



Blended Learning: Correlations on the Effectiveness of the Different Learning Environment

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ABSTRACT

Utilization of technology in the teaching and learning process has brought a significant impact to the education sector. Technology offers educators and learners a new learning experience to encourage and enrich the teaching and learning process. The study used descriptive-correlation to know the effectiveness of the different learning environment through pre-test and post-test and to determine the satisfaction rating of the respondents towards the different kinds of learning environment. It was found out in the result that blended learning shows an effective tool to enriched student performance in programming. It is recommended to use different learning mode of delivery to shows a significant increase and improvement in the academic performance.

Keywords: *Blended Learning, Student Performance, Correlation, Distance Learning, Information Technology.*

1. INTRODUCTION

Higher education has been actively encouraged to obtain effective and flexible delivery models to provide all scholars with more convenient access to quality learning experiences than is possible with traditional on-campus offerings alone.

Utilization of technology in the teaching and learning process has brought a significant impact to the education sector. Technology provides educators and learners a new learning experience to stimulate and enhance the teaching and learning process (López-Pérez,, Pérez-López, & Rodríguez-Ariza, 2011). Integration of ICTs in higher education involves an evaluation of the contribution of these tools to students' learning, especially when they are employed as a complement to Face-To-Face methods (Ginns & Ellis, 2009). Recent findings in using technology in evaluating student performance show an impressive positive feedback from the test takers despite of some factors affecting the result of the test. (Caluza, L.J.B., 2013).

The integration of ICT in the classroom has transformed the curriculum method and designed, the learning environment, and changing the way we communicate (Azizan, F. Z. 2010). The growing number of literature that explains the difference of the web-based learning in college or higher education setting as well as issues on communication patterns, teacher roles, and student performance (Khan, 1997). E-learning draw a significant impact on the teaching and learning experience of the instructors and also to the students (Azizan, F. Z. 2010).

Ruiz, J. G., Mintzer, M. J., & Leipzig, R. M. (2006) e-learning technologies offers learning structure, pacing, control of content, time, and often media, allowing the student to focus more on personal learning objectives. The focus of this study is to identify the emerging trends in higher education to blend text-based asynchronous Internet technology with face-to-face learning—often concerned to as simply blended learning. Blended learning supports all the benefits of e-learning, including cost reductions, time efficiency and location convenient for the scholar as well as the essential one-on-one personal understanding and motivation that face to face instruction presents (Brown, 2003).

Valiathan, P. (2002) describes Blended Learning (BL) as a combination of different delivery method such as collaboration software, Web-based courses, and knowledge management practices.

Garrison, D. R., & Kanuka, H. (2004) defines blended learning as an integration of classroom synchronous discussion (face-to-face) and asynchronous (text-based Internet) learning activities. Yen and Lee (2011) affirm that "blended learning, thoughtfully combining the best components of online and face-to-face education, is likely to come out as the predominant teaching model of the future". The key advantage for students by using blended learning as a delivery method is that it provides the flexibility of learning for students, encourage active learning, give prompt feedback, and respect diverse talents and ways of learning (Poon, J. 2013). In the

delivery of introductory science course the balance between online and face-to-face instruction vary depending on student characteristics, instructional goals, instructor knowledge and access online resources (Clark, I., & James, P. 2012, October).

The use of Blended Learning (BL) is widely utilized in large classes to determine the student's commitment to university learning and to produce changes in learning patterns among the first year college students (Huon, Spehar, Adam, & Rifkin, 2007).

BL enhances students' learning experiences by creating opportunities for them to improve their understanding through their own exploration and inquiry of certain subjects and topics (Sharpe et al., 2006; Cited by Poon, J. (2013)).

2. THEORITICAL FRAMEWORK

Blended Learning (BL) is a mixture of different learning environment such as but not limited to traditional learning (face-to-face) with online learning or eLearning, traditional learning with distant learning (module based learning), or a combination of these three learning environments (traditional learning, distant learning, and eLearning). This research is anchored with Discovery Learning (DL) theory of J. Bruner (1967) supported by Problem-Based Learning (PBL) theory of C.E. Hmelo-Silver (2004) and Activity Theory (AT) of A.N. Leont'ev (1979).

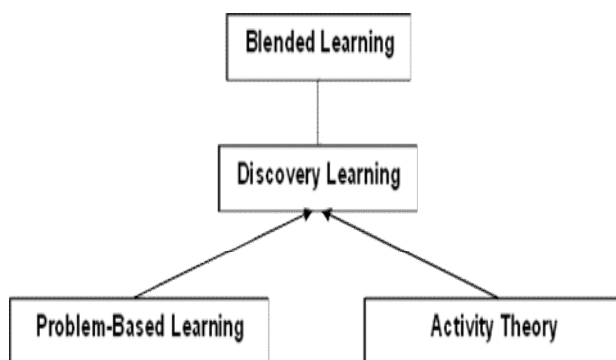


Fig. 1. A model of innovative learning in blended learning

Bruner's idea on *Discovery Learning* "is a method of inquiry-based instruction, discovery learning believes that it is best for learners to discover facts and relationships for themselves". In this theory the learners encourages active engagement, promotes motivation, promotes autonomy, responsibility, independence, the development of creativity and problem solving skills, and a tailored learning experience (Bruner, J., 1967). In this manner, it is expected that the learners are highly comprehend the subject matter being taught by the teacher. A study

conducted at the University of Twente (1998) that scientific discovery learning is a highly self-directed and constructivistic form of learning. The researcher emphasized that the use of computer-based simulation in learning as a learning environment is best suited for a discovery learning since it contributed the learner's creativity, independence, and responsibility because of the given activities such as experimentations and self-directed activities (De Jong, T. and Van Joolingen, W., 1998).

3. THE PROBLEM

The main thrust of this research was to investigate the performance of the BSIT Students in their Logic Formulation course through three (3) different mode of learning delivery by looking into the difference in their Pretest and Posttest such as Traditional Learning, Distance Learning, ELearning, and Blended Learning.

4. MATERIALS AND METHODS

Research Design

Descriptive-correlation method approach was used by the researcher such as survey questionnaire and a self-made test questionnaire. The quantitative part this research was through the use of the self-made questionnaire to know the effectiveness of the different learning environment through pre-test and post-test. While qualitative research design using descriptive methods through a survey questionnaire was used to determine the satisfaction rating of the respondents towards the different kinds of learning environment and determine its relationships between the respondents results and the learning environment.

Research Procedure

The researcher constructed a self-made survey questionnaire and a test questionnaire to evaluate the respondents learning acquired from the different learning environments. Both the instruments were evaluated and corrected by the experts in the field of information technology and expertise in test measurements and evaluation. The survey questionnaire and the test questionnaire were revised by the researcher and ask the unit chair to conduct the survey.

Respondents of the Study

The focus of the study was the undergraduate first (1st) year students of BS Information Technology enrolled in the Program Logic Formulation course. The total number of respondents who participated in this research was 109 first year students who were successfully finished the

duration of the study and 24 who were not able to finish and not included.

Data Gathering and Instruments

The researcher used a test question as its main instrument. These were personally distributed and retrieved by the researcher. In terms of validity of the test question, the researcher seeks the help of experts to critique and validate through face validation of the instruments and the researcher automatically revised the instruments. These experts were composed of the information technology and computer education unit of the university, IT Professors of another state university and colleges (SUCs), social science professor, and an expert in the field of blended learning and a professor from Texas State University. The researchers conducted a Pre-Test for all First year students who enrolled in the subject being studied. The

result of the Pre-Test was checked, get the total, and arranged from the highest to the lowest. Then labeled with 1,2,3,4 up to the last student. Group 1 were put to Blended learning, Group 2 Elearning, Group 3 Distance Learning, and Group 4 Traditional Learning (Face-to-Face Learning). The result of the Pre-Test is then the basis that made them comparable. Finally, the same questions was used in their Post-Test to see if there was a significant difference of their performance.

Statistical Treatment of Data

This Study utilized pair t-test to determine the difference of the performance in terms of Pre-test and the Post-test in Traditional Learning (Face-to-Face Learning), eLearning, Distance Learning, and Blended Learning.

5. RESULTS AND DISCUSSION

Traditional Learning (TL)

Table 1: Paired Samples Statistics in TL

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TL_preTest	10.9091	27	3.66029	.63717
	TL_postTest	21.3030	27	9.08118	1.58083

Table 2: Paired Samples Correlations in TL

	N	Correlation	Sig.
Pair 1 TL_preTest & TL_postTest	27	.418	.015

Table 3: Paired Samples Test in TL

	Paired Differences				t	df	Sig. (2-tailed)	
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower				Upper
Pair 1 TL_preTest - TL_postTest	-10.39394	8.24977	1.43610	-13.31918	-7.46870	-7.238	26	.000

A paired samples *t-test* was used to test the significant difference of the pre-test and post-test of students in Traditional Learning. The results of the analysis revealed that there is an increase of performance of the respondents since there is a significant difference between the pre-test and post-test of the students in Traditional Learning

($t=-7.238$, $df=26$, $p-value=.000$). According to Carrol, N., & Burke, M. (2010) study using different teaching modalities shows no significant difference. However, the faceto-face students reported a higher degree of effectiveness in most areas. In fact, the face-to-face students had a higher mean response in 26 of the 40 items in terms of instructor/student interaction, course outcomes and course communication.

Distance Learning (DL)

Table 4: Paired Samples Statistics in DL

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	DL_preTest	10.8485	27	3.32717	.57919
	DL_postTest	21.8485	27	8.90969	1.55098

Table 5: Paired Samples Correlations in DL

		N	Correlation	Sig.
Pair 1	DL_preTest & DL_postTest	27	.198	.268

Table 6: Paired Samples Test in DL

	Paired Differences	t	df	Sig. (2-tailed)					
					Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
								Lower	Upper
Pair 1	DL_preTest - DL_postTest	-7.124	25	.000					

A paired samples *t-test* was used to test the significant difference of the pre-test and post-test of students in Distance learning. Results of the analysis revealed that there is an increase of performance of the respondents

since there is a significant difference between the pre-test and post-test of the students in distance learning ($t=-7.124, df=25, p-value=.000$).

Elearning (eL)

Table 7: Paired Samples Statistics in eL

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	El_preTest	10.7576	27	3.51808	.61242
	El_postTest	22.7879	27	9.53532	1.65989

Table 8: Paired Samples Correlations in eL

		N	Correlation	Sig.
Pair 1	El_preTest & El_postTest	27	.498	.003

Table 9: Paired Samples Test in eL

	Paired Differences	t	df	Sig. (2-tailed)					
					Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
								Lower	Upper
Pair 1	El_preTest - El_postTest	-8.266	26	.000					

A paired samples *t-test* was used to test the significant difference of the pre-test and post-test of students in eLearning. Results of the analysis revealed that there is an increase of performance of the respondents since there is a significant difference between the pre-test and post-test

of the students in eLearning ($t=-8.266, df=26, p-value=.000$). According to the study of (Wolff, B. G., Wood-Kustanowitz, A. M., & Ashkenazi, J. M. 2014) online learning and F2F mode of delivery to be a significant predictor of final exam performance. The result does not support claims that student perform well in

online course of F2F. However, in the study of (Simon, D., Jackson, K., & Maxwell, K. 2013) suggest that online learning can be alternative to traditional classes in information system discipline

Blended Learning (BL)

Table 10: Paired Samples Statistics in BL

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Bl_preTest	11.1176	28	3.84365	.65918
	Bl_postTest	24.2647	28	9.33650	1.60120

Table 11: Paired Samples Correlations in BL

		N	Correlation	Sig.
Pair 1	Bl_preTest & Bl_postTest	28	.511	.002

Table 12: Paired Samples Test in BL

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Bl_preTest - Bl_postTest	-13.14706	8.07965	1.38565	-15.96618	-10.32794	-9.488	27	.000

There is a significant difference between the Pre-Test and the Post-Test of the students in traditional learning since there is an increase in performance. ($t=-9.49$, $df=27$, $p-value=.000$).

A paired samples *t-test* was used to test the significant difference of the pre-test and post-test of students in Blended learning. The results of the analysis revealed that there is an increase of performance of the respondents since there is a significant difference between the pre-test and post-test of the students in Blended learning ($t=-9.49$, $df=27$, $p-value=.000$). According to Larson, D. K., & Sung, C. H. (2009) study it was revealed that there was no significant difference in student performance whether whether it is taught using the face-to-face, online or blended mode of delivery. Other factor may affect student performance such as course design, instructor/student interaction and student motivation are important than delivery mode. Blended learning enhances the cognitive test and could increase student satisfaction for physical education students (Alruwaih, M.E, 2015).

6. CONCLUSION

Student performance varies the type of learning environment they are exposed. However, in this study the different learning environments were tested and shows an increase in the performance of the students in the subject. Finally, it Blended learning environment shows a better

performance of the students than the other learning environment understudied.

To improve student performance in a programming class, it is recommended to employ the different learning environments, because exposing your learners in different learning mode of delivery shows a significant increase of improvement in their academic performance relative to their subject they are enrolled.

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APPENDICES

Appendix A

Rules For Pseudocode Writing

1. When writing variable, the following must be observed:
 - a. Avoid starting or using numeric variables.
(e.g. 1,2,3...457)
 - b. Avoid starting or using special characters.
(e.g. !,@,#,\$,%,&,* , etc.)
 - c. Avoid having spaces in a variable.
e.g.
Correct variable = str_1, year_level,
prog_course.
Wrong variable = str 1, year level, prog
course.
 - d. Use variable name that is easy to understand
and has relevance to its purpose.

2. Write only one statement per line

Each statement in your pseudocode should express just one action for the computer. If the task list is properly drawn, then in most cases each task will correspond to one line of pseudocode.

EX: TASK LIST:

```
Read name, hourly rate, hours
worked, deduction rate
Perform calculations
    gross = hourlyRate *
    hoursWorked
    deduction = grossPay
    * deductionRate
    net pay = grossPay -
    deduction
Write name, gross, deduction,
net pay
```

PSEUDOCODE:

```
READ name, hourlyRate,
hoursWorked, deductionRate
    grossPay =
    hourlyRate *
    hoursWorked
    deduction = grossPay
    * deductionRate
```

```
netPay = grossPay -
deduction
WRITE name, grossPay,
deduction, netPay
```

3. Capitalize initial keyword

In the example above, READ and WRITE are in caps. There are just a few keywords we will use:

e.g. READ, WRITE, IF, ELSE, ENDIF,
WHILE, ENDWHILE, REPEAT, UNTIL

4. Indent to show hierarchy

We will use a particular indentation pattern in each of the design structures:

SEQUENCE: keep statements that are “stacked” in sequence all starting in the same column.

SELECTION: indent the statements that fall inside the selection structure, but not the keywords that form the selection

LOOPING: indent the statements that fall inside the loop, but not the keywords that form the loop

EX: In the example above, employees whose grossPay is less than 100 do not have any deduction.

TASK LIST:

```
Read name, hourly rate, hours
worked, deduction rate
Compute gross, deduction, net
pay
    Is gross >= 100?
        YES:
        calculate deduction
        NO:    no
        deduction
Write name, gross, deduction,
net pay
```

PSEUDOCODE:

```
BEGIN
READ name, hourlyRate,
hoursWorked
    grossPay =
    hourlyRate * hoursWorked
```

```
        IF grossPay >= 100
THEN
        deduction =
grossPay * deductionRate
        ELSE
        deduction =
0
        ENDIF
netPay = grossPay -
deduction
WRITE name, grossPay,
deduction, netPay
END
```

5. End multiline structures

See how the IF/ELSE/ENDIF is constructed above. The ENDIF (or END whatever) always is in line with the IF (or whatever starts the structure).

1. Keep statements language independent

Resist the urge to write in whatever language you are most comfortable with. In the long run, you will save time! There may be special features available in the language you plan to eventually write the program in; if you are SURE it will be written in that language, then you can use the features. If not, then avoid using the special features.

RULES FOR FLOWCHART WRITING

1. When writing variable, the following must be observed:

- a. Avoid starting or using numeric variables. (e.g. 1,2,3...457)
- b. Avoid starting or using special characters. (e.g. !,@,#,\$,%^^,&,* , etc.)
- c. Avoid having spaces in a variable.

e.g.

Correct variable = str_1, year_level, prog_course.

Wrong variable = str 1, year level, prog course.

- d. Use variable name that is easy to understand and has relevance to its purpose.

2. Make sure to declare your variables before using it in the flowchart.

3. Avoid using curve lines when connecting from one symbol to another.

4. Use arrowheads when connecting symbols.

5. Be consistent in using and paring the following:

- a. START/STOP
- b. BEGIN/END
- c. True/False
- d. Yes/No

6. The flowchart should be clear, neat and easy to follow.

There should not be any room for ambiguity in understanding the flow chart.

7. The usual direction of the flow of a procedure or system is from left to right or top to bottom.

8. Only one flow line should come out from a process symbol.

9. Only one flow line should enter a decision symbol, but two or three flow lines, one for each

possible answer, should leave the decision symbol.

10. Only one flow line is used in conjunction with terminal symbol.

11. Write within standard flow chart symbols briefly. As necessary, you can use the annotation

symbol to describe data or computational steps more clearly.

12. If the flowchart becomes complex, it is better to use connector symbols to reduce the

number of flow lines. Avoid the intersection of flow lines if you want to make it more effective and better way of communication.

13. Ensure that the flowchart has a logical Start and Stop.

14. It is useful to test the validity of the flowchart by passing through it with a simple test data.

Appendix B

Rubrics for Pseudocode Writing

Qualitative Description	Point(s) Earned
Correct use of reserved words in Pseudocode Writing.	1
Followed rules in writing Pseudocode	1
Correctness of program flow, procedure, or logic	2
Overall Output	1
TOTAL	5

Rubrics for Flowchart Writing

Qualitative Description	Point(s) Earned
Correct use of Flowchart symbols	1
Followed rules in writing flowcharts	1
Correctness of program flow, procedure, or logic	2
Overall Output	1
TOTAL	5