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Reducing Undergraduate Students' Information Technologies (ITs) Anxiety Through Implementation of Blended Learning: A Case Study in the Basic Natural Science Course

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Abstract: Technology has become a crucial component of teaching and learning since the educational landscape has changed tremendously. Moreover, one of the issues that has arisen due to the advancement of technology in the education sector is students' anxiety about information technologies (ITs). This paper investigates the effectiveness of Blended Learning as a technique for reducing undergraduate students' ITs anxiety. Forty first-year undergraduate students from a public university in Yogyakarta, Indonesia were asked to get involved in this study. Furthermore, one group pre-test and post-test design was utilized. Data were collected using a questionnaire and examined using quantitative analysis. The Wilcoxon signed-rank test was used to deal with non-normal data. The findings revealed that implementing blended learning in the Basic Natural Sciences course could reduce undergraduate students' anxiety about ITs.

Keywords: ITs, anxiety, blended learning

1. Introduction

Since the tremendous changes that are occurring in the educational landscape, technology has become an essential component of the learning process. Moreover, one of the issues that has arisen as a consequence of the advancement of technology in the education sector is students' ITs anxiety. Technology anxiety refers to an individual's inclination to feel anxious, apprehensive, or afraid about using technology, whether in the present or future (Parasuraman & Igbaria, 1990; Allen & Parikh, 2002). Furthermore, Hackbarth et al. (2003) reported that as individuals become more acquainted with technologies, they typically overcome their initial nervous feelings and develop positive perspectives. One of the alternative ways to introduce students to technology in the teaching and learning process is implementing blended learning. Blended learning combines traditional classroom instruction (face-to-face) and online instruction (Reay, 2001; Sands, 2002; Young, 2002; Rooney, 2003; Ward & La Branche, 2003; Graham, 2013). The purpose of this paper is to investigate how the introduction of blended learning might serve as a strategic strategy to decrease anxiety over information technology among undergraduate students, hence promoting a learning environment that is more inclusive and technologically proficient.

Numerous researchers have researched the implementation of blended learning around the world. Nugraheni et al. (2020, 2021) reported that most blended learning research still focused on the cognitive aspect. Hence, the other aspects, such as affective and psychomotor, should be explored further. In the context of the affective aspect, some research

issues were explored by some researchers, such as students' engagement/participation (e.g., Legron-Rodriguez, 2019; Stewart & Dake, 2019), students' perception (e. g., Donnelly & Hernández, 2018; Ping et al., 2018; Özkan & Malone, 2020, Tekane, et al., 2020), students' attitude (e. g., Olakanmi, 2017; Rau et al., 2017; Parsons, 2019), students' motivation (e. g., Liu et al., 2018), students' interest (e. g., Z. Liu, Lin, & Zhong, 2019), students self-efficacy (e. g., Fitriyana et al., 2020), students' independence (e. g., Butzler, 2015), student' autonomous (e. g., Lenczewski, 2016) and students' anxiety in high school students (e. g., Sarkar & Sharma, 2020). While numerous studies have explored blended learning, a pedagogical approach that combines traditional face-to-face instruction with online learning, there remains a significant gap in the literature regarding its effects on IT anxiety, particularly among students studying STEM. This focus is crucial as STEM fields are inherently technology-intensive, and students in these disciplines may experience heightened anxiety when confronted with technological tools and platforms.

Regarding this issue, leveraging blended learning implementation on students' anxiety, especially in higher education, must be explored further.

2. Method

2.1 Sample

Forty first-year undergraduate students from a public university in Yogyakarta, Indonesia were asked to get involved in this study. It is made up 10 males (25 %) and thirty females (75 %). The age average was around 19-21 years old.

2.2 Research Design

One group pre-test and post-test design was applied in this investigation. The researchers collected the data before and after the implementation of blended learning. In this study, participants interact with the intervention during 16 meetings (16 x 100 minutes). Blended learning was used in the Basic Natural Sciences course. This study's blended learning portion is made up of 4 online meetings and 12 face-to-face meetings. Furthermore, the detailed activity for each week as presented in Table 1.

Table 1. *Blended Learning Activity for Basic Natural Science Course*

Week	Topic	Mode
1	Course Introduction and Overview	Offline
2	Introduction to Natural Science	Offline
3	Living Things (Part 1)	Offline
4	Living Things (Part 2)	Online
5	Scientific Methods	Offline
6	Matter and Its Properties (Part 1)	Offline
7	Matter and Its Properties (Part 2)	Online
8	Middle Exam	Offline
9	Biotechnology (Part 1)	Offline
10	Biotechnology (Part 2)	Online
11	Earth Science (Part 1)	Offline
12	Earth Science (Part 2)	Online
13	Natural Resources (Part 1)	Offline
14	Natural Resources (Part 2)	Offline
15	The Future of Science and Technology	Offline
16	Final Exam	Offline

2.3 Data Collection

Data collection was carried out using a questionnaire. To investigate undergraduate students' ITs anxiety, the IT anxiety scale (ITAS), proposed by López-Bonilla & López-Bonilla (2012), was adapted as an instrument. López-Bonilla & López-Bonilla (2012) proposed the IT anxiety scale (ITAS) regarding the technology anxiety (TA) scale developed by Meuter et al. (2003) and the computer-anxiety scale developed by (Loyd & Gressard, 1984a,b). IT anxiety scale (ITAS) consists of 12 items such as "I feel apprehensive about using ITs," "I hesitate to use ITs for fear of making mistakes I cannot correct," and "ITs make me feel confused."The overall Cronbach Alpha value of this instrument is 0.94. This suggests that this instrument has a high level of consistency. Furthermore, the items were evaluated using a 5-point Likert scale, ranging from strongly disagree (1) to agree (5) strongly. In this study, we preferred to utilize a five-point scale instead of the original seven-point scale. Consequently, elevated scores correspond to increased levels of anxiety.

2.4 Data Analysis

The data gathered in this study was scrutinized using quantitative analysis. A descriptive analysis was performed to examine the ITs anxiety survey's average and standard deviation (SD). In addition, the Wilcoxon signed-rank test was used to deal with non-normal data. Data analysis in the study was conducted using SPSS 26.0.

3. Results and Discussion

The results of data analysis are shown in Table 2.

Table 2. *Data Analysis Results of Undergraduate Students' ITs Anxiety*

Test	Mean	SD	*p*	Z	ES
Pre-Test	2.43	0.60	<0.001	5.450	0.86
Post-Test	1.80	0.97			

Furthermore, the visualization of the results is shown in Figure 1.

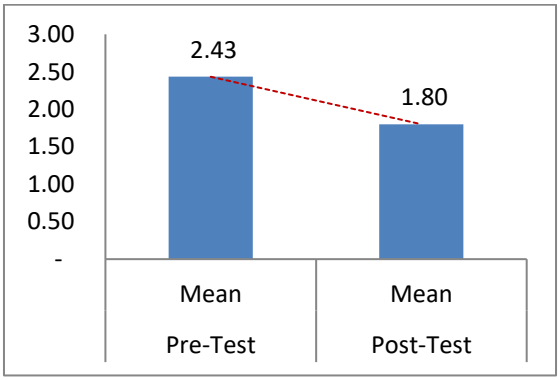

Figure 1. Undergraduate Students' ITs Anxiety Graph

As seen in Table 2 and Figure 1, undergraduate students' ITs anxiety decreased from 2.43 to 1.80. Furthermore, the Wilcoxon signed-rank test was used to examine the differences between the pre-test and post-test since the data was not normally distributed. The results

revealed that the p-value is <0.001. It indicates that there are significant differences between pre-test and post-test. Moreover, the effect size value (ES=0.86) shows the large size. It indicates that blended learning could reduce the university students' ITs anxiety. This finding aligns with previous studies conducted by Sarkar & Sharma (2020) and Sales (2020). For example, Sarkar & Sharma (2020) surveyed 56 High School Students who engaged in blended learning. The results revealed that blended learning is effective in reducing students' anxiety.

In this study, blended learning could reduce undergraduate students' ITs anxiety, perhaps due to several aspects described below. Firstly, blended learning was implemented progressively. Gradually introducing Blended Learning enables students to adapt to technology step-by-step, reducing the anxiety of abrupt changes (Garrison & Vaughan, 2008). Secondly, the institutions and instructor provided training and support. First-year undergraduate students obtain training to use a Learning Management System (LMS) at the beginning of their entrance to university. Students need sufficient technology training and support to improve their familiarity, guaranteeing a seamless integration of digital platforms (Aldalalah & Gasaymeh, 2014; Clark & Mayer, 2016; Bervell & Umar, 2018). Furthermore, the instructor implemented clear and open lines of communication to disseminate information to students regarding the Blended Learning methodology effectively. Effectively communicate the advantages, anticipated outcomes, and available assistance systems, promoting readiness and minimizing ambiguity (Garrison & Vaughan, 2008). Lastly, the instructor established inclusive and cooperative educational communities utilizing digital platforms and physical interactions. Promoting peer assistance and engagement reduces isolation, establishing a nurturing atmosphere for students navigating the online realm (Picciano, 2017).

Meanwhile, in the context of traditional face-to-face instruction, research on foreign language anxiety in face-to-face settings showed low overall anxiety levels among educators, suggesting that traditional instruction can mitigate anxiety but may not eliminate it entirely (Bicjutko & Odiņa, 2024). In a study of chemistry students, no significant difference in anxiety levels was found between online and traditional classrooms, indicating that traditional methods may not inherently reduce anxiety more effectively than blended approaches (Mouffok et al., 2023).

Moreover, there are several benefits to reducing ITs anxiety. First, it reduces students' academic anxiety about science. Bhuttah et al. (2021) reported that technological interest can assist students in building a solid foundation of scientific ideas without feeling anxious. Second, reducing ITs anxiety will enhance students' engagement in blended learning in science. Students who successfully overcome ITs fear are more inclined to actively engage in virtual and in-person aspects of Blended instruction in learning science (Clark & Mayer, 2016; Bhuttah et al., 2021).

Additionally, there are several challenges during blended learning implementation. Here are some examples of the challenges and potential strategies for overcoming the barriers. The first challenge is the technological challenge. For instance, students have an unstable network. Another example is that students need a compatible device. So, we must ensure participants can utilize the technology effectively (Hoffman, 2014). In order to mitigate the effects of this difficulty, employ the most basic technologies available to convey the message effectively (Hoffman, 2014). Furthermore, the next challenge is keeping students' attention during lessons, especially when learning online. To deal with this obstacle, we can discover a method to engage learners in active participation rather than only listening to the instructor (Hoffman, 2014).

4. Conclusions

Blended learning is more than simply a means to enhance educational efficiency; it is a remedy for alleviating ITs anxiety among undergraduate students. By introducing technology gradually, providing sufficient training and support, implementing clear and open lines of communication, and establishing inclusive and cooperative educational communities, we can

effectively reduce ITs anxiety and foster a generation of students adept at navigating the challenges of the digital age.

5. Limitations and Future Work

This research has several limitations, including the small number of respondents, so generalization is low. In the future, a larger number of samples will be needed. Another limitation is that the portion of blended learning used is only four online meetings and 12 offline meetings. Other portions have not been studied. Hence, it needs to be investigated further in the future. In future research, different ratios of online and offline meetings in blended learning could be tested by using various experimental designs. Additionally, exploring diverse teaching methodologies and integrating more comprehensive blended learning strategies could yield valuable insights into student engagement and performance.

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