Article

Blended Learning Activities in an e-Business Course

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Abstract: The objectives of this study were threefold: to understand students' perceptions of activities in a blended learning environment; to determine their preferred learning activities in this context, paralleling the four stages of Kolb's learning cycle; and to determine the effectiveness of the blended learning used, based on scores achieved in an e-business course supported by the BLearning assessment system, a custom-designed reflective assessment tool. A mixed-methods approach was used to identify the students' preferred activities. Findings indicate that (1) blended learning can add interest and variety to improve the students' learning experience, (2) students prefer blended learning activities that match the first three stages of Kolb's learning cycle (concrete experience, reflective observation, and abstract conceptualisation), and (3) data collected from the e-business course exam results show that the blended learning process was effective. In aligning teaching activities to student preferences, the notion of "teaching patterns" is introduced as the teaching perspective on these activities. Findings further indicate that blended learning activities based on the first three stages of Kolb's learning cycle may be more suitable for students who share similar learning preferences.

Keywords: blended learning; e-business; Kolb's learning cycle

1. Introduction

This study was conducted in a Thai university during a period of increased adoption of digital technology in both teaching and learning. Its purpose was primarily aimed at gaining insight into the preferred learning activities of students within a blended learning environment that extended the learning opportunities offered beyond the single mode of either face to face or online. By investigating student experiences, the effectiveness of this environment could therefore be determined.

In situating this research within the broad literature on blended learning, Kolb's learning cycle is referenced as a model that can be applied to understand the stages of learning activities involved, a model that has been used extensively within educational research for over three decades [1,2]. A primary motivation for this study was to focus on students' preferred blended learning activities at the "reflective observation" phase of the cycle, which we sought to explore through a specially designed reflective assessment tool called the BLearning assessment system.

Blended learning has been prominent terminology used within higher education contexts for the past two decades and typically used to describe a mix of face-to-face and online activities. Arguably, however, practices associated with blended learning have long pre-dated the contemporary terminology when technologies such as radio and television were adopted to augment or broaden public access to formal education. Educators have a long history of introducing educational technology into traditional classroom settings, and there are numerous antecedents to this terminology, such as flexible delivery and distance education [3].

In reporting on student experiences, active engagement was identified as important in determining preferences. In this study, students reflected on the development of videos as a review tool, and on setting questions for the e-business course examination review. As such, they are engaged in active learning because they are not just watching videos created by teachers (passive learning), as described by others [4]. The students then design and create videos by discussing in groups and searching for more information to show their in-depth understanding. Therefore, this new approach to blended learning can add value to an independent and collaborative learning strategy.

Blended learning is by itself not an innovation; however, finding out the right blended learning model that is appropriate for specific students, subject areas, and cultures has formed the focus of many previous studies. It is therefore a challenge for blended learning course design with an active learning environment to change the traditional teaching and learning patterns. This work seeks to fill that gap in our understanding by enabling the instructor to create a personalised and engaging learning environment with technology integration to provide benefits to students based on the students' preferences. This is the approach taken using the BLearning assessment system, which we present in this paper.

The following section probes the relevant literature in detail to situate the study with additional theoretical context.

2. Background Literature

According to Thaman [5], using a variety of teaching and learning approaches can increase the enthusiasm of learners. Involving students in class activities encourages them to pay more attention to, and encourages them to take greater responsibility for, their learning, which leads to improvement in their learning performance [6–8]. There are many techniques that can encourage student engagement in learning—for example, creating lesson review videos, setting lesson review questions, leading group discussions, and providing presentations [4,9].

2.1. Blended Learning

Blended learning has broad utility and application, with no commonly adopted definition. For the purposes of this paper, it is defined as terminology that generally describes learning and teaching approaches that combine digital technologies or information and communication technology (ICT) with traditional classroom methods [10–14]. Blended learning is an effective learning approach for increasing knowledge and student satisfaction [4,15,16]. From a broader perspective, it can be understood as belonging to an era of educational technology in which students learn through a combination of increasingly diverse technologies, such as desktop computers, tablet computers, mobile phones, wireless technology, and the Internet, enabling teaching and learning in a face-to-face classroom and/or online outside the classroom [17–19]. This increase in the range of possible learning opportunities has been a catalyst for change in teaching and learning activities and patterns [18,20,21]. The Oxford Group [22] noted that some learners expect that face-to-face classes will be reduced in number, and that technology will be used more in blended learning. However, ascertaining the optimal proportion for the mix of technologies and teaching activities to be used remains a challenge that depends on context. In meeting this challenge, Lopez-Perez et al. [18] proposed priority elements of learning that should be considered, including (1) student benefits, (2) teaching methods that motivate students to learn, and (3) levels of student satisfaction.

Although the literature reveals diversity in the "types of blends" [10], the benefits of blended learning are typically summarised in terms of student engagement and flexibility of process or, in more detail, as follows: (1) motivating students' "types of blends" to be more involved in learning activities, (2) enabling students to access online resources at any time, (3) stimulating online discussions to reflect the understanding and opinions of participants, (4) assisting in follow-up studies after studying in the classroom, (5) increasing

confidence in online group learning (especially with shy students), and (6) creating a flexible learning environment [21,23–27].

Blended learning, with or without the support of a specially designed system, has been used in diverse subject areas, with case-studies spanning actuarial studies, health informatics, medical science, statistics, Chinese studies, sexology, and teacher education [28]. In some contexts, a systems approach has led to blended learning systems being implemented [17]. Cutrell et al. [29] developed and experimented with a blended learning system called Massively Empowered Classroom (MEC) in a Design and Analysis of Algorithms course, which included several activities to increase student understanding of algorithms and to encourage class participation. Mohammad [26] developed a website called the Nottingham Trent University Online Workspace (NOW) to enable students to download class handouts, e-book lessons, online tutorials, and hundreds of lessons. Natasa et al. [30] designed a learning management system called the Adaptive Hypermedia Courseware (AHyCo) for use in an information science module.

Blended learning technologies and tools for face-to-face classes and activities outside the classroom use a variety of synchronous and asynchronous systems and collaboration technologies, including video conferencing and web conferencing [28]; short videos [29]; e-learning, presentations, audio, video, and whiteboards, as well as automated controlling systems for online testing and marking [31]; instant chatting, emails, and conference calls for use in individual inquiry activities [32]; and websites for downloading class handouts, e-book lessons, online tutorials, news, and related links [26]. Additional approaches include learning hypermedia and adaptive hypermedia, coding for computer programming assignments, and marking using automated test systems [30].

Donnelly [33] and Tang and Pan [34] reported that blended learning activities consist of: (1) teaching and lecturing in the classroom, (2) practical training in the computer laboratory, (3) reviewing each lesson via online forums or social networks, (4) presenting interesting new topics by sending messages through email and SMS, (5) discussing issues by talking online (synchronous chat), (6) submitting assignments and getting feedback online, (7) learning through video conferencing from external experts, and (8) learning through games, videos, and movies related to academic subjects. However, a suitable proportion for the mix of the above activities has not been suggested.

In recent decades, several authors have defined and described the key characteristics of blended learning [10,17,30,31,33,35]. This study adopts the characteristics of blended learning outlined by Dziuban et al. [33], summarised in Table 1.

Table 1. Characteristics of blended learning.

A1	Teaching with a student-centred focus
A2	An increase in interaction between students and teachers and among the students themselves (with more interaction in student discussion)
A3	A mixture of face-to-face learning and online learning using computer and communication technologies

2.2. Applying Kolb's Learning Cycle to Blended Learning

Kolb's four-stage learning cycle has been (and continues to be) used extensively in educational research, including in traditional, online, and blended learning contexts [1,2,36–39]. To gain insight into the students' learning activities in the e-business course, we chose to apply Kolb's learning cycle, which associates learning styles and provides instructional design guidelines to develop the learning skills and prepare the student for independent learning. Kolb's framework is the most relevant analytical tool for this study due to the reasons below.

- Kolb supports the concept of influences on learning style from personality traits that respond to the learning requirements of the individual [40];

- This study is learner-centred research that focuses on the students' learning experiences and preferences by considering each stage of Kolb's learning cycle, which is adopted as model for activity design.

The four stages of Kolb's learning cycle consist of (1) concrete experience—learning by applying students' existing experience and focusing on active involvement activities; (2) reflective observation—learning by reviewing lessons and reflecting students' understanding; (3) abstract conceptualisation—learning by listening and summarising concepts, which leads to new ideas; and (4) active experimentation—learning by doing, and trying out what students have learned [2]. Mobbs [41] advocated for adopting Kolb's learning cycle as a framework for distinguishing activities in blended learning, with an emphasis on learning by experience and utilising relevant teaching activities, providing examples of activities that support the four stages of Kolb's learning cycle, presented in Figure 1.
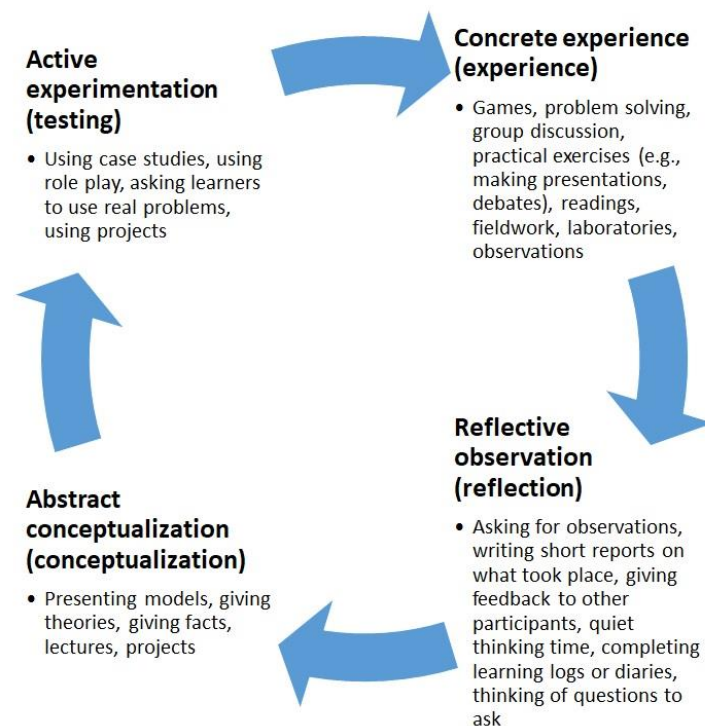

Figure 1. Activities that support the four stages of Kolb's learning cycle (from Mobbs [41]).

Kolb's original learning cycle concept was revised to provide a suitably contextualised theoretical model for this study (Figure 2). Although the learning cycle provides a generic framework for student learning, it allows us to show where in the learning cycle specific interventions might be effective. In this case, the original framework has been supplemented by the addition of "collaborative learning," linked in at the "reflective observation" stage of the cycle. Students design and create lesson review videos and set questions for the examination review by discussing in groups and searching for more information to show their in-depth understanding, and this is the reflective activity that our blended learning approach encourages. In Figure 2 we have included those two activities as particular examples of the blended approach that we trialled and evaluated in this study, though an alternative study might adopt different activities, and the revision of the learning cycle would therefore differ.
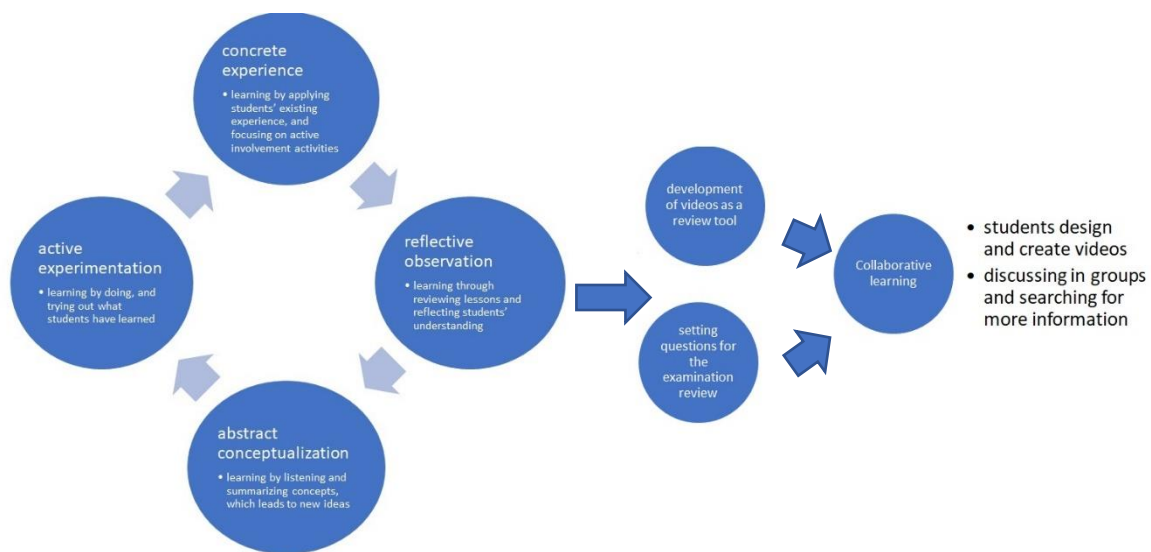
Figure 2. The revised Kolb's learning cycle used in this study (from Kolb [1]).

3. Materials and Methods

3.1. Research Questions

The following three research questions shaped this investigation:

1. What are students' perceptions of reflective learning activities in a blended learning environment?
2. What are students' preferred activities in an e-business course, according to Kolb's learning cycle?
3. How does the blended learning used support the teaching pattern, as evidenced by students' scores on the learning activities and the e-business course final examination?

3.2. Context of the Study

An e-business course is offered as an elective in the Information Technology undergraduate program at a large public university in Thailand. It is a semester-long, 12-week course, consisting of 36 h of lectures and 24 h of computer laboratory learning. This course aims to develop students' conceptual understanding of e-business and e-business marketing. The course also develops students' abilities to create e-business websites. Important topics in the e-business course include e-business strategies, revenue models, website design, online marketing strategies, online auctions, online payment, law, and online crime. Table 2 shows the blended learning activities in the e-business course, based on Kolb's learning cycle (Figure 1), and the key characteristics of blended learning (Table 1) according to Dziuban et al. [33].

Table 2. Blended learning activities in the e-business course.

Kolb's Learning Cycle	Activity	Key Characteristics of Blended Learning		
		A1	A2	A3
Concrete experience	Group discussions	x	x	
	Presentations	x		
	Case studies	x		
	Computer laboratory	x	x	x
	Online quizzes	x		x
Reflective observation	Reflective learning	x	x	
Abstract conceptualisation	Lectures		x	
	Video conferencing			x
Active experimentation	Group projects	x	x	

The concrete experience activities listed in Table 2 include both group and individual activities. In the former, small groups of three or four students discuss topical issues related to e-business—for example, the advantages and disadvantages of e-business marketing. Presentations involve students creating weblogs, or blogs, based on e-business topics that they are interested in, and analysing related software tools and their suitability for commercial deployment, which they then present in class. These are complemented by case studies of companies and their competitors. which the students research and then share their findings in class at the end of each study.

Individual activities include practical computer laboratories, in which students learn to use relevant software, such as the free osCommerce and OpenCart applications, to create online stores. Online quizzes enable students to perform self-assessment at the end of each class through the BLearning assessment system, discussed below. These are structured using 10 multiple-choice questions (MCQs) per chapter of the e-business course, with an image puzzle (see below) as a reward for getting a correct answer. Online chat with the teacher and classmates is also available on the BLearning assessment system to enable students to discuss the material in the quizzes.

Reflective learning involves small groups of three to four students making videos of lesson reviews and uploading them to YouTube and the BLearning assessment system. For each chapter in the e-business course, students develop 10 additional MCQs with five choices per question via the online BLearning assessment system. During this activity, students can discuss the topics before designing and creating lesson review videos and MCQs. These tasks can be used to not only encourage reflection of students' understanding, but also motivate students to be actively involved in their learning [4].

Abstract conceptualisation takes two forms. Lectures on each sub-topic are augmented with sets of short-answer questions to increase interaction among peers and between the students and the teacher. Video conferencing enables students to learn from external experts where, at the end of each talk, students may ask the experts questions pertaining to the latest technologies that may be used in online business.

Finally, active experimentation takes the form of collaborative group projects, involving three to four students per group developing websites for online business using open-source platforms. Before developing the websites, students interview company personnel to find out user needs and requirements, and then propose a website prototype to their users. Students develop the websites and share them in class with their peers and the teacher to provide opportunities to ask clarification questions. Finally, each group submits a report to the teacher for evaluation.

3.3. Development of the BLearning Assessment System

Assessment (including self-assessment) is an integral component of blended learning, and indeed of most formal learning [42–44]. Mestan [42], for example, reported that many students in blended learning contexts prefer routine quizzes throughout the semester, rather than just a final exam. Following this position, including several small assessments in structured learning, motivated the development of the BLearning assessment tool reported in this paper; additionally, development was motivated by the encouragement of reflective learning (here, students creating lesson review videos and MCQs).

The BLearning assessment system is an online resource that enables students to perform self-assessment at the end of each class. Because this system was designed based on standard screen ratios, it has the capability to fit most screen sizes, such as those of desktop computers, laptop computers, tablet computers, and smartphones. After signing in, students will see quizzes pertaining to the content of individual lessons. In preparation for the quizzes, students first watch YouTube videos that their classmates have previously created for revision. There are 10 multiple-choice questions (MCQs) per lesson, with five choices per question. If students answer the questions correctly, they can open one piece of a puzzle to see part of a hidden picture (see Figure 3). The purpose of the puzzle is simply to motivate the student and make the exercise more "fun." If they are unable to answer the question correctly, they must repeat the question until they get the correct answer; however, in this case, the system will not allow the students to open the puzzle. The hidden picture puzzle is added to make the quizzes more challenging. If the students do not understand a question, or have problems with it, they can ask the teacher or their classmates through the online chat or by leaving offline messages.
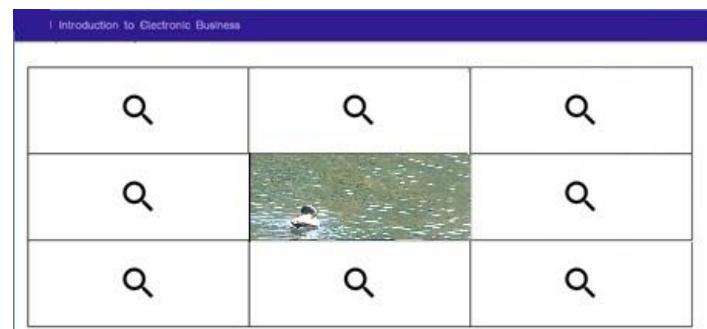

Figure 3. Image puzzle.

3.4. Instruments

A survey instrument was used in this research to collect data in two areas: (1) students' views about learning activities and (2) suggestions for improving the BLearning assessment system. The first part of the survey instrument collected views about students' preferred learning activities in the e-business course, according to Kolb's learning cycle (by ranking questions). The second part of the survey instrument asked students to comment (via free-form text boxes) on developing review videos and setting review questions for the e-business course, to identify issues with the online BLearning assessment system, and to make suggestions for its improvement.

In addition to the survey data, students' scores on the learning activities and their marks in the final course exam were collected to enable any possible correlation with the survey results to be observed.

3.5. Participants

Twenty-five 21- and 22-year-old undergraduate students, consisting of 14 males and 11 females, participated in this study. This research was approved and supported by Walailak University (Thailand). The rights of the students were protected, students were

advised that their comments would not be linked to their identities, and survey data were anonymised.

It should be noted that the sample size for collecting the data (25) was constrained by the availability of potential participants, and the following analysis, particularly the statistical analysis, needs to be viewed in that light.

3.6. Data Collection and Analysis

This was a mixed-methods study in which both quantitative and qualitative data were collected. The former consisted of a survey (using ranking questions) to study participants' opinions, collected during a 20 min period of the last class of the semester, and students' scores on the learning activities and from the e-business course final exam. A statistical analysis was performed to allow rank ordering of the blended learning activities. The frequency of students' responses was noted for each of the scales in the survey, combined with a *t*-test analysis to establish significance of any correlation with the students' final exam scores. The qualitative data were formed of students' reflections on course activities and the development of review videos and setting review questions for the e-business course and gathered through free-text boxes in the survey questionnaire.

4. Results and Discussion

In responding to the three key research questions, an indicative selection of how participants described their experiences is outlined under Question 1, a summary of preferred activities from Question 2 is discussed and outlined in Table 3, and results from Question 3 are discussed in terms of grade outcomes.

Table 3. Students' preferred activities in the e-business course.

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	Total	Score
Group discussions	0.00% 0	4.00% 1	8.00% 2	4.00% 1	28.00% 7	28.00% 7	12.00% 3	12.00% 3	4.00% 1	25	4.28
Presentations	8.00% 2	0.00% 0	0.00% 0	4.00% 1	24.00% 6	28.00% 7	16.00% 4	12.00% 3	8.00% 2	25	4.08
Case studies	8.00% 2	0.00% 0	8.00% 2	0.00% 0	24.00% 6	28.00% 7	24.00% 6	0.00% 0	8.00% 2	25	4.4
Computer laboratory	20.00% 5	28.00% 7	12.00% 3	24.00% 6	0.00% 0	0.00% 0	8.00% 2	4.00% 1	4.00% 1	25	6.68
Online quizzes	0.00% 0	0.00% 0	4.00% 1	0.00% 0	4.00% 1	0.00% 0	20.00% 5	32.00% 8	40.00% 10	25	2.12
Reflective learning	8.00% 2	16.00% 4	20.00% 5	40.00% 10	8.00% 2	8.00% 2	0.00% 0	0.00% 0	0.00% 0	25	6.52
Lectures	44.00% 11	32.00% 8	20.00% 5	4.00% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	25	8.16
Video conferencing	12.00% 3	20.00% 5	28.00% 7	24.00% 6	8.00% 2	4.00% 1	0.00% 0	4.00% 1	0.00% 0	25	6.72
Group projects	0.00% 0	0.00% 0	0.00% 0	0.00% 0	4.00% 1	4.00% 1	20.00% 5	36.00% 9	36.00% 9	25	2.04

4.1. What Are Students' Perceptions of Reflective Learning Activities in a Blended Learning Environment?

Student involvement in learning actively is a key to success in blended learning [45]. We highlight six points from the students' views on the creation of the lesson review videos and MCQs.

- In-depth learning: "I can review what I have learnt again with my group, as we need to make a lesson review video. We also read more and search more on the Internet in order to set ten questions."

This point was reinforced by another student who admitted that normally they do not review lessons until the exam. Now, by developing a lesson review video, there was an

opportunity to view the lesson video and the questions in a group long before the exam, and they noted that "these are quite useful activities." For this student, reviewing for the exam with an image puzzle as a reward for a correct answer was effective and enjoyable, and they commented, "It's fun, actually."

- Important issues: "It's an interesting activity, as we have a chance to think about good questions; we can point out the important issues of the lesson."
- Learning new technology: "I have to spend time to learn more about the new software to develop a video. I can show my ability to develop this video with the new techniques as well. So, it's a good learning experience to try something new, and it's more fun than providing a presentation in front of the class."
- Creative ideas: "To develop the lesson review video, we have to design and think creatively about how to make our classmates understand the whole chapter in this short video."
- Collaboration learning: "We discuss, design the video, and create questions together with different ideas. So, I have more chance to express my opinions in the group."

Another student expanded on this and raised the ownership of knowledge and the questions, and highlighted the benefits of those questions being set by peers, particularly that both the questions and answers are at the right level of difficulty:

"We can think of our own questions and answer questions which are set by our classmates (not the teacher). So, it's kind of the same level of knowledge. Some questions are easy or difficult, so we will know our friends better now through their works."

This was not a view shared by all students, however, and one student expressed the view that the teacher should take the ownership of setting questions:

"Some questions are too easy or confusing; the teacher should set the questions, not the students. Students preferred a variety of question formats, such as short answers or matching games, to make it more fun."

- Pride in work: "We have to upload our video on YouTube where many people can view it online. So, our work will be shown in public, not only for our classmates and teacher."

4.2. What Are Students' Preferred Activities in the e-Business Course, According to Kolb's Learning Cycle?

A summary of students' preferred activities, gathered from the survey (ranking question), is shown in Table 3. Students placed the activities in order of their preferences (#1 = the most preferred activity, #9 = the least preferred activity). An average ranking was calculated for each activity to evaluate the most preferred activity in the e-business course. The activity with the largest average ranking was the most preferred choice. The average ranking was calculated as follows (SurveyMonkey.com, accessed on 18 April 2021) where:

$$w = \text{weight of ranked position}$$

$$x = \text{response count for answer choice}$$

$$\text{Average ranking} = \frac{x_1 w_1 + x_2 w_2 + x_3 w_3 + \cdots + x_n w_n}{\text{total response count}}$$

Weights were applied in reverse; the most preferred choice, ranked as #1 by students, had a weight of 9, and the least preferred choice, ranked as #9, had a weight of 1.

The responses (Table 3) clearly show that most students preferred to learn by listening to lectures from teachers in face-to-face classes (score = 8.16) or external experts via video-conferences (score = 6.72). Historically, students have expected teachers to be experts in content and to impart knowledge to students [46]. If this expectation is not met, students are not satisfied, and they feel they have not been taught and are not learning. Hence, it is not surprising that the students' preferred learning style is that of listening to lectures, as students have been familiar with passive learning since primary school. They hesitate

to diligently engage in student-centred learning, such as online quizzes (score = 2.12) and group projects (score = 2.04), where they need to generate, validate, and represent their own knowledge through much thought, decision-making, and action-taking. It appears that student-centred learning activities were less popular with this group of students, because they had not been trained to lead activities, and they thought that too much work was required from them.

4.2.1. Liked and Disliked Blended Learning Activities in the e-Business Course

A content analysis of the comments made by students in the survey was performed, and this expands on the data presented in Table 3 and explains the reasoning why students like (or dislike) specific activities.

The popular activities were clearly articulated by the students—for example, one student noted, "I like the lectures; the teacher has many fun stories from her experience," whereas another stated, "I like the group discussion and have a chance to express my opinion in class." Support was also offered for the computer laboratory ("I like the computer laboratory, to learn how to create online shops") and for the inclusion of case studies ("I like to learn from case studies, as they are real stories, with interesting discussions"). Furthermore, although not in the specific set of categories the survey addressed, students noted the effectiveness of writing blogs and presentations ("I like the writing blog assignment and presenting how we can earn real money from affiliate programs") and making lesson review videos ("I like making the lesson review videos and setting questions, as I have a chance to review what I have learnt").

Some students liked expressing opinions in the class and creating websites for real businesses. However, some students thought that there was too much work in the course. This was probably because, by their own admission, they enrolled in five to six subjects per semester, and had too many other activities competing for their time ("There are too many jobs, or probably I enrolled in too many subjects this semester"). The group project was perceived as a negative ("I don't like too many group assignments or working together; there are many awkward problems working together"). Reservations were further expressed about online quizzes being given each week, and about pair discussions, where one student noted that "Pair discussion is good, but the person who answers questions in the class is always the same person."

4.2.2. Individual Learning Styles

According to Pashler et al. [47], "optimal instruction requires diagnosing individuals' learning style and tailoring instruction accordingly." Therefore, students learn best when the information is shown to them in their preferred styles. Kolb's learning cycle and the activities, questionnaires, and thoughts of undergraduate students on the proportion of blended learning in the e-business course are shown in Figure 4. Lectures (18%), computer laboratories (15%), videoconferencing (15%), and reflective learning (14%) were more preferred than other blended learning activities. These preferred learning activities present a mix of face-to-face classes and technology integration in order to increase effective student learning experiences [48]. Many researchers [21,23,25,26] have emphasised the use of digital tools to motivate students to be more involved in learning activities in order to reflect on their understanding of the subject matter. The online BLearning assessment system is used to encourage the reflection of students' understanding through a flexible learning environment (such as the ability to complete online quizzes anytime, anywhere). Group projects were the activities ranked last in this e-business course; students need to put a lot of effort into those activities.
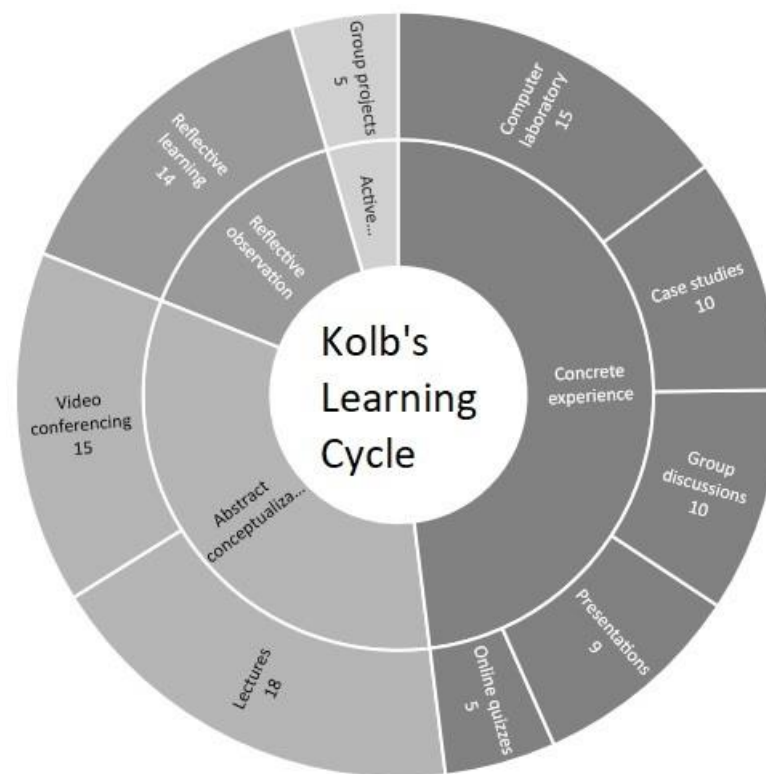
Figure 4. Proportion of blended learning activities in the e-business course.

4.3. How Does Blended Learning Support the Teaching Pattern, as Evidenced by Students' Scores on the Learning Activities and the e-Business Course Final Examination?

4.3.1. Effectiveness of Blended Learning Based on Activity Scores

Students' scores were accumulated from the following blended learning activities: group discussions (10%), reflective learning (10%), presentations (10%), computer laboratory (20%), and group projects (20%). Statistical data analysis of each activity—group discussions (mean = 8.16, SD = 1.27), reflective learning (mean = 9.16, SD = 1.31), presentations (mean = 7.36, SD = 0.74), computer laboratory (mean = 15.14, SD = 1.72), and group projects (mean = 15.37, SD = 1.54)—indicated that students were able to engage in reflective learning but were not able to present their work persuasively.

Four out of 25 students received scores of more than 60 out of 70, with another four students receiving scores of less than 50 out of 70. Therefore, most students were able to satisfactorily engage in blended learning activities, with the majority receiving scores of more than 50. This is in line with Afacan [49]: "the greater engagement in the learning process achieved from the blended learning activities resulted in higher course outcomes."

4.3.2. Effectiveness of the BLearning Assessment System Evidenced by e-Business Course Examination Scores

The BLearning system is the main component of our intervention, and its success will be reflected in the success of the module overall. To evaluate the effectiveness of the BLearning assessment system, we therefore compared the final exam scores this year (experimental group) with those from the previous year of the same course. Although we recognise the limitations of this system, we do see some parallels in the way the courses are delivered—the same course coordinator, teacher, course content, and assessor, who can confirm the same level of difficulty of the final exam. We are confident that the delivery of the module in the two years was equivalent save for the introduction of the BLearning tool in the second year. Although the improved scores do not conclusively prove that the BLearning system improved student performance per se, student performance did improve significantly. The main change to the delivery was the introduction of the

BLearning system, and we infer that at least part of the student performance improvement was due to BLearning. The one-sample *t*-test is used to estimate the mean of a population and to compare it to a target value [50], and to determine whether a sample mean is statistically different from a specified value. The target value (16 out of 30) was based on the previous year's average final exam score in this subject in a traditional classroom. The usual pass score, on the other hand, is 50%.

The one-sample *t*-test has four main assumptions. If the data meet the following requirements, the test result is valid [51]:

- The dependent variable must be continuous (interval/ratio)—the final exam score was a continuous variable. The range of scores was from 13.50 to 25.50;
- The observations are independent of one another—there were no relationships between the final exam scores, and the data were mutually independent;
- The dependent variable should not contain any outliers—Figure 5 (left) shows boxplots of a variable final exam score with outliers, which were removed later for the one-sample *t*-test;
- The dependent variable should be approximately normally distributed—the final exam scores in Figure 5 (right) were approximately normally distributed (after removing outliers), and the shape was approximately symmetrical and bell-shaped.
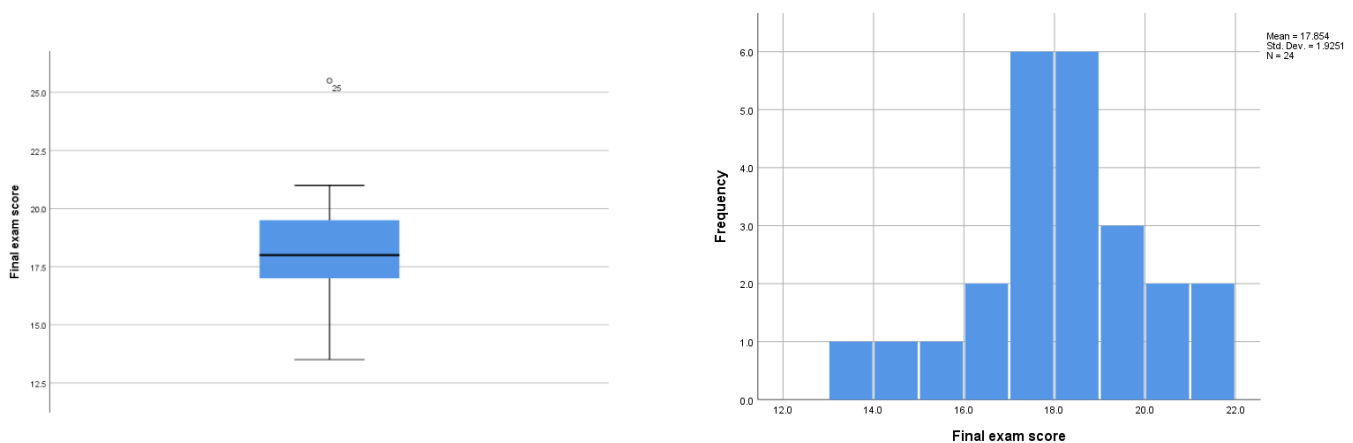

Figure 5. Boxplots and histogram of final exam scores (histogram after removing outlier).

Hypothesis 1 (H1). *u ≤ 16 (the mean score of a population is less than, or equals, the target value);*

Hypothesis 2 (H2). *u > 16 (the mean score of a population is more than the target value).*

Table 4 shows that the $p < 0.05$ ("Sig. (2-tailed)") value was 0.000; this actually means that $p < 0.0005$. Therefore, it can be concluded that the population means were statistically significant, rejecting the null hypothesis (H1) and accepting the alternative hypothesis (H2). The test score was statistically significant, higher by 1.85 (95% CI, 2.667 to 1.041) than a normal test score of 16, t(23) = 4.718, $p = 0.000$. The mean score of the population was higher than the target value. It can be concluded that the proposed learning approach significantly improved the students' learning performance. Blended learning activities that engage students in designing and creating class review videos and establishing questions for the examination review might benefit them in terms of assisting them in recognising their learning challenges and resulting in positive learning performance. This may explain why the students scored higher on their final exam than students who had been taught traditionally in prior years. However, we must be mindful that the incorporation of modified material to fit into the new (blended) delivery may itself have contributed to the improved scores. The blended delivery would have been impossible without such material, and it would therefore have been essentially impossible to exclude the contribution of that material from the equation. This result supports the study by Kenney and Newcombe [52],

which concluded that students who learn with a blended learning approach get higher grades than students who learn via traditional learning methods.

Table 4. One-sample *t*-test.

	Test Value = 16					
	t	Df	Sig. (2-Tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Final exam score	4.718	23	0.000	1.8542	1.041	2.667

5. Implications and Conclusions

This study set out to achieve three objectives: (1) to understand students' perceptions of their activities in a blended learning environment, (2) to determine their preferred learning activities in this context in terms of Kolb's learning cycle, and (3) to determine the effectiveness of the blended learning approach used within an e-business course. For each objective, the findings indicate clear results and are summarised as follows. Blended learning can add interest and variety to improve the students' learning experience. Students' creation of lesson review videos and MCQs encourages them to engage in active learning and demonstrate their understanding. Blended learning focuses on a student-centred model and is time consuming; therefore, discerning the optimum proportion of activities in learning and teaching is important for effective learning and for student satisfaction.

When the students' preferred blended learning activities were compared with Kolb's learning cycle, the sequence of blended learning reflected the first three phases, namely, concrete experience, reflective observation, and abstract conceptualisation. However, group projects, which can be associated with the last step of Kolb's learning cycle (active experimentation), were less popular activities for undergraduate students in the Information Technology program at the author's university, and this appeared to be because the students think that too much work is required from them. Further studies are required to explore whether it is possible to use a different blended learning approach that can deliver active experimentation in a manner that fully engages students, although the reasons for students' discomfort with those group projects, such as limited time for other classes, suggests that this may not be a purely pedagogic problem.

Data collected from the e-business course exam results show that the blended learning process was effective, as evidenced by higher student exam scores. It can be argued that improved delivery of material per se, rather than the use of blended learning, could explain the improved exam results (or, indeed, a variation in the difficulty of the exam itself); therefore, further studies are required to confirm the role of blended learning in students' exam success.

At a general level this study shows that, rather than relying on a single delivery mechanism or a single pedagogy, a higher education lecturer can use a variety of techniques and tools with confidence and the student experience is likely to be enhanced with improved learning outcomes. However, we can be more specific.

The first research question provides evidence that the environment is conducive to student learning through students' explicit identification of reflective activities that are supported by the technologies. The second research question provides us with an understanding of the types of learning activities students find effective and/or enjoyable, and in particular highlights the inclusion of laboratories and reflective activities to support lectures and videoconferencing. The third research question provides evidence—through a statistical analysis of marks achieved—that students who engaged with the blended learning activities reported here achieved significantly better grades than students taught traditionally in previous years. Thus, we have been able, at least partially, to fill the gap in our knowledge about the effectiveness of technology-enhanced blended learning.

Limitations

A limitation of this study was the small sample of 25 participants, some of whom were poor learners (based on their previous grades). Although the results presented here are positive and suggest that a blended approach can enhance the effectiveness of technology-enhanced learning (TEL), further studies need to be conducted to measure the impact of the proposed blended learning activities on a larger sample or with higher-achieving students. This study was also limited by its focus on a specific cohort of students, and different groups of students may produce different outcomes. In addition, the different blended learning models should be investigated to compare students' satisfaction and performance levels.

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