P-ISSN: 2776-7329, E-ISSN: 2776-7310
Proceedings
5th Vocational Education International Conference
Semarang, 13 July 2023

Implementation of Hybrid Learning as a Form on Educational Technology at the University Level

Aniesa Puspa Arum*, Suyitno Muslim, Eti Herawati, Lilies Yulastri

Universitas Negeri Jakarta
*Corresponding author. Email: aniesa.puspa@gmail.com

ABSTRACT
This study implemented a Hybrid Learning strategy through class action studies. The purpose of using Hybrid Learning in the classroom was to encourage students' critical thinking. The application of Hybrid Learning strategies was motivated by demonstrating that existing strategies leave students passive and, as a result, instructor-provided materials are limited. Hybrid Learning strategies should develop tutor guidance to achieve learning outcomes. Study subjects included her 176 student of Faculty of Engineering. This research was conducted by threecycles Class Action Research. Data were collected through observation-guided learning activities and student performance tests. Results showed that the student's critical thinking improved from 8.4% for him to 42.2% for her in the first cycle after treatment. In the second cycle, it developed even stronger to 92.3%. In the third cycle, student performance exceeded the threshold level. The conclusion was that Hybrid Learning was effective in developing students' critical thinking skills.

Keyword: *Hybrid learning, Education, Technology*.

1. INTRODUCTION

In the era of Industrial Revolution 4.0, universities must be prepared to face an era of disruption. The ability to innovate is essential for higher education, including applied learning by faculty. Universities must be able to produce quality graduates who think critically and systematically, are creative and communicative, and are capable of building teamwork. It needs to change using technology that learns from the old "face-to-face" system. According to Utomo and Ubaidillah [1], online learning can facilitate communication, coordination, and discussion prior to presentation without face-to-face meetings. In line with Rusman's research [2], e-learning is interesting learning for students and demonstrated through classroom learning. Students are highly engaged and enjoy all the processes that take place during their learning, which can improve their learning outcomes.

If conventional or face-to-face learning cannot be optimized, lecturers can adopt online learning for students. Online learning is not without challenges, such as poor internet connection quality and the fact that not all students have a private wifi connection, which makes studying less than optimum. As a result, planning is essential while carrying out this research.

According to Rivalina's [3] research, e-learning cannot be done quickly, but must be done in stages that include the construction of facilities and infrastructure, support from leadership policies and training, and outreach to students. Learning cannot take place without these stages.

A strategy that can combine face-to-face and online learning is a hybrid learning strategy. The learning concept is to combine lecture and online learning methods. Hybrid learning offers flexibility in terms of time, place, and variations in learning methods compared to online or face-to-face methods. By implementing a hybrid learning strategy, students are expected to think critically, be moral, disciplined, noble in character, and be able to use technology wisely. According to Kitchenham [4], hybrid learning is learning that uses a variety of communication technologies and mobile devices to obtain information in order to achieve a goal. Hybrid learning offers educators the opportunity to create a more conducive learning environment. According to Garrison and Vaughan [5] , Holt, Segrave, and Cybulski [6], hybrid learning is a novel approach to the learning process that combines face-to-face and online learning. Additionally, according to Staker [7] , hybrid learning is a learning process that allows students to study on campus or at home using online media. Students can

decide when, where, and what kind of learning they want to do, without having to meet the instructor face-to-face.

According to Bath and Bourke [8], the reasons for implementing Hybrid Learning are to widen learning possibilities, assist learning activities, support sources of information for students, improve involvement, and support for active participation in learning. The lecturer's role in hybrid learning is that of a facilitator who guides online learning, designs appropriate and communicative activities, encourages students to be active through constructive and motivating feedback, and provides suggestions and input required to increase interest and knowledge.

Discovered that the more time students have to work on tasks online, the more flexibility they have to finish them. According to Georgsen and Lovstad [9], the issue in Hybrid Learning stems from students' lack of online abilities, which causes them to be less involved in their groups.

The utilization of Hybrid Learning necessitates not just mastery of learning materials but also technological capabilities. According to Bowen, Chingos, Lack, and Nygren [10], professors and students must not only grasp learning material but also technology; otherwise, learning would become a burden for both lecturers and students. This scenario is consistent with the findings of Akyuz and Samsa [11], who found that unmastered technology makes research findings and methodologies less successful in boosting the value of learning outcomes.

Because e-learning is now expanding in the field of education, challenges in the period of the industrial revolution 4.0 through the use of technology in the education system are required. This is seen by the numerous online learning programs available to students via cell phones or websites. In the industrial revolution period 4.0, technology plays a significant role in skill development, therefore students' technological abilities and critical thinking skills are critical in ensuring learning success [12].

According to Permendikbud No. 68 of 2013 [13], single information learning pattern becomes branch information based learning and mass based learning pattern becomes customer needs (users) by enhancing student potential development. According to Heckman, Osterlund, and Saltz [14], the educational goal of hybrid learning leads to clearer boundaries between classes, but learning can be continuous. A study by deNoyelles and Reyes-Foster [15] states that continuous task assignment, especially in online discussions, may improve students' level of analysis. It includes critical thinking skills and peer involvement has positive associations. According to Arham and Dwiningsih [16], learning using mixed learning strategies can improve learning outcomes. The conclusion from the statements made is that blended learning is learning that can develop students' critical thinking skills and can improve student learning outcomes.

2. METHODS

2.1. Objectives and Hypothesis

The objectives of our research were as follows:

1) To investigate the impact of the students' utilization of the forum and exams on their academic achievement.
2) To illustrate the relationship between WebCT student assessment and academic success.
3) To show the relationship between the extent to which the forum and assessments were used and the platform evaluation.

The null hypotheses were as follows:

H10: There are no significant variations in performance amongst Materials Science students based on their utilization of WebCT.
H20: There is no relationship between WebCT student evaluation and academic success.
H30: There are no major changes in the WebCT evaluation based on its level of use.

2.2. Design

The planned study aims called for the employment of an ex post facto cross-sectional methodological design using variables that were not experimentally changed, as well as descriptive and correlational approaches.

2.3. Participants

The sample included 176 students in their first year at the Higher Technical School who were enrolled in a Faculty of Engineering course. There were 60 (34.09%) women and 116 (65.91%) males among the participants. According to age, 110 (62.50%) students were between the ages of 18 and 20, 40 (22.73%) were between the ages of 21 and 25, 17 (9.66%) were between the ages of 26 and 30, and 9 (5.11%) were above 30. 116 students completed the WebCT Usage Perception and Satisfaction Questionnaire (PSEW).

2.4. *Instruments*

WebCT statistics on use and student evaluations were acquired. The items that referred to the PSEW questionnaire evaluation were carefully prepared. This questionnaire was divided into two sections. The first section had 48 items to be answered on a Likert scale, divided into four categories: formal and technical factors

(8 items), content (16 items), assessment tests (12 items), and global evaluation (9 items). The second section was qualitative in nature. This article presents the quantitative results. Cronbach's alpha was performed to assess the reliability of the PSEW and yielded =.923, indicating an outstanding level of dependability [17].

2.5. Data Analysis

The statistical suite software Statistical Package for the Social Sciences (SPSS) (version 17) was used. When the dependent variable was assessed at the interval level and had a normal distribution, parametric tests were employed for goals 1 and 3. When the independent variable was dichotomous, the Student's T-test was employed, and when the independent variable was polytomous, variance analysis (ANOVA) was utilized. When the dependent variable did not achieve an interval level measurement or did not follow a normal distribution, non-parametric tests were utilized. If the independent variable was dichotomous, the Mann-Whitney U test was used, and if it was polytomous, the Kruskal-Wallis test was used. We utilized Spearman's rank-order correlation for goal 2. A 95% confidence level (=.05) was utilized for all tests.

3. RESULT

3.1. Influence of the Use of Assessments on Performance

To conduct this analysis, we divided the number of tests done into three categories: low (between the 1st and 33rd percentile), moderate (between the 33rd and 67th percentile), and high (between the 67th percentile and the maximum number of tests taken). The Kolmogorov-Smirnov normality test revealed that Units 1 and 3 satisfied the assumption of normality.

Figure 1 summarizes the mean values of the grades earned by students in the three units (as a function of the degree to which the test was employed) and the average ranges of Unit 2, where a non-parametric test was used.

Grades	Degree of use of assessment test	Descriptive statistics			Average ranges (*AR*)
		N	*M*	*SD*	
Content unit 1	Low	41	3.33	2.178	
	Intermediate	61	4.71	2.054	
	High	68	5.88	1.631	
Content unit 2	Low	27	3.21	2.061	35.31
	Intermediate	59	5.06	2.296	67.91
	High	62	6.71	1.298	97.84
Content unit 3	Low	21	4.13	1.720	
	Intermediate	50	4.61	2.034	
	High	66	5.20	1.548	

Figure 1. Description Statistics of Grades by the Degree of Use of the assessment test

The homoscedasticity assumption was met, according to the Levene test in ANOVA (Figure 2). As a result, we utilized Snedecor's F of the ANOVA and discovered significant differences in the following variables:

1. When analyzing the Unit 1 grades, a comparison of the mean of the low (M=3.33; SD=2.178), intermediate (M=4.71; SD=2.054), and high degree of use of the test (M=5.88; SD=1.631), F(2,167)=22.728; p=.000, with the post-hoc Tukey honest significant difference (HSD) test confirmed that the significance resulted from the differences between the low and intermediate (p=.001), low and
2. In terms of Unit 3 grades, a comparison of the means of the low (M=4.13; SD=1.720), intermediate (M=4.61; SD=2.034), and high (M=5.20; SD=1.548) degrees of use, F (2,134)=3.470, p =.034, with the post hoc Tukey HSD test confirmed that the significance came from the differences between the low and high degrees of use (p =.045).

	Levene test		ANOVA Snedecor			
	Statistic	Sig.	*F*	df-1	df-2	Sig.
Content unit 1	2.663	.073	22.728	2	167	.000
Content unit 3	2.049	.133	3.470	2	134	.034

The non-parametric Kruskal-Wallis test (Table 3) indicated significant differences in the grades of Unit 2 between the low (*AR*=35.31), intermediate (*AR*=67.91) and high degrees (*AR*=97.84), $X^2(2, N=148)=42.336$; *p*=.000.

Table 3. Kruskal-Wallis test for aggregate grades by the degree of use of the assessment test

		Kruskal-Wallis test		
	N	Chi-squared	df	Sig.
Content Unit 2	148	42.336	2	.000

Figure 2. ANOVA Results for Aggregale Grades by the Degree of Use of the Assessment Test.

Therefore, we accept the alternative hypothesis: "There are substantial disparities in the student's performance according to the degree of usage of the assessment exam in the three content units".

3.2. Influence of the Use of the Forum on Academic Performance

To investigate this impact, three usage groups were defined based on the quantity of messages written on the forum: low (between the 1st and 33rd percentile), middle (between the 33rd and 67th percentile), and high (between the 67th percentile and the maximum number of messages).

The Kolmogorov-Smirnov normality test revealed that the grades from Units 1 and 2 did not have a normal distribution, but that the grades from Unit 3 did. Figure 3 summarizes the averages of the grades received in the three units (as a function of forum usage) as well as the average ranges of Units 1 and 2, using a non-parametric test.

Grades	Forum degree of use	Descriptive statistics			Average ranges (*AR*)
		N	*M*	*SD*	
Content unit 1	Low	30	4.59	2.198	38.72
	Intermediate	30	4.70	1.937	38.87
	High	32	6.27	1.829	60.95
Content unit 2	Low	26	4.94	1.952	30.77
	Intermediate	28	6.21	1.935	47.89
	High	32	6.33	1.808	50.00
Content unit 3	Low	24	4.45	1.713	
	Intermediate	28	4.52	2.127	
	High	32	5.53	1.411	

Figure 3. Descriptive Statistics of Grade by Forum Degree of Use.

The homoscedasticity assumption was met, according to the Levene test (Table 5). As a result, we employed Snedecor's F of the ANOVA. We discovered significant differences in the mean of the low (M=4.45; SD=1.713), intermediate (M=4.52; SD=2.127), and high (M=5.53; SD1.411) forum degrees of use, F(2,81)=3.517; p=.034, with the post hoc minimum significant difference (MSD) test confirming that the significance resulted from the differences between the low and high (p=.025) and intermediate and high (p=.029) degrees of use.

4. DISCUSSION

First, it should be noted that the BL modality significantly improved academic performance. These results are consistent with those of other researchers [18-20], and content comprehension improved reflective and critical thinking skills, as demonstrated in face-to-face trials in all cases [21]. Furthermore, dropout rates were reduced, consistent with other studies [22].

The findings show that students who were more active, i.e., those who accessed WebCT resources more frequently and significantly, outperformed those who were less active. Some scholars argue that the degree of contact between the student and the system influences academic outcomes [23,24]. The students who posted the most messages on the forum had completed the most assessments.

Likewise, we discovered a link between academic success and platform evaluation. That is, academic performance may have improved as a result of the aforementioned factors, and we may conclude that the more the effort, the better the performance and evaluation. Previous study has indicated that when a student perceives the learning environment positively, he or she does better academically.

Several elements in the differences evaluated allowed us to interpret the results. For example, in terms of content, students stated that the platform's continual usage permitted individual learning, that the variety of alternatives provided aided understanding, and that the information itself was simple to grasp. The fact that the assessments were employed and that students may repeat them as many times as they wanted reduced the initial difficulty of the topics over time [19,23]. We should remark that this strategy was particularly adaptable to individual differences since it was built on settings that could contain a wide range of resources that addressed various requirements.

As far as formal and technical aspects are concerned, students appreciate the ease of use of the platform. However, they criticized the access speed as the system sometimes fails. Regarding evaluation, we found that the following items were highly evaluated by students. The test gave me motivational results. They helped me learn when I made a mistake. They helped me discover previously unthinkable aspects. They allowed me to de-stress during exams. And they have enabled my work to be more organized and productive. Students are more motivated and at the same time more likely to succeed [25]. Furthermore, results showed that planning one's work impacted performance, leading to optimization of study time and results [26].

The professorship received a rating of about 5 in the overall rating aspect of the factors considered.BL modalities are expected to provide better support and performance follow-up for students thanks to the available tools and result in individualized counseling. The teaching work on the platform is fundamental to achieving a satisfying learning experience. Professors are curriculum facilitators as well as content stewards [20].

We believe that these findings are significant for the areas of architecture and engineering, where knowledge of Materials Science is necessary, albeit in varying degrees, for all students. However, when compared to other topics, there is minimal study on BL in architecture and engineering [20].

In future research, we recommend replicating this study over time to see if our findings hold true. We also want to concentrate on the students' main techniques, styles, and approaches, as well as define the learning routes that the students take, determine which of these paths are beneficial, and compare them to other learning styles and approaches.

5. CONCLUSIONS

The following conclusions can be taken from the examination of the findings and the discussion offered:

a) The utilization of the forum and the self-evaluations provided in WebCT increases the student's academic achievement.

b) Students who scored higher on the evaluation of WebCT materials performed better academically.

c) As students' utilization of the forum and self-evaluations improve, so do their scores on the content supplied in WebCT.

AUTHORS' CONTRIBUTIONS

Author conducted research based on the needs of analysis

ACKNOWLEDGMENTS

Thank you to all those who have contributed in completing this research. It is hoped that this research can provide benefits to readers.

REFERENCES

[1] S.W. Utomo, and M. Ubaidillah, Pemanfaatan aplikasi whatsapp pada pembelajaran berbasis masalah untuk mata kuliah akuntansi internasional di universitas pgri madiun. Kwangsan: Jurnal Teknologi Pendidikan, 6(2), 2018, pp. 199–211. https://doi.org/10.31800/jtp.kw.v6n2.p199--211

[2] M.P. Rusman, The development of an e-learning-based learning service for MKDP curriculum and learning at the Indonesia University of Education. Development, 7(31), 2016, pp. 83-7.

[3] R. Rahmi, Strategi Pemanfaatan E-Learning Dalam Mengatasi Keterbatasan Jumlah Dosen, 2017.

[4] A. Kitchenham, Blended learning across disciplines: Models for implementation. Hershey, PA: Information Science Reference, 2011.

[5] D.R. Garisson, N.D. Vaughan, Blended learning in Higher Education : Framework, Principle, and Guidelines, 2008.

[6] D. Holt, S. Segrave, and J.L. Cybulski, E-Simulation for Educating the Professions in Blended Learning Environment, 2013. http://dx.doi.org/10.4018/9781466629196.ch050

[7] H. Stake, The Rise of K-12 Blended Learning: Profiles of Emerging Models, Innosight Institute, 2011.

[8] D. Bath, and J. Bourke, Getting started with blended learning, Australia: Griffith Institute for Higher Education, 2010.

[9] M. Georgsen, and C.V. Løvstad, Use of Blended Learning in Workplace Learning. Procedia – Soc. Behav. Sci., 142, 2014, pp. 774–780. DOI: https://doi.org/10.1016/j. sbspro.2014.07.614

[10] W. G. Bowen, M. M.Chingos, K.A. Lack, and T. I. Nygren, Online learning in higher education: Randomized trial compares hybrid learning to traditional course. Education next, 13(2), 2013, pp. 58-65.

[11] H.İ. Akyüz, S. Samsa, The effects of blended learning environment on the critical thinking skills of students. Procedia-Social and Behavioral Sciences, 1(1), 2009.

[12] M. Erdem, P. Kibar, Students Opinoins on facebook Supported Blended Learning Environment, 13(1), 2014, pp. 199-206.

[13] Permendikbud. 2013. Basic Framework and Curriculum Structure of High School. Jakarta: Permendikbud.

[14] R. Heckman, C. Osterlund, J. Saltz, Blended Learning at the Boundary : Designing a New Internship, 19(3), 2015, pp. 111-127.

[15] A. deNoyelles, B. Reyes-Foster, Using Word Clouds in Online Discussion to Support Critical Thinking and Engagement, 19(4), 2015.

[16] U.U. Arham, K. Dwiningsih, kelayakan Multimedia Interaktif Berbasis Blended Learning Pada materi Pokok Kimia Unsur, 5(2), 2016, pp. 345-352.

[17] D. George, P. Mallery, SPSS/PC+ step by step: A simple guide and reference, 1995.

[18] K. Blackmore, P. Compston, L. Kane, D. Quinn, and D. Cropley, The Engineering Hubs and Spokes Project: Institutional Cooperation in Educational Design and Delivery. In Curriculum, Technology & Transformation for an Unknown Future: Proceedings ASCILITE. Queensland: The University of Queensland, 2010.

[19] J.L. Cortizo, E. Rodriguez, R. Vijande, J.M. Sierra, A. Noriega, Blended Learning Applied to the Study of Mechanical Coupling in Engineering, 54(4), 2010, pp. 1006-1019.

[20] R. Francis, S.J. Shannon, Engaging with Blended Learning to Improve Students' Learning Outcomes, 38(4), 2012, pp. 359-369.

[21] T. S. Cooner, Creating opportunities for students in large cohorts to reflect in and on practice: Lessons learnt from a formative evaluation of students' experiences of a technology enhanced blended learning design. British Journal of Educational Technology, 41(2), 2010, pp. 271-286.

[22] M. Llamas-Nistal, M. J. Fernández-Iglesias, J. González-Tato, and F. A. Mikic-Fonte, Blended e-

assessment: Migrating classical exams to the digital World. Computers & Education, 62, 2013, pp. 72-87. http://dx.doi.org/10.1016/j.compedu.2012.10.021

[23] J. M. Alducin-Ochoa, and A. I. Vázquez-Martínez, Hybrid Learning: An Effective Resource in University Education?. International Education Studies, 9(8), 2016, pp. 1-14.

[24] C. K. Beer, D. Clark, and D. Jones, Indicators of Engagement. In C. H. Steel, M. J. Keppell, P. Gerbic, and S. Housego, Curriculum, Technology & Transformation for an Unknown Future: Proceedings ASCILITE. Queensland: The University of Queensland, 2010.

[25] C. M. Mora, J. L. Sancho-Bru, , J. L. Iserte and F. T. Sánchez, An e-assessment approach for evaluation in engineering overcrowded groups. Computers & Education, 59, 2012, pp. 732-740. http://dx.doi.org/10.1016/j. compedu.2012.03.011

[26] D. Domingo-Calabuig, and C. Sentieri-Omarrementeria, Blended learning in the area of the architectural projet. 3rd International Conference on Education and New Learning Technologies. Barcelona: Spain, 2011.