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Abstract. This study aims to analyze the quality of the implementation of blended learning in analog electronics learning in terms of aspects of student effectiveness and response. This research is descriptive analysis research. The subjects of this study were 44 students of physics education FKIP Lambung Mangkurat University. The effectiveness of the implementation of blended learning is viewed from the results of student cognitive learning, using learning outcomes tests. While the response of students using questionnaires. Based on the data analysis, it was found that the effectiveness of the implementation of blended learning was categorized as medium with an N gain value of 0.58, and the student response to learning through blended learning was good. The conclusion is that the quality of the implementation of blended learning in analog electronics learning has medium effectiveness, and the student response is good.

1. Introduction

Physics is the study of the material properties, energy, and symptoms experienced by objects in nature. This is also the basis for the development of technological science in everyday life. One of the courses in the physics education courses is analog electronics. The learning achievement of analog electronics courses is that students are able to master the knowledge and understanding of direct current, alternating current, semiconductor material, semiconductor diode, transistor, coupling amplifier circuit, feedback, operational amplifier, and oscillator.

The ability of students to master and to understand the material about analog electronics must be trained by students by lecturers through the learning process. The problem is that there must be additional learning time, other than in class [1]. This is because the time for learning is not sufficient to fully exercise all mastery and understanding in each chapter and every meeting [2,3]. Another problem is how to keep interaction between teachers and students going while learning outside the classroom. This is very necessary for a place where although different places, teachers and students can interact, and students can gain knowledge, do assignments/quizzes, and other activities. This requires additional learning without face to face [4].

The challenge in the 21st century is the use of technology in the education system [2,5–10]. Technology can be used to improve the teaching-learning process [11–15]. Most of the higher institutions aware that using technology can enhance student's experience and knowledge[16]. Technology can overcome the problem of how to unite lecturers and students, who do not face it to face [6]. Technology needs to help the process of interaction and communication between lecturers and students [17]. The use of technology in education benefits both students and teachers.

One learning that uses the latest technology is web-based learning [18]. Web-based learning can help organize learning without having to meet face-to-face between lecturers and students. The advantage of web-based learning is that the learning process is not limited to time, while face-to-face learning is limited by face-to-face learning time [5]. However, the weakness of web-based learning is that it is less capable of assessing activity with observations of student participation in the learning process [5]. For this, face-to-face learning is more effective. Weaknesses and advantages of face-to-face learning and web-based learning can be mutually covered by each other. Therefore, it is important to combine face-to-face learning with web-based learning [5,19–25]. Learning like this is called blended learning.

Blended learning emerged as one of the most popular pedagogical concepts at the beginning of 2000 [24]. The blended learning model goes hand in hand with Education 4.0; learning activities are integrated with cyber technology [26,27]. The Learning that implements blended learning is expected to help students master and understand the material in analog electronics lectures. Blended learning aims to facilitate learning and build students' knowledge through meaningful interactions [28]. Blended learning has the potential to strengthen the core of teaching and learning [6].

There are many other ideas that instructors can use in their course to blend technology with face-to-face teaching [22]. To implement blended learning, an application that is a learning management system (LMS) is needed [7]. LMS, as an interaction platform, turns out to be useful and easy to use [29]. Moodle is an open-source learning management system that is now widely used in learning [3,4,30–34].

The blended learning used in this study is ULM Integrated Learning. This is a moodle that is being used at Lambung Mangkurat University. Teachers can use LMS Moodle to post readings, videos, wikis, forums, and quizzes to enhance self-regulation and increase student interaction outside the class setting [22,35]. Likewise with ULM Integrated learning, this has provided space for us to add teaching materials in the form of e-books, word, video; quiz; and assignments. In addition, lecturers and students can discuss through the available forum and chat features. Presence can be done directly by students who have been online/entered into online learning. Assessment can also be done through ULM integrated learning. Thus, ULM Integrated learning facilitates learning easily.

There are no studies that discuss how the quality of the implementation of blended learning in analog electronics courses. It is important to examine the quality of the implementation of blended learning so that learning in the following year will be refined to make it better. Therefore, this study focuses on analyzing the quality of the implementation of blended learning in analog electronics learning seen from its effects on student learning outcomes and student responses. The research questions are: (1) how is the effectiveness of the implementation of blended learning to improve student learning outcomes? (2) what is the student's response to the implementation of blended learning in analog electronics learning?

2. Method

This type of study was a descriptive analysis study. This study focused on analyzing descriptively the quality of implementation of blended learning in analog electronics learning seen from its effects on student learning outcomes and student responses. The subjects of this study were 44 students of FKIP physics education at Lambung Mangkurat University who joined analog electronics courses in 2018/2019. Data on the effectiveness of blended learning implementation on student learning outcomes were collected through tests of cognitive learning outcomes (pretest and posttest) about analog electronics. In addition, data on student responses to the implementation of blended learning in analog electronics learning were collected using student response questionnaires. Data about effectiveness were analyzed using the N-gain test, and the effectiveness categories would be stated [36]. Data on student responses were analyzed descriptively. The quality of the implementation of blended learning in analog electronics learning would have a good category if: (1) effectiveness was minimal in the medium category; and (2) student responses were minimal good.

3. Result and Discussion

Analog electronics learning is carried out by implementing blended learning. Learning is carried out 16 face-to-face meetings according to a predetermined schedule. Then, learning, coupled with web-based

learning uses integrated e-learning ULM. Teaching materials such as e-books and powerpoint presentations are uploaded on ULM integrated e-learning so students can download it for study. At each meeting, using web-based learning, students have been given quizzes and assignments that must be carried out. This quiz and assignment give a score according to the student's answer. This value is accumulated to be the value of student assignments.

The average results of the pretest and posttest can be seen in Figure 1. The figure shows that the average posttest is higher than the average pretest. Both pretest and posttest data have been declared normally distributed by statistical tests.

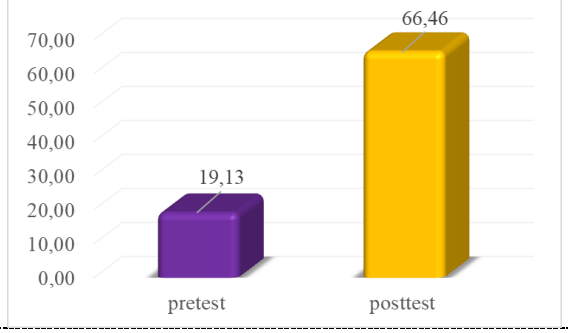

Figure 1. The average of pretest and posttest

The N-gain test results show a value of <g> of 0.58. Based on the gain criteria [36], the effectiveness of the implementation of blended learning on student learning outcomes in the medium category. Thus, there is an increase in student analog electronics learning outcomes after applying blended learning. This increase has been in accordance with previous research [18,19,22,24–26,34,37–43], which states that the application of blended learning can improve student learning outcomes.

Through blended learning, students can study anywhere[30,44]. The students had to attend classes in person and had access to an asynchronous online classroom to undertake a range of learning activities based on their classes [25]. Blended learning can involve students actively and allow students to get feedback [45].

The results of the student questionnaire responses showed an average of 3.51. This means that the student's response to the implementation of blended learning is good. Students who are taught with blended learning feel happier and attractive not easily bored during the lesson [26,34]. Students have a good view of blended learning; it influenced by the knowledge and experience of students in using technology [8]. Blended learning is able to create an interesting learning experience for students [9] and also gives more flexibility and helps students in the learning process [4]. Students have realized that learning in the future will lead to the use of information technology and expect learning to take advantage of this technology [18].

Blended learning has facilities to meet the needs of our era, which have various kinds of technological innovations [2,46]. Blended Learning has succeeded in becoming a trend and is widely used in leading universities in the world [6,19]. Blended learning is perceived as useful, enjoyable, supportive, and flexible for learners [17,24]. Blended learning is one of modern learning that relies on the use of information technology to improve active learning strategies and learner-centered strategies [47]. Blended learning promotes student-centered learning by empowering students to take more responsibility for their learning and to increase the involvement and participation necessary for that learning [6].

The implementation of blended learning using ULM integrated learning in analog electronics learning is provided in several sub-topics according to the curriculum. There are three major components of blended learning: learning environment component, Instructional component and media component [48]. Blended learning combines multiple delivery media that are designed to complement each other and promote learning and application-learned behavior [16].

ULM Integrated-learning has provided space for us to add teaching materials in the form of e-books, word, video, etc. In blended learning the information obtained by students is more and from various sources [35]. Blended learning is a flexible approach to designing programs that support a mixture of different times and places to learn [42]. Blended learning has several features of face-to-face learning and web-based learning [47]. At each meeting both the face to face learning and web-based learning have their respective priorities. This makes it easy to monitor student attendance at each meeting, both face to face learning and web-based learning.

Blended learning can improve scheduling flexibility for educators by combining the best aspects of face to face and instructions online [26]. One of them is the implementation of quizzes and assignments. Quizzes and assignments are done and collected through ULM integrated learning in the rules and time determined by the educator. So, educators are more flexible in learning. In addition, assignments in online content are designed to encourage active students [18]. Lecturers can begin to have a meaningful assessment in blended learning [9], like based on assignments or quiz. For quiz facilities and assignments, students also get feedback in the form of material achievement responses [45].

Lecturers and students can discuss through a forum and chat features that are available in Integrated ULM learning. The intensive initial discussion in online discussion forums caused students to be better prepared to attend lectures. Forums are also good as space for students to reflect on their understanding, learning process, sharing ideas and problems faced related to the topics discussed [18]. The presence of a discussion forum or chat feature like this helps lecturers and students communicate well. Teachers using blended learning environments should encourage students for more collaboration[24]. This is so that a positive learning situation occurs.

The various features of moodle from ULM integrated learning make blended learning effective in improving student learning outcomes about analog electronics. Various facilities provided by ULM Integrated Learning motivate students to good respond to blended learning. Thus, the implementation of blended learning in analog electronics learning is of good quality.

4. Conclusion

The conclusion of this study is that the quality of the implementation of blended learning in analog electronics learning has a good category. This is because the implementation of blended learning has medium effectiveness, and the student response was good. Thus, analog electronics learning by implementing blended learning is effective for improving student learning outcomes. This good quality shows that blended learning can be applied again in the next lecture or other lectures.

Future research should explore alternative designs aiming at higher levels of performance. Based on the results of this study, it is suggested that it can try to implement blended learning in learning to improve student learning outcomes. In addition, further research on implementing blended learning in other subjects is very necessary.Also, more research needs to be done into the effectiveness of using blended learning.

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