Original Investigation

Project-Based Learning Approach in Teaching Information and Communications Technology

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SUMMARY

The idea of outcomes-based education shifts educators from content-deliverer to project manager, facilitating the investigation of learning approaches and focusing on deeper learning to develop students' essential skills for their career readiness. This study established the effectiveness of the project-based learning (PBL) approach in teaching topics on Information and Communications Technology (ICT) among selected students of three programs at President Ramon Magsaysay State University (PRMSU), Iba, Zambales during 2nd semester SY 2018-2019. The study employed a descriptive research method to describe and interpret the present condition and relate to the desired objectives. Descriptive and inferential statistics were used in analyzing data gathered. The study findings conclude that student-respondents had a "Fair" level of performance in ICT topics during the pre-test while "Very Good" after using the PBL approach; the PBL approach was effectively based on the result analysis of mean, frequency counts, standard deviation, and t-test computation. The variance test analysis revealed a significant improvement in students' performance on ICT topics, as reflected in the post-test result. Recommendations are provided.■

KEYWORDS

PBL Approach; Teaching; ICT; Topics; Outcomes-Based; Simulation

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INTRODUCTION

THE notion of outcomes-based education directed educators to facilitate learning and help students grow both theoretical and application. Thus, teachers should facilitate the skill competence needed for work and industry requirements - the knowledge, intellectual processes, and fundamental skills in order for them to be active and engaged participants in the actual job.

In line with this thrust, collegiate courses incorporated Information and Communications Technology (ICT) in the curriculum to improve other student skills, problem-solving, critical thinking, and decision-making in a computer-based perspective. Therefore authentic activities learner-centered instruction should be highly considered and utilized (1).

One of the learner-centered approaches is Project-Based Learning (PBL). This approach's essence and objective are authentic activities, child-centered, output, and performance-oriented, which are highly considered and emphasized in determining students' academic achievement and performance in the classroom context. PBL is needed to ensure student success and ability to compete in today's society (2). Wagner believes that schools and teachers need to focus their curriculum around critical thinking and problem-solving skill building instead of memorizing facts for multiple-choice tests. PBL in ICT provides a venue for teachers to use projects and simulation for skill-building activities tied to the curriculum while allowing students to experience their education in a variety of beneficial ways. Moylan claimed that PBL had been identified as a critical methodology for closing the gap between current student learning and developing the necessary 21st-century knowledge and skills (3). Licht argued that PBL is essential to teaching 21st-century critical thinking, communication, collaboration, and creativity skills (4). Like other teaching approaches, PBL faces difficulties in its implementation (5). Unequal division of labor and students' low attendance or dropping out were significant issues identified by Gibbes & Carson (6). Resentment between students regarding the unequal contribution of work (7), lack of experience and understanding of the value of collaborative work (8), team dynamics problems among team members or to openly critique peers (9) and adapting to an unfamiliar student-centered approach and work management shifts (10) were then identified and observed proofs of difficulties utilizing the PBL approach and have to be addressed by the teachers and administrators for the students to maximize its benefits.

Therefore, this study was conceptualized to contribute to the literature on the PBL approach regarding its benefits, drawbacks, and students' valuable outputs as a result of utilizing the approach. Moreover, it is hoped that readers and educators further understand the valuable contribution of the PBL as a student-centered approach that aims to improve the academic achievement, enhance awareness and responsiveness to actual industry needs and skill requirements as well as acquire life skills of students since these are what the current Philippine Higher Education programs want to pursue and achieve for its learners.

OBJECTIVES

The study aimed to determine the effectiveness of the PBL approach in teaching topics on ICT among selected students of three programs at President Ramon Magsaysay State University (PRMSU), Iba, Zambales for the 2nd semester SY 2018-2019. Specifically, the study sought to determine the level of students' performance on topics in ICT in the pre-test; determine the level of students' performance on topics in ICT in the post-test, and test significant difference on topics in ICT among selected students of three programs at PRMSU during the pre-test and the post-test.

METHODOLOGY

The study utilized the Input-Process-Output conceptual framework. The input component contains the result of the pre-test and post-test on ICT topics and the PBL approach's effectiveness in teaching ICT. In the process, the researcher included questionnaires on activity sheets with the PBL approach and the statistical tools such as frequency, percentage distribution, weighted mean, standard deviation, mean percentile score, and t-test for the dependent variable. The output component consists of the effectiveness of PBL approach in the students' performance, specifically on the binary numbering system, flowcharting, algorithm, and introduction to programming.

This study employed a descriptive research method as an instrument. According to Best & Kahn (11), the

term descriptive research has often been misused to describe three types of investigation that are different. Perhaps their superficial similarities have obscured their difference. Each of them employs the process of disciplined inquiry through the gathering and analysis of empirical data, and each attempts to develop knowledge. Saralia pointed out that descriptive research is devoted to gathering information about prevailing conditions or description and interpretation situations (12).

The study was conducted at President Ramon Magsaysay State University Iba, Zambales, during the 2nd semester SY. 2018-2019. Two hundred selected students taking up ICT from different programs of PRMSU Iba campus served as respondents of this study. Out of 200 respondents, 92 or 46% were Bachelor of Science in Computer Science (BSCS) course, 63 or 31.50% were Bachelor of Science in Information Technology (BS Info Tech) course, and 45 or 22.50% were Bachelor of Science in Computer Engineering (BSCOE) course, respectively.

The research instruments that were used in the study were activity sheets and questionnaires. The activity sheets made use of the PBL Approach in discussing topics in ICT. It included a pre-test to measure students' prior knowledge in binary, flowcharting, algorithm, introduction to programming topics, exercises to assess students' learning for every topic immediately, and a post-test that evaluated the general performance of the students in every topic. The test consists of five items for every binary topic, flowcharting, algorithm, and introduction to programming. Mean Percentile Score (MPS) results for the pre-test were used to determine the student-respondents' level of ICT performance.

Descriptive and inferential statistics were used to interpret the data gathered.

RESULTS AND DISCUSSION

The level of students' performance on ICT topics was reflected by the result of their Pre-test and Post-test.

The pre-test and post-test were composed of a 20 item test, which included five items on each of the four ICT topics. It was used in gathering information and identifying the weaknesses and strengths of student-respondents. It was administered to evaluate the level of students' performance in performing ICT concepts. The class performance was described using frequency counts and descriptive value.

Table 1 shows students' performance in ICT in pre-test and post-test in terms of the binary numbering system.

For Pre-Test, out of 200 student-respondents, there were 73 or 36.50% whose scores are 2; 58 or 29.00% got a score of 3; 40 or 20.00% got a score of 4; 16 or 8.00% and 13 or 6.50% for scores 5 and 1, respectively. The mean score in the Pre-Test was 2.87 or 3, interpreted as Good. For Post-Test, out of 200 student-respondents, there were 159 or 79.50% whose scores are 5; 27 or 13.50% got a score of 4; 11 or 5.50% got a score of 3; 2 or 1.00% got a score of 2 and only 1 or 0.50% got a score of 1. The mean score in the Post - Test was 4.71 or 5, interpreted as Excellent. There was an increase of 1.84 or 64.11% on the students' mean score in the pre-post test on ICT, particularly the binary numbering system.

Table 2 presents students' performance in ICT in pre-test and post-test in terms of flowcharting.

For Pre-Test, out of 200 student-respondents, there were 91 or 45.50% whose scores are 2; 42 or 21.00% got a score of 1; 40 or 20.00% got a score of 3; 20 or 10.00% got a score of 4 and 7 or 3.50% got a score of 5. The mean score in the Pre - Test was 2.30 or 2, interpreted as Fair. For Post-Test, out of 200 student-respondents, there were 114 or 57.00% whose scores are 5; 32 or 16.00% got a score of 4; 26 or 13.00% got a score of 3; 19 or 9.50% got a score of 2 and 9 or 4.50% got a score of 1. The mean score in the Post - Test was 4.12 or 4, interpreted as Very Good. The students' overall increase in performance on ICT, particularly flowcharting, was 1.82 or 79.13% reflected on their post-test results.

Table 3 shows students' performance in ICT in pre-test and post-test in terms of algorithm.

For Pre-Test, out of 200 student-respondents, there were 71 or 35.50% whose scores are 3; 50 or 25.00% got a score of 2; 42 or 21.00% got a score of 4; 21 or 10.50% got a score of 5 and 16 or 8.00% got a score of 1. The mean score in the Pre-Test was 3.01 or 3, interpreted as Good. For Post-Test, out of 200 student-respondents, there were 121 or 60.50% whose scores are 5; 63 or 31.50% got a score of 4; 12 or 6.00% got a score of 3; 4 or 2.00% got a score of 2, and nobody got a score of 1. The mean score in the Post-Test was 4.51 or 5, interpreted as Excellent. Reflected on the students' performance during their post-test, it was revealed that there was an increase of 1.50 or 49.83% on the students' mean score on ICT, notably algorithm.

Table 4 presents students' performance in ICT in pre-test and post-test in terms of an introduction to programming.

Table 1. Level of Students' Performance on ICT in terms of Binary Numbering System.

Descriptive Value	Score	Pre-Test		Post-Test	
		Frequency	Percent	Frequency	Percent
Excellent	5	16	8.00	159	79.50
Very Good	4	40	20.00	27	13.50
Good	3	58	29.00	11	5.50
Fair	2	73	36.50	2	1.00
Poor	1	13	6.50	1	0.50
Total		200	100.00	200	100.00
Mean		2.87 or 3		4.71 or 5	
		Good		Excellent	

Table 2. Level of Students' Performance on ICT in Terms of Flowcharting.

Descriptive Value	Score	Pre-Test		Post-Test	
		Frequency	Percent	Frequency	Percent
Excellent	5	7	3.50	114	57.00
Very Good	4	20	10.00	32	16.00
Good	3	40	20.00	26	13.00
Fair	2	91	45.50	19	9.50
Poor	1	42	21.00	9	4.50
Total		200	100.00	200	100.00
Mean		2.30 or 2		4.12 or 4	
		Fair		Very Good	

Table 3. Level of Students' Performance on ICT in Terms of Algorithm.

Descriptive Value	Score	Pre-Test		Post-Test	
		Frequency	Percent	Frequency	Percent
Excellent	5	21	10.50	121	60.50
Very Good	4	42	21.00	63	31.50
Good	3	71	35.50	12	6.00
Fair	2	50	25.00	4	2.00
Poor	1	16	8.00	0	0.00
Total		200	100.00	200	100.00
Mean		3.01 or 3		4.51 or 5	
		Good		Excellent	

For Pre-Test, out of 200 student-respondents, there were 115 or 57.50% whose scores are 1; 38 or 19.00% got a score of 2; 29 or 14.50% got a score of 3; 9 or 4.50% got a score of 4 and 5 respectively. The mean score in the Pre-Test was 1.80 or 2, interpreted as Fair. For Post-Test, out of 200 student-respondents, there were 139 or 69.50% whose scores are 5; 31 or 15.50% got a score of 4; 15 or 7.50% got a score of 3; 9 or 4.50% got a score of 2 and 6 or 3.00% got a score of 1. The mean score in the Post-Test was 4.44 or 4, interpreted as Very Good. In the ICT topic on Introduction to Programming, students achieved an increase of 2.46 or 146.66%.

To see the difference in the level of students' performance on topics in ICT, the results of the pre-test

Table 4. Level of Students' Performance on ICT in Terms of Introduction to Programming.

Descriptive Value	Score	Pre-Test		Post-Test	
		Frequency	Percent	Frequency	Percent
Excellent	5	9	4.50	139	69.50
Very Good	4	9	4.50	31	15.50
Good	3	29	14.50	15	7.50
Fair	2	38	19.00	9	4.50
Poor	1	115	57.50	6	3.00
Total		**200**	**100.00**	**200**	**100.00**
Mean		**1.80 or 2**		**4.44 or 4**	
		Fair		**Very Good**	

Table 5. The difference in the Level of Students' Performance in Topics on ICT.

ICT Topics	t	df	Sig. (2-tailed)
Binary Numbering System	22.686	199	0.000
Flowcharting	23.847	199	0.000
Algorithm	21.346	199	0.000
Introduction to Programming	30.799	199	0.000
Total	**40.608**	**199**	**0.000**

and post-test were compared. Using the t-test, the difference and the significance of students' performance in ICT can be seen.

The decision and interpretation of the data gathered during the pre-test and post-test were presented in **Table 5**.

The computed significant value for t of Sig. = 0.00 for binary, flowcharting, algorithm, and introduction to programming was less than 0.05 alpha level of significance. Therefore, the null hypothesis is rejected. It can be concluded that there was a significant difference in the level of students' performance on ICT in pre-test and post-test in terms of the four topics. With the use of the PBL approach in teaching topics in ICT, respondents' learning competencies have been developed. After the use of the PBL approach, the student-respondents learn and simulate ICT topics effectively.

CONCLUSION

(i) The student-respondents had a "fair" level of performance on ICT topics during the pre-test while very good after using the PBL approach in teaching topics on ICT.

(ii) The use of the PBL approach in teaching topics on ICT was effectively based on the mean analysis, standard deviation, frequency counts, and t-test computation.

(iii) There was a significant improvement in the students' level of performance on topics in ICT, as reflected in the result of their post-test.

RECOMMENDATIONS

(i) The PBL approach in teaching topics on ICT is practical and can be used as a teaching strategy for other topics and subjects.

(ii) ICT instructors are encouraged to use the PBL approach in teaching ICT to address the least learned topic on the course.

(iii) A similar study may be conducted to improve and validate the findings of this research.■

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