emergency, critical, and disaster nursing management. Finally, during the sixteenth week, a post-test re-measurement of data was conducted using the project-based learning assessment sections for emergency, critical, and disaster nursing management.

Aspects of assessment related to emergency nursing or first aid. Each aspect has a number of criteria to be evaluated, with scores given based on the extent to which the necessary action is implemented by the individual being evaluated. Here is a brief explanation for each aspect: i) Triage: This assesses the ability of individuals to implement START triage by giving a score based on how well they perform the START triage components (respiratory,

perfusion, and mental status). Scores are given based on the correct amount and whether the components are executed in sequence; ii) Beads: This evaluates the ability of individuals to do beads correctly. Scores are given based on how well they do the assessment of beads needs, the selection of the right materials and tools, following the right procedures and techniques, and the proper evaluation and monitoring; iii) Evacuation: It evaluates the ability of an individual to undertake evacuation actions, including an assessment of evacuating needs, the use of appropriate materials and tools, follow-up to the correct evacuating procedures and techniques, and appropriate evaluation and monitoring; iv) Transportation: It assesses the ability of an individual to carry out transportation actions, including an assessment of transportation needs, the proper use of materials and tools, following the correct transportation procedures and techniques, and appropriate evaluation and monitoring; v) Primary Survey: This assesses the ability of individuals to conduct primary surveys in emergency situations. Scores are given based on how well they can perform the Airway, Breathing, Circulation, Disability, and Exposure (ABCDE) components, as well as whether they are performed in sequence; vi) Respiratory release: This assesses the ability of an individual to perform proper respiratory release actions. Scores are given based on how well they perform. They need assessments, the right materials and tools, the right procedures and techniques, and proper evaluation and monitoring; vii) Respiratory Assistance: This assesses the ability of individuals to provide proper respiratory assistance. Scores are given based on the extent to which they can carry out needs assessments, use the right materials and tools, follow the right procedures and techniques, and conduct proper evaluation and monitoring; viii) Pulmonary Heart Resuscitation: It assesses the ability of the individual to perform pulmonary heart resuscitations correctly, with an assessment of needs, the use of the right materials and tools, following the right procedures and techniques, and appropriate evaluation and monitoring; ix) Liquid resuscitation: It evaluates the ability of an individual to carry out a proper fluid revitalization, including an assessment of needs, the use of appropriate materials and tools, following the correct procedures and techniques, and appropriate evaluation and monitoring; x) Bronchial Toilet: It assesses the ability of an individual to perform bronchial toilets correctly, with an assessment of needs, the use of the right materials and tools, following the right procedures and techniques, and appropriate evaluation and monitoring; xi) AGD/Glucose/Liquid Monitoring: This assesses the ability of an individual to perform airway, respiration, circulation, glucose, or fluid monitoring properly, including needs assessment, proper use of materials and tools, following the correct procedure or technique, and appropriate evaluation and monitoring; xii) ECG/Bed Side Monitor Installation: This assesses the ability of an individual to install an ECG or bedside monitor correctly, including assessment of needs, proper use of materials and tools, following the correct procedure or technique, and appropriate evaluation and monitoring. Instruments assessment of evaluation of project-based learning has been carried out reliability and validity test with the results of the test. Before utilizing the simulation assessment instrument on all respondents, it was essential to conduct a validity and reliability test to assess the validity and consistency of the assessment items in the instrument. The results of the validity test indicated that the r-table value was 0.388, thereby concluding that all assessment items in the instrument were valid. Subsequently, the assessment instrument underwent a reliability test using Cronbach's alpha, which yielded a Cronbach's alpha score exceeding 0.60 for all assessment instrument items, signifying the reliability of all assessment items.

Data analysis

The results of pre-test and post-test measurements were then analyzed using a Wilcoxon Test to determine the impact of project-based learning methods on improved student learning outcomes in emergency, critical, and disaster nursing management courses.

Ethical clearance

The study received ethical approval from the Health Research Ethics Committee of the Faculty of Nursing, Universitas Jember on November 24, 2022.

Results

The study findings describe the data collected during the study. The results of the study include the characteristics of the respondents and the results of the data analysis. In Table 1, it was observed that the majority of respondents were female, accounting for as much as 83%, and the age group of 21-22 years constituted 81.3%. This suggests that nursing students, particularly women in their early twenties, dominate the sample, making them highly suitable for project-based learning. The results of the bivariate analysis in Table 1, using the Wilcoxon test on the group, obtained a significance value of 0.0001 ($p < 0.05$). The results of this statistical test can be concluded that the PJBL method is effective in increasing the knowledge of emergency, critical and disaster nursing in diploma Nursing Study Program students, Faculty of Nursing, Universitas Jember odd semester 2022/2023. Table 2 conclude that the intervention has a statistically significant effect on the variable of interest, especially considering that all 125 cases showed a positive change (or rank). Table 3 showed that the Z-value and the p-value both indicate that the intervention had a highly statistically significant impact on the variable being measured.

Table 1. Distribution of respondents' characteristics (n=123).

Category	Frequency (n)	Presented (%)
Gender		
Male	21	17
Female	102	83
Age (year)		
<20	4	3.25
21 -22	100	81.3
> 22	19	15.45

Table 2. Wilcoxon signed ranks test.

N	Mean rank	Sum of ranks
Post Intervention – Pre intervention		
Negative ranks	0 ^a	0.00
Positive ranks	125 ^b	7875.00
Ties	0 ^c	
Total	125	

a,b,c ?????

Table 3. Test statistics.

Post Intervention – Pre Intervention	
Z	-9.702
Asymp. Sig. (2-tailed)	0.0001

Discussion

One of the strategies to enhance student engagement in the classroom is to enhance the learning process. Educators, as teachers, are encouraged to tap into their potential, including the application of innovative and creative teaching methods to boost student involvement. The project-based learning model significantly impacts students' active participation in the learning process. In this context, 'activeness' refers to students taking on an active role in their learning, with educators guiding the direction of the material.¹⁵ Project-based learning (PBL) is one of the learning models that require students to be active and help each other to create projects that are discussed through discussion and collaboration. From the observation of learning activity, all aspects or indicators of students' learning activity have reached the baseline of learning success in each cycle.¹⁶

Based on the study's findings, it is evident that students' engagement in learning can be significantly enhanced through the implementation of the Project-Based Learning model. In this approach, the teacher functions as a facilitator, guiding students to discover answers to essential questions. Through project-based learning, students are empowered to explore a subject in various meaningful ways that resonate with them.¹⁷ Students become accustomed to collaborative work, assessment is carried out through the measurement, monitoring, and evaluation of all learning outcomes, and there is ample room for the development of learning resources.^{18,19}

Implementing the Project-Based Learning model in the Emergency Nursing course has yielded highly effective results. This is evident in the increased engagement of both students and teachers when employing the Project-Based Learning model. This approach involves real-world assignments that encourage students to think actively, engage in creative problem-solving, and design and produce products related to their ongoing learning. Consequently, knowledge is constructed by the students themselves, with the teacher serving as a facilitator. These findings align with several prior studies in this area.^{20,21} The PBL method has a positive impact on student performance in learning and academic achievement.

This is also consistent with the results of previous research conducted, one of the project methods provided is that students are asked to design disaster simulation activities as their project assignments, where students are directly involved from planning to the evaluation of activities, where students are actively involved and design their simulation activities, and learn to collaborate with related parties such as the village chief regarding the facilitation of activity locations, with the researcher team and nursing laboratory regarding the loan of tools, other parties regarding the loan of ambulances, and coordination with their friends for role sharing.^{22,23} Nursing students need to be equipped with disaster nursing competencies to adequately prepare graduates to participate when a disaster occurs. The results obtained from the disaster simulation project method given to students in emergency nursing learning are effective in increasing students' understanding and technical skills in learning emergency nursing with the results of a p-value of 0.00001.²⁴

As nurses who will work in various fields of public health services, nurses have challenges and responsibilities to provide nursing services to all levels of society and nurses must be able to adapt to their respective work areas.²⁵⁻²⁷ Therefore, nursing students need to be able to adapt to the world of work at an early stage, so project-based learning trains them to adapt to their work environment

by introducing cases from the world of work. This can increase students' creativity in solving problems and finding effective solutions to various problems that arise in the world of work.

This study has several limitations. It was conducted with a specific sample of students in the emergency nursing, critical care, and disaster management learning program within one course of study. This specificity may restrict the generalizability of the findings to other nursing programs or educational contexts. Therefore, the results may not be directly applicable to a broader student nursing population. Additionally, the study lacked control groups, employing a pre-experimental pre-post test design without a control group. This absence of control groups makes it challenging to discern whether improvements in learning outcomes are solely attributed to project-based learning methods or if other factors also influence the outcomes. The study did not account for external factors that might affect learning outcomes, including participants' prior knowledge or individual differences. These unaddressed factors have the potential to confound the results and limit the isolated interpretation of project-based learning effectiveness.

Conclusions

In conclusion, the research results demonstrate the effectiveness of the project-based learning method in enhancing students' comprehension of emergency, critical, and disaster management nursing. The implications of this study suggest that nursing educational institutions should consider incorporating this method into their curriculum and learning strategies to enhance the overall quality of nursing education. Further research is necessary to validate these findings and explore various factors that may impact the effectiveness of project-based learning methods in nursing education. A range of learning methods, such as project-based learning, the case method, and simulation, can be employed to improve students' understanding.

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