

Blended Learning Approach for Less Proficient Students

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Abstract

This article describes the implementation of blended learning in a higher education institution by focusing on the less proficient students. Malaysia's Ministry of Higher Education has urged every university to introduce blended learning in their teaching and learning processes as a new approach. Nevertheless, there are less proficient students who are hesitant, less motivated, and face difficulty in associating learning with technological applications. Our main purpose is to show how blended learning can be designed to suit the less proficient students by first identifying their learning styles and then creating a motivating supportive learning system through the use of teaching technology applications. The sample size for this study is 64 business program students from four groups taking the course Introduction to Statistics in two consecutive semesters. These are students who had to repeat a few subjects including Introduction to Statistics as well as students who entered university with lower qualifications and had to undergo one semester of booster certification program. Final examination scores are used as a measure of students' performance. Comparison using examination marks scored is shown using independent *t* test, mean effect size, and Box and Whiskers plot. Results showed noticeable difference in examination scores obtained by the different groups of students. As a conclusion, while blended learning approach bears many benefits, it has to be tailored to suit the different students' cognitive levels as well as learning styles.

Keywords

e-learning, Introduction to Statistics, higher institutions, online tools, teaching and learning

Introduction

Current technology offers numerous teaching applications to help course instructors impart knowledge and facilitate learning. Availability of such technology makes way to the development of blended learning, which is a teaching approach that takes advantage of such teaching application tools. One such tool is the video that plays an important role in replacing the instructor in his or her absence. However, technology is just a tool. To be able to use the tool, one has to have the know-how and the motivation to use the tool, while overcoming the fear of not being able to catch up with the fast evolving technology.

Muirhead and Salmon (2002) stated that there is a necessity to motivate students with poor level of independence as online learning lacks face to face interaction. On the contrary, social interaction is an inherent characteristic of conventional teaching approach settings. To have an effective blended learning approach, a student must have interest in the material taught; be a self-motivated, independent, and self-directed learner; be a critical thinker; enjoy family support; receive positive and timely feedback; accept responsibility for own learning; be organized; and possess practical knowledge in the use of computers; deficiency in any of

these factors may cause poor social interaction among students' community (Irizarry, 2002). Thus, a sufficient solution to develop a strong sense of community in students who would feel isolated in a fully online course is to offer one with no complete loss of face-to-face contact.

We have developed a blended learning module for a subject called Introduction to Statistics (Md Noh, Yusoff, & Yusoff, 2015) and had implemented the module to students enrolled in the subject for the past three semesters at a public university. The first two semesters were a success where failure rate among students who were taught using the blended learning module was small and grades achieved were significantly better than students who were taught using conventional approach (Md Noh et al., 2015). However, in the third semester, a sudden increase in failure rate to more than 25% had opened our eyes to look further into the strengths and weaknesses of blended learning especially when it involves

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less proficient students. This article aims to show how blended learning can be designed to suit the less proficient students. Comparison in grades scored in the final examination is presented to show the effect of the redesigned module.

Literature Review

Mobile Devices and the Uses of Social Media in Blended Learning

Technology is undeniably changing the face of education, and the technology impact is widely felt by educators and learners. A study was conducted by Gikas and Grant (2013) to understand learning perceptions with mobile computing devices and the roles of social media. This study revealed that mobile computing devices and the use of social media created opportunities for interaction and provided opportunities for collaboration, student engagement with the content, and communication using social media, and Web 2.0 tools. Another perception study about social media, the Twitter, was also conducted by Tur and Marín (2015). This study revealed that students perceive that mobile technology is useful in education and are willing to use the Twitter as a tool of learning. A similar study about online tools by Montero-Fleta, Pérez-Sabater, and Pérez-Sabater (2015) concluded that Twitter can increase students' confidence in using English as a communication language. Likewise, students view online tools as an easier learning method and less intimidating way to search new vocabulary. Another similar study about the use of mobiles for learning higher education by Al-Emran, Elsherif, and Shaalan (2016) also suggested that mobile-learning can be one of the teaching pedagogies in higher education. Even with slow Internet connectivity, students still view and accept blended learning favorably (Thang et al., 2013).

There are numerous online teaching materials available for every subject with various different approaches. In Mathematics and Statistics, websites like Khan Academy, OpenEd, Sophia.org, Ted Ed, Learn Zillion, DreamBox, Edmodo, and Blendspaces are taken as references to produce high quality teaching materials in blended learning. These websites use good software applications such as ShowMe, Educreation, Knowmia, and Explain Everything in producing interesting and excellent materials for teaching and learning tools.

Challenges of Implementation in Blended Learning

There are several challenges in implementing blended learning as a mode of teaching. Khan, Shaik, Ali, and Bebi (2012) mentioned an effective way to overcome the challenges is sufficient technology support and infrastructure. The biggest challenge in implementing blended learning is to adopt the method into the teaching and learning system. The same

challenge is highlighted in a study by de Jong, Savin-Baden, Cunningham, and Verstegen (2014). De Jong highlighted six major issues that are relevant to designing blended learning systems. Two main issues are cultural adaptation and technology know-how. Students must be able to change to adopt the new teaching and learning style. However, one should note that social interaction and communication should not be jeopardized at the expense of technology usage. The role of teacher, careful selection of collaboration tools, and technical preparation are important considerations when designing and implementing blended learning. Teaching materials provided online must be carefully chosen to assist successful teaching and learning process.

Lim and Morris (2009) highlighted four categories of good instructional design. They are instructor qualities, quality of learning activities, learning support facilities, and study workload. Challenges of blended learning implementation highlighted by Ocak (2011) are complexity of the instruction, the lack of planning and organization, effective communication, institutional support, and the lack of electronic means. Other challenges identified by Butcher (2016) are time consuming, changing roles, difficulty in adopting new technologies, and the frustration with technical infrastructure and individual learner distraction. Ocak pointed that successful implementation of the blended courses can be affected by their highly complex and different teaching patterns. Despite the challenges, Kim, Bonk, and Teng (2009) predicted that blended learning will become a new teaching pedagogy in the future trend. The use of technology can be seen as an innovative challenge to restructure the teaching-learning process and integrate Information and Communications Technology in independent, collaborative, and interactive work. In addition, the blended students are more successful in transferring their knowledge to their projects than the ones in the face-to-face group (Demirer & Sahin, 2013). This finding implies that blended learning approach has a positive effect on the transfer of learning.

Good blended learning materials can motivate good students to learn. This is because good students have high motivation to learn (Lim & Morris, 2009). Salili, Chiu, and Lai (2001) found that students, who are confident and motivated to learn, spend more time and effort and achieve higher levels of performance than those who are not confident and not motivated. This is supported by Sankaran and Bui (2001) who found that less motivated learners did not perform as well on knowledge test as motivated students. These less motivated students do not have the same amount of excitement toward the subject matters as the good students. This is the human part of the challenges that an educator has to face when implementing blended learning.

Figure 1 shows the blended learning components and percentage of students who face problems in blended learning. The components are online assessment, classroom tutorials, and video power point. The red line represents the component with the highest percentage of student who face problems,

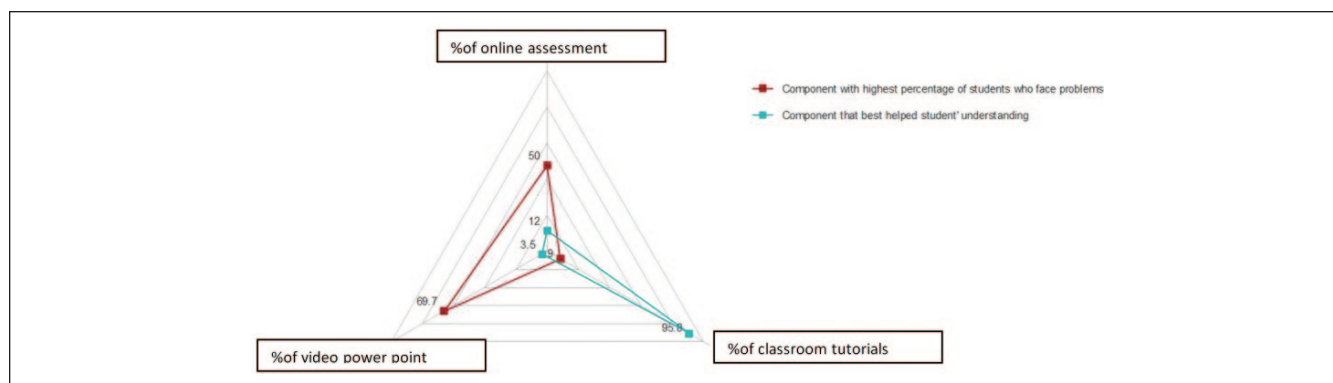


Figure 1. Blended learning components and percentage of students who face problems.

while the green line represents the component that best helped students' understanding. The components that have the highest percentage of students facing problems are online assessment and video power point. Meanwhile, the component that best helped students' understanding is classroom tutorials. These results were obtained by Yusoff et al. in 2015.

Proficiency Levels

The term *proficiency* is used in a variety of ways in education. Other similar terms for less proficient students are less effective learners, ineffective learners, poor readers, unsuccessful learners, or unskilled learners. Educators evaluate tests or other forms of assessments by giving scores and scales, and thereafter categorize students into several proficiency levels. This method of categorizing students is widely used in education to assess students' achievement.

Most studies found that high proficient students make use of strategies more consciously, more purposefully, more appropriately, and more frequently than do poor learners (Oxford & Nyikos, 1989). Similarly, Naiman, Frohlich, Stern, and Todesco (1978) found that high proficient students use a great variety of appropriate strategies for both receptive and productive tasks, whereas less effective learners have a smaller range of strategies and often do not choose appropriate strategies for the task.

Mehrdad, Ahghar, and Ahghar (2012) studied reading comprehension across three levels of proficiency (elementary, intermediate, and advanced). Mehrdad et al. found that an elementary (less proficient) student is not able to benefit from the cognitive and metacognitive strategies compared with intermediate and advanced learners. Mehrdad et al. further found that elementary readers mainly attend to the factual information in the text and fail to relate such information to the general content. Poor readers are not aware of the use of strategies to monitor their comprehension of texts as well as their strategy use (Mokhtari & Reichard, 2002). Lower achiever student's use less metacognitive strategies compared with higher achiever students (Park, 1997).

Pammu, Amir, and Maasum (2014) focused on reading strategies for less proficient tertiary learners. Panmu, Amir, and Maasum found that the less proficient learners used top-down strategies for better comprehension. The reading strategies used was setting purpose for reading, previewing text, determining what to read, resolving conflicting information, and confirming prediction. Another study by Mistar (2001) found that good and poor students in Indonesia use similar strategies but good learners use the strategies more frequently and effectively than poor learners do. Chen (1990) found that more proficient learners actually use fewer communication strategies, though they use them more effectively than less proficient students. Generally, proficiency has been determined on the basis of the educators' judgments about their students based on the marks or grades and their personal "on-balance" assessment of their students given the descriptors of high proficiency or good, middle proficiency or fair, and low proficiency or poor (Magogwe & Oliver, 2007).

Approach for Less Proficient Students

"If I cannot learn the way you teach, will you teach me the way I can learn?" a simple quote from Ignacio Estrada (Courtesy of David Zats). In practice, not all teaching methods can fit all students. Everyone is unique and needs different approach. Some of us are fast learners and some of us are slow learners. Slow learner is a term used to describe a student with the ability to acquire all necessary academic skills, but at a rate and depth below that of the average student (Muppudathi, 2014). Muppudathi suggested that every teacher or educator should build self-confidence among slow learners, be able to repeat (saying the same thing over and over), and encourage other learning activities. In summary, an educator must have innovative approaches or strategies for less proficient students. For example, to build up students' confidence level, an educator may use a simple approach first before gradually introducing a more complex but important approach. From experience, we observe that this approach is effective especially for mathematical and statistical subjects.

Table 1. Summary of Sample Characteristics.

| Characteristics | Sample A | Sample B |
|-----------------------------|---|---|
| 1. Program | Business program | Business program |
| 2. Course | Introduction to Statistics | Introduction to Statistics |
| 3. Total number of students | 31 students | 34 students |
| 4. Number of groups | Two groups: <ul style="list-style-type: none"> • Repeaters (10 students) • A mixed of booster, repeaters, and a couple of good students (21 students) | Two groups: <ul style="list-style-type: none"> • Repeaters (21 students) • A mixed of booster, repeaters, and a couple of good students (13 students) |
| 5. Lecturer | Mrs. Rohana | Mrs. Rohana |
| 6. Teaching module | Original Blended Learning | Redesigned Blended Learning |
| 7. Semester | June-October 2015 | December 2015-March 2016 |

Method

The sample size for this study is 64 business program students from four groups taking the course Introduction to Statistics in two consecutive semesters. The four groups of students are divided into two samples called Sample A and Sample B.

Sample A consists of 31 students who took the course Introduction to Statistics from June to October 2015. Whereas Sample B consists of 34 students who took the same course from December 2015 to March 2016. Sample A is divided into two groups; one group contains 10 students who had to repeat the subject while the other group contains 21 students comprising of those who had undertaken a booster program because they entered the university with lower qualification, repeaters, and a few good students (according to their cumulative grades [CGPA]). Sample A was taught using the Original Blended Learning (OBL) module.

Sample B is also divided into two groups; one group consists of 21 students who had either repeated the subject once, twice, or had dropped the subject when they should have taken it in earlier part of the program. The other group of 13 students is made up of those who had undertaken a booster program because they entered the university with lower qualification, repeaters of the subject, and several good students (according to their CGPA). Students from Sample A who failed their examination and had to repeat the subject are included in Sample B. Furthermore, both samples of students were instructed by the same lecturer (Mrs. Rohana). Sample B was taught using the Redesigned Blended Learning (RBL) module. Apart from very few good students, the rest of the students in both samples are considered less proficient in the course. To give a better insight to readers, a summary of the characteristics of each sample is shown in Table 1.

We have tried to control all possible variables to reduce the differences between the two samples. From Table 1, we can see that Characteristics 1 to 5 for both samples are very similar. To show whether the redesigned blended module is more effective for less proficient students, we compare final exam marks and the total marks (final exam marks plus

continuous assessments marks) for the two samples using *t* test and look at the mean effect size. The final exam scores can be used for comparison because for every semester, students' answer scripts are inspected by an audit committee elected by the university to make sure that markings are according to the marking scheme and no unsolicited marks given to students' answers willfully. As such, the scores can be taken as true data.

Brief Description of the OBL Module

The blended learning module that we developed consists of three dimensions: face to face (F2F) sessions, self-learning, and assessments. The total four contact hours per week is divided into 2 hr F2F and 2 hr self-learning (a ratio of 50:50). F2F sessions are class sessions where students can ask questions, discuss, and solve problems in the lecturer's presence. At the same time, the lecturer facilitates, explains, and provides exercises for students to work on. This is the time when lecturers can ensure that students solve problems using correct methods and understand concepts correctly. Self-learning sessions require students to learn independently anywhere and at their own convenient time. Students are provided with videos on all the topics in the syllabus, lecture notes, and tutorial exercises. Assessments are embedded in both F2F and self-learning sessions. They consist of short written quizzes, assignments, and tests. The final examination is conducted at the end of the semester after a week of "study leave" where no formal lectures are allowed during the week. During F2F sessions, a minimal technology application is used; most of the time, instructors use "chalk and talk" method. While during self-learning, communication among students and instructor is made easy with instant messaging applications (WhatsApp and Telegram). The university online learning application is also available for forums, online quizzes, and online accessible storage of all teaching materials.

To make it easy to differentiate between the OBL module and the redesigned module, we are going to call the original module as OBL module and the redesigned module as RBL module.

RBL Module

The following paragraphs describe how the components of the three dimensions of the OBL were tailored to suit the less proficient students.

Technology applications. During F2F sessions, technology applications used in RBL module are Explain Everything and Padlet, while during self-learning, similar communication applications as in OBL module are used.

Investigate learning styles. The first two semesters of students instructed using the OBL module had proven blended learning is suitable for diverse learning styles. Thus, applying the same method of teaching to all students during F2F and assessments are acceptable. However, results from the third semester of blended learning showed that the statement might be true only up to a certain cognitive and motivational level. Below a certain threshold level, we still have to be sensitive and cater for the different learning styles when teaching. Thus, at the beginning of the first class, we asked students to answer a questionnaire on visual, auditory, and kinesthetic learning styles (VAK questionnaire). Results showed that all of the less proficient students are kinesthetic whereas the few good students are all either visual or auditory or both. This is quite an interesting finding that implies watching and listening to an instructor's explanation will get the less proficient students nowhere near to comprehending what is being taught and what more to remember the facts and figures. To learn quicker, these students have to be doing more activities connected to the subject rather than only watching and listening.

Realizing that the students are mostly kinesthetic in learning style, we have redesigned the original module to include more activities. But that is not enough because asking them to do more activities may only rouse complaints as they may have to spend more time on our subject while other subjects also demand their attention. Hence, the instructor has to balance between the enthusiasm to get the students to learn her subject with the amount of workload given to students. Moreover, students will not do the exercises, quizzes, and assignments if they are not motivated enough.

Integrate videos and lecture notes. Some students have voiced out that they find difficulty in concentrating to academic videos. It is well understood that listening to academic videos may be a boring activity as academic videos do not have the attractions of a movie and the likes. What more if some theoretical concepts are not understood by the students? To overcome the problem of understanding the videos, during F2F session, instructor uses the power point videos converted to portable document format (PDF) as lecture notes. This is to familiarize students with the slides in the videos as well as facilitate students' memory of the content. Students could ask questions about the slides and redo the examples when they watch the video again. *Instant feedback on short written*

quizzes. Each of the quizzes takes about 10 to 15 min of the 2 hr F2F session. The objective is to strengthen memory of what has been learnt before as well as to motivate students to put in effort to learn. It is a way to avoid students passively watching a video which does not achieve any level of rich learning as it does not require the student to do anything but sit, watch, and, with a bit of luck, absorb information. For each chapter, students are required to watch a fixed number of video slides and a topic for the quiz is given. After the quiz, students' answers are redistributed among them and the correct answers are presented together with the marking scheme. Students then mark their friends' answers and return the papers to their owners when finished marking. In this way, students get instant feedback on their mistakes. All marks achieved are recorded and contribute to a portion of the continuous assessment mark. The reason for this is to eradicate any idea by the students that the quiz is unimportant and so no need to be concerned with.

Proportion of F2F to self-learning. The proportion of F2F to self-learning in OBL module was set to 50:50. In RBL module, F2F stays 2 hr but the amount of time allocated for completely independent self-learning is reduced to 1 hr while another hour of self-learning is set for open book quizzes. So the proportion becomes 50:25:25 or 2:1:1. There is at least one open book quiz for every chapter. Every student has to submit their individual quiz and marks given will be a proportion of their continuous assessments. Students may choose not to be in class, but they have to come to class to get the question paper. This is to ensure that they make themselves available to do the quiz. They are allowed to discuss and to look up notes and books, but it is compulsory for them to submit in a specified time set by the instructor. The quiz was designed so that students can finish in 1 hour. Instructor is not present in class but is available online to answer any query about the quiz except to give direct answer. Students are encouraged to teach and to learn from each other. Especially, the better ones are encouraged to teach while the weaker ones are encouraged to ask. In this way, we hope to create a happy and lively study environment for the students. This method overcomes the main disadvantage (Muirhead and Salmon, 2002) of blended learning which is the lack of face to face social interaction.

The main objective for implementing open book quizzes is to motivate students to study. Although they are open book quizzes, they need to have basic knowledge to hasten their understanding so that they can finish the quizzes in the specified time. Marks for these open book quizzes are given for submission, not for the correct methods and answers per se. However, different marks are given for the different amount of questions answered completely. This method of assessment helps to relieve the instructor from having to correct too many quizzes. The answers to an open book quiz are discussed in the following F2F session. Students who are absent are given a link to Padlet for online submission.

Table 2. Comparison Between Summary Statistics of Original and Redesigned Modules.

| Summary statistics | Based on final exam scores only | | Based on final exam and ongoing assessment scores | |
|---------------------|---------------------------------|---------|---|---------|
| | RBL | OBL | RBL | OBL |
| <i>M</i> | 58.97 | 47.19 | 58.43 | 46.19 |
| Sample size | 34 | 31 | 34 | 31 |
| Median | 61.75 | 47.5 | 60.76 | 49.22 |
| Variance | 229.302 | 174.995 | 190.525 | 155.839 |
| <i>SD</i> | 15.14 | 13.23 | 13.80 | 12.48 |
| <i>SE</i> | 2.60 | 2.38 | 2.37 | 2.24 |
| Minimum | 15 | 21 | 15.86 | 18.33 |
| Maximum | 79 | 73.5 | 80.41 | 69.81 |
| First quartile | 52.50 | 36.25 | 54.92 | 34.31 |
| Third quartile | 68.50 | 55.75 | 67.33 | 53.25 |
| Interquartile range | 16.00 | 19.50 | 12.41 | 18.94 |
| Mean effect size | 0.83 | | 0.93 | |

Note. RBL = Redesigned Blended Learning module; OBL = Original Blended Learning.

Continuous assessment proportion. The continuous assessment consists of tests, quizzes, and open book quizzes. Out of 100% total final mark, tests constitute 30% and quizzes and open book quizzes constitute 10%. Tests are meant to evaluate understanding of the subject material whereas quizzes and open book quizzes are meant to motivate students. That is why for each set of short instant quizzes, open book quizzes, and online quizzes, only the best scores from 30% of the total assigned short instant quizzes, open book quizzes, and online quizzes are counted for the 10%. To motivate students, this information is kept secret.

Analysis and Results

Table 2 shows the comparison between summary statistics of students' performance under both OBL and RBL modules. Two different scores are used in the comparison: (a) final exam scores only and (b) final exam plus ongoing assessment scores. The mean, median, minimum, and maximum values for OBL module are all lower than the mean, median, minimum, and maximum values for RBL module. In addition, lower dispersion in scores (lower standard errors) for OBL module indicates that the rest of the scores are close to the mean value. These results indicate that in general, students in RBL module perform better than students in OBL module.

We also extend the analysis to effect size analysis to know how much the effect of RBL module is over the OBL module. We have used the effect size given by Cohen's *d*. The mean effect size for final exam scores only is $d = 0.83$ while $d = 0.93$ for final exam and ongoing assessment scores. This indicates a large effect size suggesting high practical significance.

Table 3 shows the comparison of scores using box-plots. From the plots, we can see that the distributions of final exam scores are almost normal for both OBL and

RBL modules. However, the distribution of final exam and ongoing assessment scores for OBL module is left skewed showing the impact of ongoing assessment scores on the total scores. If the ongoing assessments measure students' effort, then we can conclude that only half of the students had dedicated reasonable effort while the other half had dedicated less than reasonable effort. However, in the RBL module, the distribution of final exam and ongoing assessment scores is still almost normal.

Further analysis using independent sample *t* test is conducted to compare the scores. Results in Table 4 show that there is a significant difference between scores for OBL and RBL modules; that is, mean score for RBL module is significantly higher than the mean score for OBL module.

Limitation

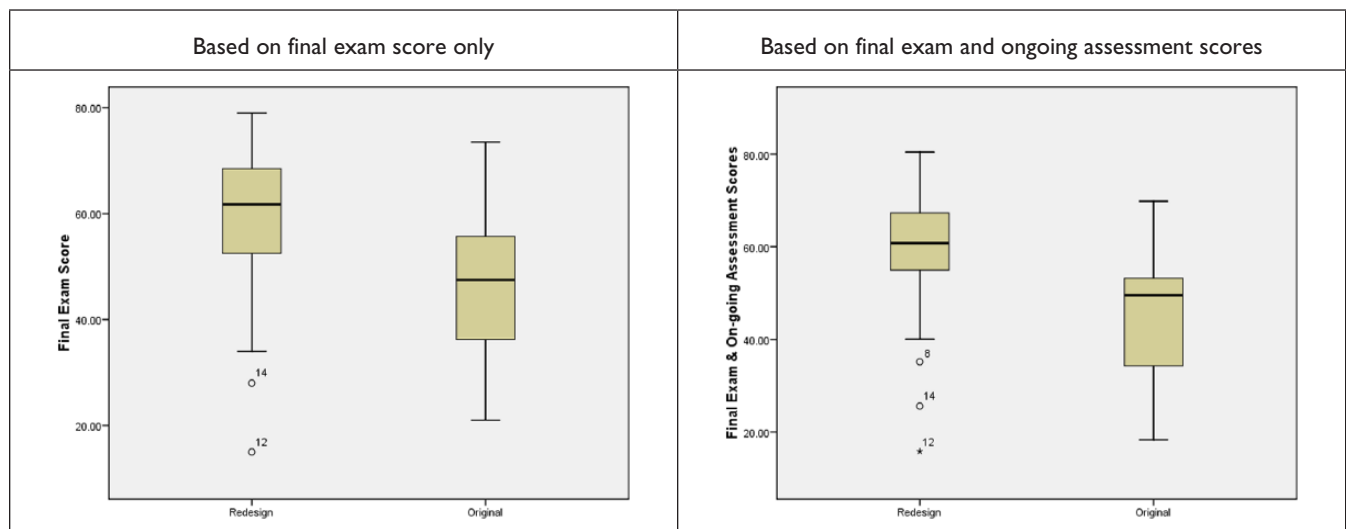
Apart from the difficulty in obtaining identical samples for conducting comparison, the other limitation is that the RBL module has been verified on only two groups of students in one semester. Further verification with more groups of students is necessary to get more reliable results.

Conclusion and Recommendations

Nowadays, blended learning is a must. If students cannot learn the way we teach them, then as instructors, we must find ways to change our teaching method. Hopefully, teaching and learning can be joyful as well as a satisfying experience for both students and instructors. Results from this study show that blended learning can be used as a teaching approach for less proficient students in the course Introduction to Statistics. However, the dimensions of the blended learning have to be tailored to suit the students' learning styles. This is because even though an average proficient student can quickly familiarize and adapt to blended learning approach, less than average proficient students need to have additional monitoring to encourage higher participation.

One important element in the RBL module is the increase in opportunity for academic social interaction among students. Through open book quizzes, students have the chance to socialize academically through discussion while completing the questions. This has a tremendous effect on elevating shyness and individualistic behavior among students. As a result, they become more helpful, more caring toward each other, and more importantly have higher motivation to study.

Finally as a reminder for us, technology is just a tool; to get students to work and motivate them to put in effort, the teacher is most needed. However, motivation through talking and advice will not have a transcendental effect if not supported by a good learning system. A good learning system for a course is one that offers many opportunities for student enhancement such as abundant and easy access course materials, instant feedback on progress through quizzes and tests, and an environment of helpfulness among colleagues and instructors.

Table 3. Box-Plots.**Table 4.** Independent *t* Test of Scores for Original and Redesigned Modules.

| Score | <i>t</i> test value | <i>df</i> | Significance (two-tailed) | SE difference | 95% confidence interval of the difference | | Significance difference |
|--|---------------------|-----------|---------------------------|---------------|---|-------|-------------------------|
| Based on final exam marks only | 3.325 | 63 | 0.001 | 3.5421 | 4.69 | 18.85 | Yes |
| Based on final exam marks and ongoing assessment | 3.736 | 63 | 0.000 | 3.2758 | 5.69 | 18.78 | Yes |

This redesigned blended learning module provides a system whereby like it or not students are forced to put in effort to learn the subject through instant feedback on short quizzes as well as involvement in academic discussion among colleagues during open book quizzes. Through the use of technology, they have easy access to abundant course materials as well as two-way communication with instructors and colleagues. Thus, we recommend three elements essential in blended learning for less proficient students: easy access to course materials, instant feedback, and academic social interaction.

Declaration of Conflicting Interests

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