EFFECTIVENESS OF BLENDED DEFENSES IN HUMAN ANATOMY COURSES

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INFO ARTIKEL

Diterima
10 February 2021
Diterima dalam bentuk review 13 February 2021
Diterima dalam bentuk revisi 20 February 2021

Keyword:
Human gross anatomy; Teaching of anatomy; E-learning; Dentistry.

ABSTRAK

It is very demanding to teach anatomy in the present curriculum of medical education. The amount of time allotted to teach and learn human anatomy is diminishing. The traditional teaching method is no longer effective in being able to provide vast amounts of human anatomy learning material. Besides, this method is also passive, which is not liked by the current generation of students. Various disciplines have widely used the learning approach with the blended learning method. This study aims to compare the effectiveness of the blended learning method (BL) with the traditional teaching (TT) method on the student's final grades and the percentage of graduation rates for the gross human anatomy courses. A total of 217 final student grades from Batch 2016 (69 students), Batch 2017 (69 students), and Batch 2018 (79 students) were collected and analyzed. Students in Batch 2018 received the blended learning (BL) method while the Batch 2016 and Batch 2017 received the traditional teaching (TT) method. The mean final scores between the BL and TT methods were compared, also the percentage of graduation rates between the two methods. There was a significant mean difference in the student's final grade ($P < 0.001$) between the BL method (66.77) versus the TT method (47.84). The percentage of students who passed with the BL method (65.82%) is higher than the TT method (10.14%). The result concluded blended learning method is more effective in increasing the final grade and percentage of graduating students than the traditional teaching method for gross human anatomy courses.

Introduction

Teaching anatomy in the modern curriculum era is very challenging. For the past 30 years, we have heard complaints about the decline in anatomical knowledge of general practitioners and surgeons. These complaints are due to the reduced time given for anatomy courses in undergraduate medical education, the reduction in the number of staff, and the reduced time in which there is no longer any activity in the form of cadaveric dissection either for an undergraduate medical student or surgical residents.

Knowledge of anatomy is fundamental in examining patients, establishing a diagnosis, and communicating with patients, and other medical professions about the medical findings obtained (Ngan et al., 2018).

Much debate arises about how to teach anatomy in this era. Some lectures still tend to use traditional approaches that emphasize the existence of activities in the form of cadaveric dissection and those who tend to use new (modern) approaches such as self-directed learning, problem-based learning, and computer-based learning (Shaffer, 2014). Teaching anatomy in this era also needs to pay attention to the characteristics of its student. Current generation students have been identified as generation Z or generation digital natives because they grew up in a digital environment. This digital environment and related culture have changed the thinking and learning process of this generation compared to the previous one (Dudoit et al., 2016).

In general, students in generation Z are easy to socialize, like to express themselves, are always mobile, have a global mind, communicate digitally, and like visual things. They receive and process information quickly, like multitasking, and are highly dependent on communication technology to interact socially and professionally. Generation Z grows highly connected, confident in the technology, and chooses to learn independently using electronic resources compared to using traditional teaching methods. This generation of students prefers a comfortable learning environment and always needs positive (supportive) feedback to help them build their skills and confidence (Danziger et al., 2018).

Higher education must be able to meet the needs of this generation Z and must struggle to change the way it teaches to be in line with the values and learning styles (Swaminathan et al., 2020). Nowadays, learning strategies with blended learning are widely used by various disciplines, because the new technology used is very profitable and has the potential to increase efficiency and support the delivery of learning materials (Charles et al., 2018). Blended learning defines as a combination of face-to-face lectures and online learning media, but more than that as an element of social interaction

During the past five years, teaching and learning gross human anatomy at our department anatomy for undergraduate dentistry students have changed according to the new dentist curriculum. The latest curriculum provides plenty of learning material to complete in a short time. This condition caused a decline in the graduation rate. We must find new learning methods to overcome this problem. Human anatomy teaching and learning techniques have evolved in recent years, from conventional teaching methods to web-based e-Learning technology (Green & Whitburn, 2016). Still, the results of the study only refer to the level of satisfaction and perception of students in the use of the blended learning method, in which students provide positive responses (Ocak & Topal, 2015). Study on the comparative effectiveness of blended learning in teaching all organ systems of gross human anatomy compared to traditional teaching methods has never been reported before. In particular also towards the final grades (score) and graduation rates of undergraduate dentistry students.

In 2019, it was the first time we use a Moodle-based learning management system for teaching and learning the undergraduate dentistry student in Batch. Therefore, we want to find out whether this new learning strategy will more effectively increase the undergraduate dentistry student's final grade and rate of graduation compared to the traditional learning method that has been running before.

Research Methods

Analytic observational research with a cross-sectional approach was conducted to analyze the final grade of the undergraduate Dentistry Faculty Students, Mahasaraswati University. This research was carried out at the Department of Anatomy, Medical Faculty of Udayana University, from January to May 2020. Data was collected from the final grades of undergraduate dentistry students Batch 2016-2018. The scores that have been used are from those of students who have met the following criteria: the student fully participated in face-to-face lectures and practical activities; they took the midterm and final exams; also did all of the online activities (for the Batch 2018). Face-to-face lectures and practicums were conducted directly at the Department of Anatomy, Medical Faculty of Udayana University, every Friday, from May to June 2017-2019.

The number of students who met the inclusion criteria in this study was 217 students. The amount obtained from each Batch. Batch 2016 (69 students), Batch 2017 (69 students), and Batch 2018 (79 students). The course was held in the even semester and comprised 12 topics that will be given during nine meetings each week.

A. Traditional teaching

Students in all Batch received a total of 35 hours of theoretical and 10 hours of practicum. Hours for theoretical were divided into:

Table 1
The names of the topics and time given for theory and practicum

Topic	Hours for theoretical	Hours for Practicum
The basic concept of human anatomy	3	-
The integumentary system	3	-
The musculoskeletal system	4	2
The respiratory system	3	1
The endocrine system	2	-
The cardiovascular system	3	1
The oral cavity, pharynx, and esophagus	2	-
The special senses	2	1
The nervous system	4	2
The urogenital system	4	-
The embryology of head and neck, and	4	-
The digestive system	1	1

Batch 2016 and 2017 have used this teaching method. The study guide was given one week before the course began. Learning activities on the traditional

teaching method were only lecture and practicum. Midterm exams and final exams were conducted with a paper-based test.

B. Blended learning

Students were registered at https://elearning.unud.ac.id and enrolled in the course with enrollment keys that have been distributed before. At e-Learning, students were divided into six small groups that have 13-14 members. One facilitator facilitated one group. Students were able to flexibly access lecture instructions, reading resources, learning materials such as PowerPoint slides, and lecture videos that were embedded from YouTube at least a week before the lecture started. But they cannot access the other topics. Subsequent e-Learning activities included:

1. Forum

   In this activity, students in the group conducted an online discussion of cases or questions on Saturday started from 4:00 pm. The discussion session was opened for one day. Evaluation of the online discussion was carried out by lecturers guided by the rubric. The weighted score for the forum was 20% of the total final grade. Besides being assessed, students were always got feedback as long as they attended discussion forums.

2. Quiz

   Every Monday, students did the quiz, and the quiz opened at 08.00 pm for two hours. Three times the number of attempts given, and the score used was the average. For each attempt, the time given to answer the quiz ranges from 15-30 minutes. That quiz's questions were True-False and Multiple Choice Question (MCQ). Quiz questions that appeared as many as 5-30 questions from the question bank that was already available. The weight for this quiz was 20% of the total final grade.

3. Assignment

   Some topics from the course gave assignments to students. Furthermore, they completed these activities in groups and were assessed by the facilitator (lecture) based on the rubric. The weighted value for the assignment is 20% of the total final grade. They also got feedback on their work.

4. Midterm exams and final exams

   Students took the online exam in the anatomy lecture room using their laptops and internet data. There were many as 90 MCQ items of questions that they must work for it. The questions and choices were randomized automatically. The weight of each exam was 20% of the total final grade.

   The final grades Batch 2016 and 2017 were obtained from the combined average of the midterm exam with the final exams. Whereas the final grades Batch 2018 were the combined score of quiz activities, forums, assignments, midterm exam, and final exam. The weight of these activities was 20%.

5. Statistical analysis

   The final average grade of each Batch was collected and compared. Data normality was tested with the one-sample Kolmogorov Smirnov test. If the result

was normal, data from each Batch was analyzed using the one-way analysis of variance (ANOVA) for comparing three batches; otherwise, the Kruskal-Wallis analysis will be used. Furthermore, the learning method strategy was analyzed with the independent t-test if data were distributed normally. Otherwise, it was analyzed using the Mann-Whitney *U* test.

Results and Discussion

A. Research Results

The study involving 217 students produced a different percentage of passing grades between three Batches (Figure 1) and between the learning methods used (Figure 2). The rate of graduation referred to the final score. Figure 1 showed the highest percentage of passing grades in the Batch 2018 than the others. That Batch itself was undergraduate dentistry students who had started using blended learning methods in our Department of Anatomy. A similar comparison also was seen in Figure 2, where the percentage with blended learning was more significant than the traditional teaching method. The last-mentioned method was obtained from the combined score of two Batches, 2016 and 2017, and still had low scores.

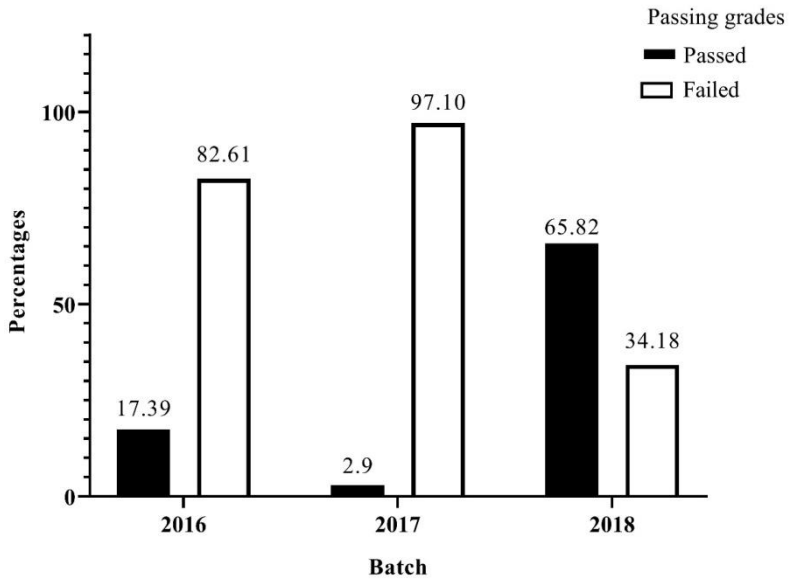

Figure 1
Percentage of passing grades (score ≥ 65.00) on the undergraduate dentistry student among batches of 2016-2018

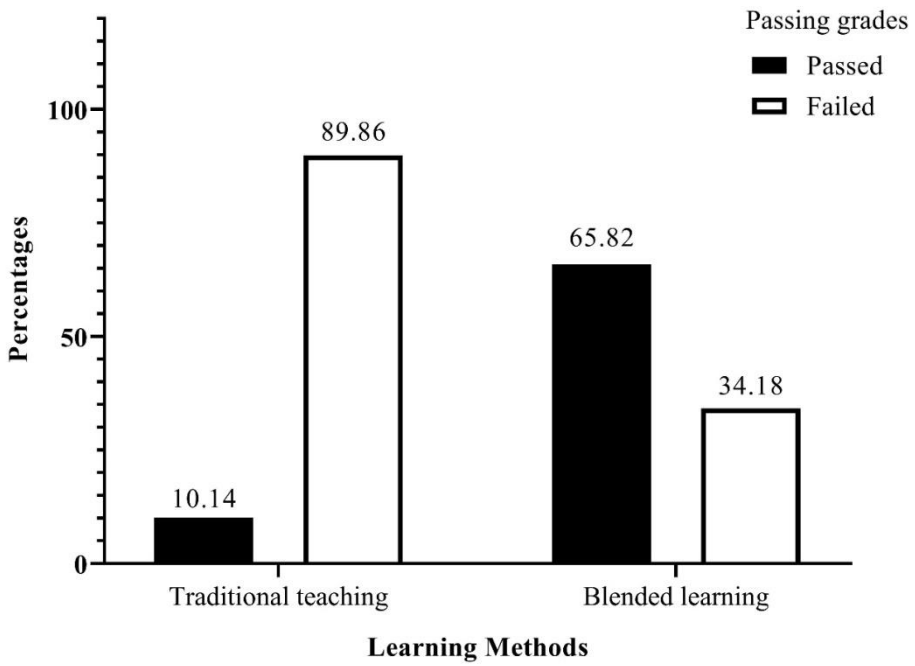

Figure 2
Percentage of passing grades (score ≥ 65.00) on the undergraduate dentistry student among teaching methods used.

On the other hand, all test scores data on those undergraduate dentistry students showed differences in data distribution ($p < 0.001$). The Kruskal-Wallis analysis showed that there were significant mean differences in final scores in several batches ($p<0.001$). Also, the Mann-Whitney *U* test showed that only Batch of 2016-2018 and 2017-2018 differed significantly with p-value <0.001, respectively (Figure 3). The Mann-Whitney *U* test completed the analysis of the learning method applied (Figure 4). Besides, the average of the final scores between the two methods was significantly different ($Z = -9{,}941$; $p<0.001$).

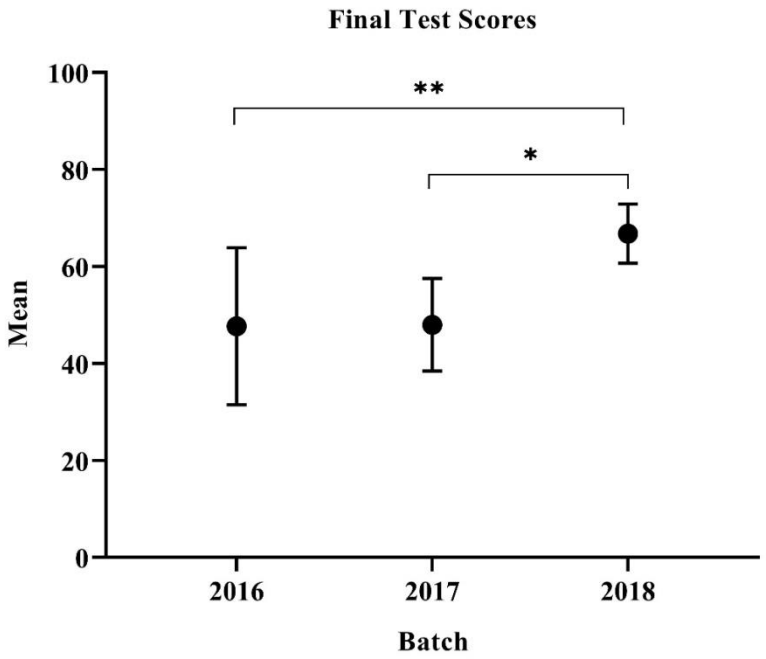

Figure 3
Mean difference between final scores among the three Batches (Batch 2016:51.35, Batch 2017: 47.99, and Batch 2018: 66.77). Note: Mann-Whitney test revealed *p<0.001 and **p<0.001 significantly.

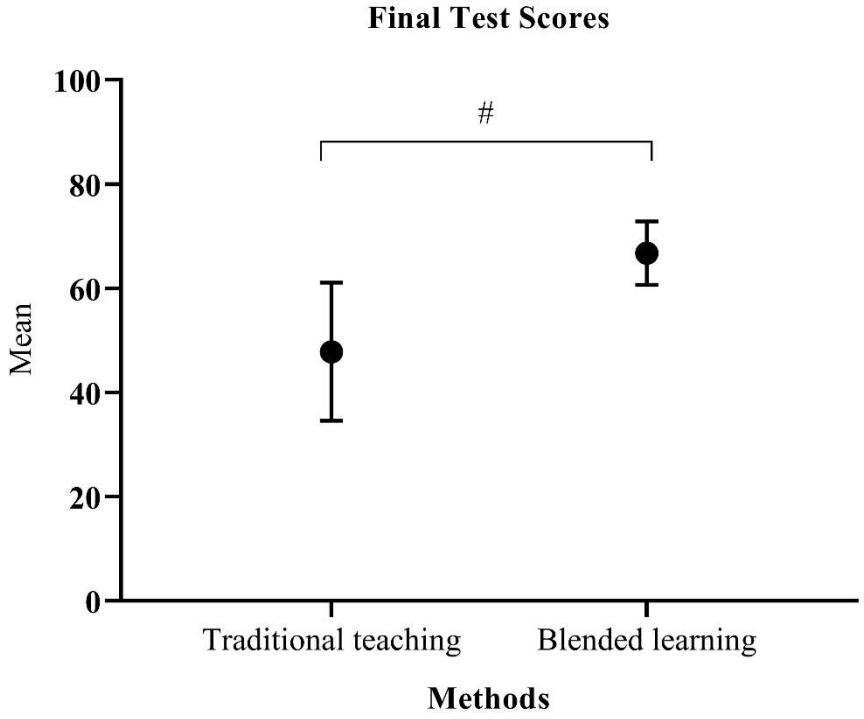

Figure 4
Mean difference in final scores among the teaching method used (TT: 47.84 versus BL: 66.67). Note: Mann-Whitney test revealed #p<0.001 significantly.

B. Discussion

Anatomy has a vital role in the curriculum of medical education, dentistry, and other health professions such as nurses, pharmacy, and physiotherapy. Unfortunately, in the new medical education curriculum, the time allotted for anatomy is diminishing. Traditional teaching and learning methods are no longer effective in being able to provide vast amounts of anatomy learning material. Besides, this method is also passive, which is not liked by the current generation of students.

The result of the study showed that the strategy of blended learning and teaching was significantly effective compared to traditional teaching strategies to increase the final student grades. Kenney and Jane conducted the same research on the effectiveness of blended learning on the student's final grade but carried it out in different disciplines. Psychosocial courses given in the blended learning class show the average final score slightly higher than the non-blended class (Kenney & Newcombe, 2011).

Blended learning provides easy for students to access learning materials anytime and anywhere. The existence of this convenience is one of the factors that increase the achievement of learning outcomes and makes it easy to provide a lot of learning material that can be delivered in a short time (Green & Whitburn, 2016). Lecture instructions and assignments also become effective even if they were done in large classes. The role of the lecturer changed to become a facilitator (Kenney & Newcombe, 2011).

We provided learning content and learning activities gradually on our online course. Students can access the next learning topic if they have completed all the current learning activities. So they can focus on completing the current issues that they were faced with. Proper content delivery made students work independently, become active learners, and comprehend the learning outcomes. But the research was conducted by (White et al., 2019). shows that it was student engagement that was a determinant factor that influenced student learning and performance rather than the mode of content delivery (Seethamraju, 2014).

Medical graduates expected not only limited to having good anatomical knowledge but also having excellent communication skills. Forum and assignment activities at the e-Learning facilitate students to develop their communication skills, encourage students to express their arguments, acknowledge other friends' views, and be able to use respectful and kind words during debates. They were trained to always work together in solving a question or case given by the lecturer. The facilitators only assessed the online discussion for the forum activities without providing the correct answers so that the debate would not stop. The weakness of this activity is our difficulty in evaluating the ongoing discussion objectively, and it takes a long time to saw student writings in the forum.

Online discussions have also been found to have a beneficial impact on learning with a case study approach on the graduation of students. The study also agreed that online discussion allows learning to be flexible and independent; the

knowledge gained will be constructive and can develop critical thinking skills. The design and evaluation of online discussions must be made effectively.

Given quizzes in the learning process has a positive influence on student academic performance (Pinto-Llorente et al., 2017). Quizzes support continuous evaluation and allow students to self-assess their progress in the learning of gross human anatomy. Quizzes also promote independent learning and facilitate direct formative feedback to guide students in the learning process. This finding clearly shows that the quiz gives participants to play an active role in their learning, and also reveals the importance of the teacher's role as a guide to this process (Romero-Reveron, 2020). But our study did not analyze the effectiveness of the quiz on the final grades and graduation of students as well as forum and assignment activities (Salas-Morera et al., 2012)

Conclusion

Based on the results of the study, it can be concluded that the time allocation is decreasing in the new medical education curriculum. The blended learning method is more effective than traditional teaching and is no longer effective in providing large amounts of anatomy learning material. Also, this method is passive, and currently, creative students do not provide it. This increase is one of the factors that increase learning outcomes and provides the benefits of many learning materials that can be delivered in a short time. Therefore, they can focus on solving the current problems they face. Forum activities and assignments in e-learning can help students develop communication skills, encourage students to express their opinions, express the opinions of other friends, and be able to use polite and friendly language when debating. They are always committed to solving problems or cases raised by the lecturers. The moderator only evaluates the activities of the online discussion forum without giving the correct answer, so that the debate does not stop

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