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Blended Learning Approach in Improving Student's Academic Performance in Information Communication, and Technology (ICT)

R.R. Germo
John B. Lacson Foundation Maritime University, Iloilo City, Philippines

ABSTRACT: This quasi-experimental study aimed at looking into the effectiveness of blended learning approach in improving the performance in Information, Communication, and Technology (ICT) Course of Bachelor of Science in Marine Transportation (BSMT) first year students at JBLFMU-Arevalo during the second semester of school year 2018-2019. The respondents of this research were the two sections comparable with each other who were enrolled in the subject ICT. There were 40 student respondents composed of 20 in the experimental group and 20 in the control group. A validated and reliability-tested 45 item researcher-made multiple choice test was used as an instrument with a Cronbach index of 0.88. The statistical tools used were mean, standard deviation, Mann-Whitney test, and Wilcoxon-Signed ranks test set at .05 level of significance. The effect size was computed to determine the effectiveness of the blended learning approach in terms of students' performance in ICT. Results showed that in the pretest, though the experimental group had a higher mean score than the control group, the Mann-Whitney test showed that the mean scores of the two groups were comparable because the significant value was greater than .05. When the treatment was introduced, findings showed that there were significant differences in the ICT performance in the pretest and posttest of experimental and control groups as well as in the posttests of both groups. Results inferred that blended learning approach was more than a hundred percent effective showing significant results on the experimental group. It could also be inferred that the better performance of the control group could be attributed to the traditional method of teaching, the lecture method.

1 INTRODUCTION

According to Horton [1], a blended learning approach utilizes electronic technologies to create learning experiences. A common definition is also shared by Clark and Mayer [2] as to which blended learning approach is delivered through digital devices to support learning itself. In this nexus of the modern age where technology is delivering education across the globe befits the emergence of the blended learning approach. Also cost reduction in training, education, and transformed higher education is assured [2, 3]. On the contrary, the blended learning approach also poses several pitfalls. First, the limited cognitive system and instructional fall down (Coherence Principle). Second, degraded engagement on the method or boring approach or even less interactive. Lastly, losing sight of the intended learning outcome [2].

In the Philippines, the blended learning approach is synonymous with online learning [4]. However, Moore, Dickeon – Deane, and Galyen [5] differently defined online learning from the blended learning approach as well as distance learning. They also added that the implicit definition of the term relies on

the author's explicit definition. In addition; they also stated that uncertainties of the definition become the characteristics of the term "blended learning approach" and it may be of any form as long as it can provide a learning opportunity for an individual [6]. For a blended learning approach experience to be authentic, Herrington, Reeves and Oliver [7] state that it must follow the foundation in the theory of situated cognition or situated learning with the application of technology associated pedagogical approaches to blend the course [2]. Esteves [8] even ventured the application of social media for the enhancement of learning.

For the blended learning approach experience to be effective, it must follow the four key processes outlined [2]. In addition, they also added the three blended learning approach architectures - Receptive, directive and guided discovery. However, there are fewer papers for each individual architecture which in turn be an opening for more studies to be conducted. To fill in some interesting parts, Hrastinski [9] stated that there are two types of blended learning approaches namely: asynchronous [10, 11]. In addition, Horton [1] also stated his different varieties of blended learning approach which includes: standalone course, learning games and simulations, mobile learning, social learning, and virtual classroom courses.

Modern Philippine educational instruction, especially focused on higher education systems are slowly pacing for blended learning approach ventures. Interestingly, the University of the Philippines Open University (UPOU) ventures for mobile learning approach [1] to tap excluded sectors of the Filipino society to reach their online learning programs [4]. (Access to technology as indeed been a challenge in implementing a blended learning approach for developing countries like the Philippines [12]. Further challenges include technological awareness, curriculum design, motivation, and learner's behavior [13].

The rapid growth of computers and network communication systems with the upbringing of modern educational instructions has made Information, Communication, and Technology (ICT) a superb media in transforming education. ICT also reaches far out to technology as much as cloud computing. Nowadays, many are venturing for the application of cloud computing in delivering a blended learning approach namely: blended learning approach cloud [14]. To add, ICT has been proven to create a paradigm shift of Philippine educational instruction methods and thus blended learning approach has been embraced as a means of delivering efficient and low-cost quality education [15]. ICT and blended learning approaches have proven to address educational development effectively as stated by Button, Harrington, and Belan [16] for a blended learning approach in nursing education.

This study comes with several critical reasons. First and foremost is the introduction of blended learning approach for maritime education systems especially in the course of ICT. Second, the challenge for modern instruction parallel to the rise of technology. Third, the challenge to deliver quality, low cost and effective education for the maritime workforce. Fourth, the assessment of effectiveness of blended learning approach course to the maritime students. Lastly, to address the challenges of modern shipping in a way of technological education with the help of modern pedagogy as well as the rapid assimilation of education to the leading maritime workforce supplier of the world.

This study is anchored under the learning theories for online education specifically the Theory of Connectivism developed by Siemens [17] that acknowledges major shifts in the way knowledge and information flows, grows, and changes because of vast data communication networks as well as guide the development of effective learning materials together with the application of other existing learning theories.

Generally, this study aimed to determine the effectiveness of blended learning approach to improve the students' academic performance in ICT.

2 MATERIALS AND METHODS

2.1 *Research Design*

The quasi-experimental method of research was utilized to effectively answer the questions relating to the effectiveness of blended learning approach in improving the student performance in ICT. According to David [18] quasi-experimental design is nearly the same as true experimental designs, except that the former do not have restrictions of random assignment.

The study is a quasi-experimental in structure since it uses two comparable groups of respondents. The first group was the "Experimental Group" where the intervention was applied and the other was the "Control Group" where the traditional instruction method is to be applied. In this case, the experimental group shall receive the blended learning approach intervention. Furthermore, in line with the objectives of this research, a pretest-posttest method is to be employed. The idea is to assess the respondents' initial and final performances. At the same time, assess their growth after the intervention. This is done as to solely isolate the effectiveness of the intervention with negligible factors affecting the results.

This pretest-posttest quasi-experimental research design determines the effectiveness of blended learning approach in improving the student performance in ICT among first year BSMT students during the first semester of school year 2019–2020.

2.2 *Participants*

The participants of this research were two intact sections relatively comparable first year BS Marine Transportation sections of the JBLFMU-Arevalo in Iloilo City, who were enrolled in the course ICT during the second semester of school year 2019-2020. They were selected through match-group design using their General Weighted Average (GWA) in the second semester, school year 2018-2019. There was a total of 40 students composed of 20 in the experimental group and 20 in the control group. The

tossing of coin was used to determine the experimental and control group. The head was assigned for experimental group and the tail for control group.

2.3 *Instrument*

A Table of Specification (TOS) was used to create the questionnaire. It underwent content validity and reliability-testing of 0.88 using Kuder-Richardson 20 set at .05 level of significance. Then after, a 45-item researcher-made multiple choice test was made that comprises topics from prelim to final was used in this study.

The topics were taken from the prelim, midterm, and final lessons which included the following: Introduction to Computer Concept, Windows and Desktop, Word Processor and Application Spreadsheet and Application, Main Features of Data Processing System Software and Management, Hardware and System Technology Basic Construction and Use of Computer Networks on Ships, Bridge-Based and Shipboard Computer Application, and Basic Hardware, Software and Network Troubleshooting. The study was conducted from June 2019 to October 2019 of the school year 2019-2020.

2.4 *Data Collection*

The data needed for this study were gathered through the use of achievement tests in pretest and posttest. The pretest was submitted for preliminary validation to a panel of jurors selected for their expertise in terms of content and appropriateness of instrument.

Pre-and post-tests were administered to both experimental and control groups. During the first-class session, the researcher administered the pretest to the experimental and the control group. This set of data was tagged as the "pre-course" data.

The experimental group and control group were handled by 2/M Karl Danielle Sira, an ICT Instructor. The experimental group who are the section Polaris 1 A was taught according to blended learning approach using online session using Blackboard OLMS and lecture-class discussion. On the other hand, section Bowline the control group was taught the course employing only the traditional lecture-class discussion method. The intervention lasted for two months, i.e. 18 weeks during the first semester of school year 2019-2020.

2.5 *Data Analysis*

The statistical tools used in this study were the following:

Mean was used to determine the students' performance in the pretest and posttest. The mean scale and description for interpreting the pretest and posttest scores is shown in Table 1 below:

Table 1. Mean scale and description for interpreting the pretest and posttest scores

Mean scale	Description	Indicators
36.04 – 45.0	Excellent	Students have mastered all the competencies
27.03 – 36.03	Very good	Students have mastered most of the competencies
18.02 – 27.02	Good	Students have mastered at the average competencies
9.01 – 18.01	Fair	Students have mastered few competencies.
1.0 – 9.0	Poor	Students have mastered very few competencies

Standard deviation was used to determine the level of the students' homogeneity in their ICT course performance.

Mann-Whitney test was used to determine the significant differences in the pretests and posttests of two groups in ICT and for the significant difference in the mean gain of the pretest and posttest of the experimental and control groups set at .05 level of significance.

Wilcoxon-Signed ranks test was used to determine the significant differences in the pretest and posttest of two groups in ICT set at .05 level of significance.

Effect size was used to determine the effectiveness of the blended learning approach in terms of students' performance in ICT. This is done by using the means and standard deviation in the posttest among the experimental and the control groups.

3 RESULTS AND DISCUSSION

3.1 *Pretest Score Performance of the Experimental and Control Groups*

The pretest was initially conducted to determine the comparableness between the experimental and the control groups in terms of cognitive levels. The posttest was given to the respondents after the experiment.

Table 2 shows the pretest scores among the experimental and control groups. Twenty students composed the experimental group and 20 for the control group.

The experimental group's pretest mean score is 19.15 described as "Good" (students have mastered at the average competencies) while the controls group's mean score is 17.95 described as "Fair" (students have mastered few competencies).

It is noted that the experimental and control groups registered comparably the same mean scores in the pretest, indicating their almost identical cognitive levels before the experiment. This is closely similar with the results of Navallasca, Damarcus, and Atanacio [19] where the experimental group results a higher mean compared to the control group. However, when tested statistically, they are non-significantly different with each other denoting that the two groups are homogenous. Similarly, Simkins and Allen [20], Kirk [21], and Aidoo, Boateng, Kissi, and Ofori [22] coheres with this fact.

Table 2 Pretest Score Performance in ICT of the Experimental and Control Groups

Compared Group	n	M	Description	SD
Experimental	20	19.15	Good	2.30
Control	20	17.95	Fair	3.14

3.2 *Posttest Score Performance of the Experimental and Control Groups*

Table 3 shows the posttest scores among the experimental and the control groups. The experimental group's posttest mean score is 29.95 while that of the control group is 27.05. Both means scores are described as "Very Good" (students have mastered most of the competencies).

On the other hand, the experimental group manifested a higher mean score in the posttest than the control group, implying that the experimental group's better performance in ICT after the experiment. In conjunction, González-Gómez, Jeong, Rodríguez, and Cañada-Cañada [23] agrees that blended learning obtains higher results to traditional methods. Israel [24] states the same.

Table 3 Posttest Score Performance in ICT of the Experimental and Control Groups

Compared Group	n	M	Description	SD
Experimental	20	29.95	Very Good	2.84
Control	20	27.05	Very Good	2.68

3.3 *Difference in the Pretest Score Performance in ICT between the Experimental and Control Groups*

Table 4 reveals that there is no significant difference in the pretest scores of experimental and control groups, U = 164.50, p = .331. This means that both groups possess the same knowledge in ICT.

Relevant to the assessment of learning, Simkins and Allen [20] defined pretest as an assessment of fundamental knowledge of students and as a starting point of assistive learning. Aidoo, Boateng, Kissi, and Ofori [22] supports the results as pretests denote the constancy of their cognitive capacities.

Table 4. Mann-Whitney test result for the significant difference on the pretest score performance between the experimental and control groups on knowledge in swimming and life-saving techniques.

Compared group	U	W	Z	Asymp. sig. (2-tailed)
Experimental Control	91.50*	301.50	-2.95	0.003

Note. ns means not significant at .05 level of probability.

3.4 *Difference in the Posttest Score Performance in ICT between the Experimental and Control Groups*

Table 5 reveals that there is a significant difference in the posttest scores of experimental and control groups, U = 93.50, p = .004.

The experimental group is better than the control group. This can be supported by the larger mean scores (see Tables 1 and 2) as compared to the control group as well as the higher mean gain that can be gleaned later in Table 7. This simply implies that blended learning is an effective intervention.

Dickinson [25] cited the fact that curriculum intervention intensifies learning which is apparent on the results. This was also supported by Navallasca, Dumaicos, and Atanacio [19] and Metzler [26] stating that an intervention with a successive and smooth flow of activities embedded in the curricula is effective in increasing learning.

Table 5. Mann-Whitney Test Result for the Significant Difference in the Posttest Score Performance in ICT between the Experimental and Control Groups

Compared group	U	W	Z	Asymp. sig. (2-tailed)
Experimental Control	93.50*	303.50	-2.90	.004

Note. Asterisk (*) means significant at .05 level of probability.

3.5 *Difference in the Pretest Score Performance in ICT between the Experimental and Control Groups*

The students' pretest and posttest mean scores were compared to determine their significant difference.

Table 6 reveals that there is a significant difference in the pretest and posttest scores of the experimental group, Z = -3.93, p = .000. This means that the experimental group's performance after the intervention is significantly better than before the intervention.

The experimental group's performance after the intervention is significantly better before the intervention. Notwithstanding with today's modern age where students learn of the digital world at an earlier age, the values denote that blended learning provides a greater experience in assimilating knowledge [23- 27].

Table 6. Wilcoxon-Signed Ranks Test Result for the Significant Difference in the Pretest and Posttest Score Performance in ICT of the Experimental Group

Compared test	Z	Asymp. sig. (2-tailed)
Pretest Posttest	-3.93*	.000

Asterisk (*) means significance at .05 level of probability.

3.6 *Difference in the Pretest and Posttest Score Performance in ICT of the Control Group*

Table 7 reveals that there is a significant difference in the pretest and posttest scores of control group, Z = -3.94, p = .000. This simply shows that the control group's posttest performance is significantly better than their pretest performance.

Although blended learning is highly effective as modified curricula, the traditional methods were also effective in delivering knowledge [28]. The proof of time is evident at such that the traditional methods are still observed. However, since the traditional curricula was also a modified one, Metzler [26] adheres with the results

Table 7, Wilcoxon-Signed Ranks Test Result for the Significant Difference in the Pretest and Posttest Score Performance in ICT of the Control Group

Compared test	Z	Asymp. sig. (2-tailed)
Pretest Posttest	-3.94	.000

Note. Asterisk (*) means significant at .05 level of probability.

3.7 *Mean Gains of the Experimental and Control Groups*

Table 8 shows the mean gains of the experimental and control groups. It shows that the mean gain in their scores in ICT of the experimental group is higher than the control group.

The active theme of the blended learning stimulates the learner to seek further knowledge. This was evident to Metzler [26]. Thus, the harmonized use of blended learning gains a larger mean gain compared to the traditional form with better results compared to the other [23, 24]. As a result, Potter's [27] implications would guarantee a higher mark for those who undergo blended learning.

Table 8. Mean Gains Between the Experimental and Control Groups

Compared group	Pretest	Posttest	Mean Gain
Experimental	19.15	29.95	10.80
Control	17.95	27.05	9.10

3.8 *Difference in the Mean Gains of the Experimental and Control Groups*

Table 9 reveals that there is no significant difference in the mean gains of experimental and control groups, U = -155.50, p = .004.

For mean gains, the experimental group is better as compared to the control group as showed on the mean gain of scores. However, there is no significant difference with each other. It can be inferred that the intervention was effective as the traditional method, however, slightly more effective than the traditional ones.

The mean gains are not significant for both groups but the posttests of both groups are significantly different. With this, despite the absence of significance on both groups' mean gains, the experimental group which is the blended learning approach is significantly better than the control group.

The development of instructional models as stated by Foster, Shurtz, and Pepper [29] guarantees higher ratings when there is a successful utilization of the developmental processes which is aligned to the claims of Metzler [26]. The effectivity of both instructional models has both achieved results. However circumstantial, blended learning has proved better as an instructional model as it is significantly different to its posttest results which implies a greater learning tool [23, 24, 27].

Table 9. Mann-Whitney Test for the Significant Difference in the Mean Gains of the Experimental and Control Groups

Compared group	U	W	Z	Asymp. sig. (2-tailed)
Experimental Control	155.50^{ns}	365.50	-1.21	.226

Note. ns means not significant at .05 level of probability.

The effectiveness of the blended learning approach in terms of students' performance in ICT was quantified using the effect size. Using the means and standard deviation in the posttest among the experimental and the control groups, the value of the effect size is 1.05. This means that the effect size was large and the intervention was more than a hundred percent effective [30- 32].

4 CONCLUSIONS

The experimental group appeared to have learned significantly better in their ICT lessons after having been subjected to the blended learning approach than the control group. It was shown that the blended learning approach was an effective teaching styles in teaching ICT course.

In modern pedagogy where student centered approach is widely applied, the means of learning of students greatly attribute as to how the subject matter is thoroughly delivered. Through and through, modern technology is affecting basic education and replacing traditional teaching methods. In effect, technology is harnessed to be a guiding tool for efficient learning by assimilating tools and methods of orderly fashioned learning resource techniques that stimulates cognitive absorption of knowledge and thus enabling continuous and smooth learning output and retention and that is blended learning approach.

However, learning may have barriers as to the nature of a 21st century learner. Despite this, being traditional and modern instruction may be way separate in delivering learning. Attitudes and epistemology of a learner are also believed to be a factor. Nonetheless, triumph to modern and classic pedagogy is attributed to the bond shared between a teacher and a learner with trust as a key despite the difference of instructional medium.

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