

Optimization Blended Learning Systems in Physics Learning Outcomes with Successful Skills in Management Learning

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ABSTRACT

The objective of this research is to develop blended-based management systems as well as its suitable learning device for physics subject of high school in Sumatera Utara Province. The research and development method with 4D design. Determination of the learning mode chosen as the basis for developing an optimized learning system with learning tools designed to meet online and face-to-face elements. Preparation for designing lesson plans, media, and student worksheets is inseparable from the adjustments that have been built in the blended learning system. Need Assessment is carried out by considering the implementation of learning, the number of subjects with different systems, and understanding variations in learning systems. The system built will be tested through user feedback. The conclusions that can be informed from the implementation of this development research are 1. Determination of the 'Flipped Classroom' Blended Learning blended learning system. This lesson has been understood and needs adjustments to the meeting process compared to 50:50; 2. The use of web-based online classes makes it easier to change the face-to-face learning system; 3. Optimization is needed to increase the percentage of quality produced in the application of the selected blended system.

Keywords: Blended Learning; User Response; Learning Outcomes; Successful Skills.

INTRODUCTION

Learning that is applied in various schools still uses traditional learning, which is still using learning that prioritizes face-to-face between teachers and students even though the world of work or the business world is faced with a life based on information and communication technology (ICT) which makes it easier for us in various affairs. Likewise, in learning to transfer knowledge, many media make it easier for students to explain the knowledge and information needed in the world of education [1]–[4]. The main problem is that students or teachers are still low in mastering technology, therefore various educational institutions in Indonesia still use traditional learning. The use of Information, Communication, and Technology (ICT) in education has changed the way of learning from conventional learning or traditional learning that prioritizes face-to-face to digital-based learning by utilizing technology and information

[5]–[7]. Many digital-based learning media developments make it easier for students to learn independently to produce online learning or offline learning.

At first, the term Blended learning was also known as the concept of hybrid learning that combines face-to-face, online and offline learning, but recently it has changed to blended learning. Blended learning is a learning approach that combines the advantages of face-to-face learning and e-learning. The idea behind a blended learning environment is a learning environment where teachers and students work with a mix of books, presentations and classroom activities, and digital resources including online materials or smartphone applications. Blended learning is learning that combines or combines various web-based technologies, to achieve educational goals [8]–[10]. Blended learning is a learning approach that integrates traditional face-to-face learning and distance learning that uses online learning resources (especially web-based) and a variety of communication options that can be used by educators and students.

The composition of blended learning that is often used is by using the 50/50 pattern, in the available time allocation, which is 50% face-to-face 50% online learning, some use the 75/25 pattern, meaning 75% face-to-face meetings 25% online learning, and some apply 25/75, 25% use face-to-face learning, 75% use online learning [11]–[13]. The use of these patterns depends on the analysis of the competencies required, the objectives of the subjects, the characteristics of the learners, the characteristics and abilities of the learners, and the available resources. However, the main consideration in designing the learning composition is the provision of suitable learning resources for various characteristics of learners so that learning becomes interesting, effective, and efficient.

In combining online learning with face-to-face, what is called blended learning is different from other learning models. Blended learning also has certain characteristics including (1) a learning process that combines various learning models, learning styles, and the use of various technology and communication-based learning media, (2) a combination of independent learning via online with face-to-face learning between teachers and students and combines independent learning, (3) learning is supported by effective learning from the method of delivery, learning methods and learning styles, (4) in blended learning parents and teachers also have an important role in the learning of students, teachers are facilitators while parents are motivators in their children's learning. The characteristics of blended learning are that students can socialize well with others, students have plenty of time and can provide feedback, students are also guided well and students learn in an ideal atmosphere.

The blended learning model has the aim of facilitating learning by providing various learning media by taking into account the characteristics of students in learning. This learning can also encourage participants to make the best use of face-to-face contact in developing knowledge. Then, the follow-up of learning can be done offline and online. Learning programs that use full online are not appropriate for learning that requires face-to-face meetings between students and teachers, such as Panjaskes material and other materials that require practice. Effective online learning is carried out if there are students who are unable to attend, with the use of online media it is hoped that students will still be able to follow the subject.

Various blended learning models have been developed [12], [14], [15]. Some also mention that this model is also the same as other types of blended learning. Immediately, here are some blended learning models that have been applied by various educational institutions in various parts of the world. **1. Station Rotation Blended Learning**, Station-Rotation blended learning is combining three stations or spots in one hour of face-to-face divided into three; **2. Lab Rotation Blended Learning**, the Lab Rotation Blended Learning model is similar to Station Rotation, which allows students to have the opportunity to rotate stations through a predetermined schedule but is carried out using a special computer laboratory that allows flexible schedule arrangements with lecturers. Thus, a computer laboratory is needed; **3. Remote Blended Learning or Enriched Virtual**, In Remote Blended Learning, students focus on completing online learning, they do face-to-face learning with lecturers only occasionally as needed; **4. Flex Blended Learning**, Flex is included in the type of Blended Learning model where online learning is the core or the backbone of student learning but is still supported by offline learning activities. Students continue learning that begins in real classrooms with flexible schedules that are individually tailored to a variety of learning modalities; **5. The 'Flipped Classroom' Blended Learning**, this Flipped Classroom version of Blended learning is the most widely known, Flipped Classroom starts from student learning that is done online outside the classroom or at home with content that has been provided previously. After carrying out the online learning process outside the campus, students then deepen and practice solving problems on campus with lecturers and/or classmates.; and **6. Individual Rotation Blended Learning**, Individual Rotation Model allows students to rotate through stations, but according to an individual schedule set by the lecturer or by a software algorithm.

METHODS

Activities designed through research and development (R&D) with 4D design are aimed at designing learning systems. The system was built with consideration of the needs assessment that was carried out at the beginning of the research activity. Determination of the learning mode chosen as the basis for developing an optimized learning system with learning tools designed to meet online and face-to-face elements. Preparation for designing lesson plans, media, and student worksheets is inseparable from the adjustments that have been built in the blended learning system.

Need Assessment is carried out by considering the implementation of learning, the number of subjects with different systems, and understanding variations in learning systems. This information becomes a reference for building a learning system that will be selected in the development of learning in this research. The system built will be tested through user feedback. Users of this system are students and educators at the high school level in North Sumatra. This data will be analyzed descriptively to describe the state and readiness of the system built to go to the experimental stage and the application of learning.

RESULTS AND DISCUSSION

Analysis from Need Assessment

Figure 1 shows that the implementation of learning carried out until 2021 has a fairly stable presentation for the percentage of the three types of learning systems (33.36%). This is due to the shift in the system caused by the pandemic that has been experienced by almost all countries. This diversity is supported by government policies to continue to carry out learning

activities. Education is an important sector in building a country by looking at the quality of human resources.

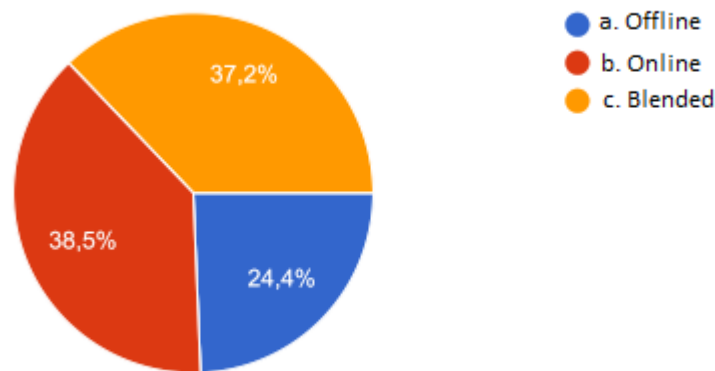


Figure 1. Percentage of Learning Implementation until 2021

From the learning equipment owned by educators, it can be seen the quality of learning that has been carried out so far. The number of Student Worksheets owned has not fully met the needs of learning (Figure 2). Student Worksheet is one of the important things needed to be able to improve the quality of the skills possessed by students, but in reality, the provision of student worksheets needs more adjustments to support blended learning activities [1], [2], [7], [10], [12]. At first, online learning was still combined with conventional learning to train students to be more independent. Practicing independent learning for students in Indonesia is not an easy thing, because the previous learning system (traditional pattern) assumed that the teacher was the main source of learning. After students are more independent than online learning can be done thoroughly [16]–[18]. Online learning is a system that can facilitate students to learn more broadly, more, and varied.

Online learning requires students and teachers to communicate interactively by utilizing information and communication technology, such as computer media with the internet, telephone, or fax. The use of this media depends on the structure of the learning material and the types of communication required. Fully online learning requires several requirements for students, namely: (1) ICT literacy: students must have initial skills in the form of basic ICT mastery as a tool for learning, meaning that if students are in a low grade where their reading and writing skills are not good, then they are not suitable to use online, but for them, it is more suitable to use traditional classes that are directly guided by the teacher [11], [12], [14]. (2) Independence: online learning requires the condition of students who are accustomed to independent learning, namely utilizing online learning facilities to study material, take quizzes, and practice mastering competencies without having to be guided directly by the teacher. In this case, students must have high internal motivation to continue learning to achieve targets and conditions like this only exist in high-grade students and higher education. (3) Creativity and Critical Thinking: online learning facilities are very diverse, students can learn various available tools such as browsing, chatting, group discussions, video conferencing, online quizzes, online drills, and others, this requires students' creativity to take advantage of all optimal. In this case, students' creativity is needed to vary and explore learning experiences

with varied modes. Online learning facilitates more content than the material available in traditional learning, so students are required to have the critical ability to choose, determine and absorb which knowledge they need more.

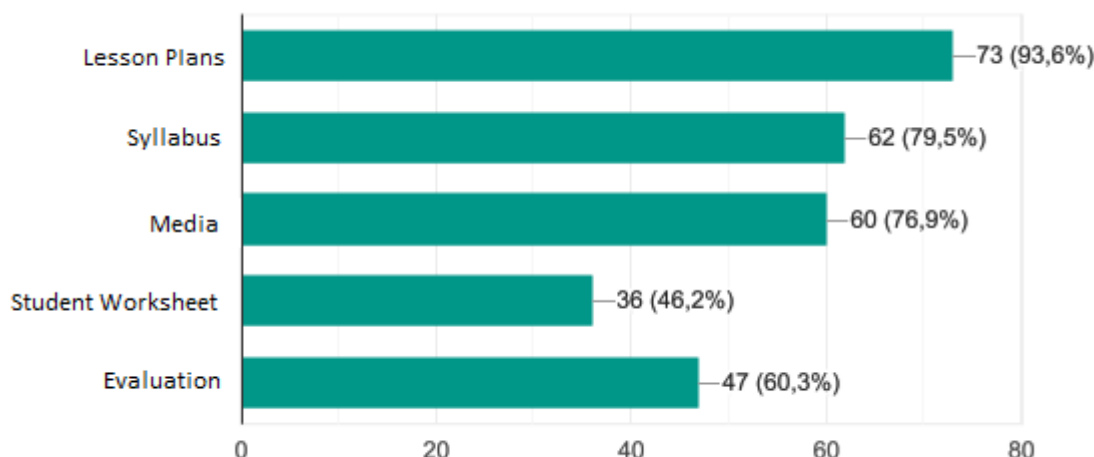


Figure 2. Availability of Learning Tools

When compared with the understanding of educators in preparing Learning Devices, it is very clear that educators have a high understanding (Figure 3). This shows that management's ability to prepare for learning is already above the standard of ability. In this case, there are many things that educators consider to optimize blended learning when applied. The benefits of using learning media based on the Learning Management System are (a) an increase in the effectiveness of learning and student academic achievement; (b) increase comfort; (c) attracting more students' attention to the material presented in the lesson; (d) can be applied with various levels and learning models; (e) can increase learning time by utilizing technology. This is what needs to be done to anticipate the unattainable learning outcomes achieved, especially the learning outcomes of Physics [19]–[22].

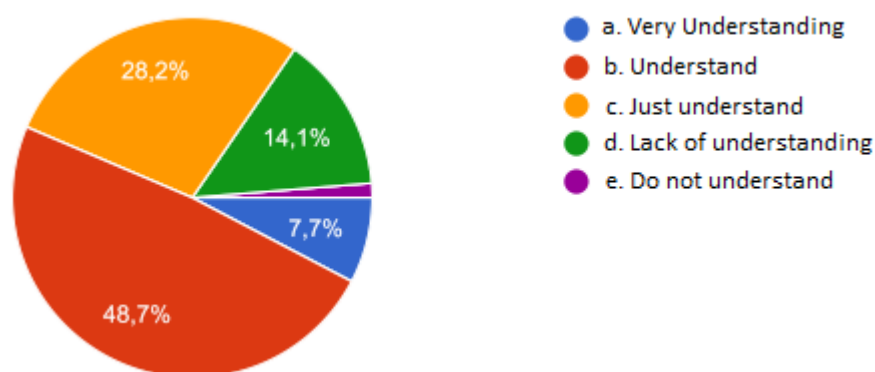


Figure 3. Level of Understanding of Blended Learning

The factors that influence the learning process and student learning outcomes are internal and external. Internal factors consist of physical factors, psychology, interests, motivation, and learning methods. Internal factors are very influential in improving student learning outcomes. This can be seen from the more physically fit the child receives the material, the easier it is to

digest. While the factors of interest, motivation, psychology must be improved and considered because these factors greatly affect the way of learning, the better interest, motivation, psychology, the learning outcomes will increase [23]–[25]. Therefore, attention to internal factors is highly recommended in improving student learning outcomes. External factors are no less important as a factor in improving learning outcomes. The way students get along in the family, school, and community environment is very vulnerable in improving learning outcomes. Supervision and assistance are needed, so that achievement in learning can be realized. Therefore, the relationship between internal factors and external factors is very close in influencing the process and learning outcomes. It is also assessed that there is a need for learning methods that are suitable for students' conditions.

By developing blended learning, students will be more active so that they feel they have the opportunity to express opinions, ideas, ideas, and questions so that they can improve student learning outcomes. Blended learning that is applied will be supported by learning media that can help the process of delivering learning material. Learning media are everything that can be used to channel messages (learning materials) so that they can stimulate the attention, interests, thoughts, and feelings of students in learning activities to achieve learning objectives. In addition, the student worksheet is expected to be adapted to the abilities that can be achieved with the blended learning system. Physics problem solving is the ability of individuals or students to use their thinking processes to solve problems contained in physics problems through a process that emphasizes strategies, procedures, systematic steps to find answers. The main purpose of learning physics problem solving is not to equip students with various sets of abilities and thought processes, but more than that it is hoped that students can take advantage of these physics problem-solving abilities when faced with problems in everyday life. Problem-solving ability is one of the things that students must have in learning because problem-solving skills are very important for students and their future.

Analysis from Users Response

The results of the needs analysis carried out concluded to direct the development of blended learning with the 'Flipped Classroom' Blended Learning. Learning is carried out with a 50:50 comparison system for one semester of meetings. This learning is carried out by modifying online media adjustments based on web classes. This learning system is easier to accept during a pandemic with policies from the government. With the implementation of this learning system, a description of the user's response from the developed learning system can be seen (Figure 4).

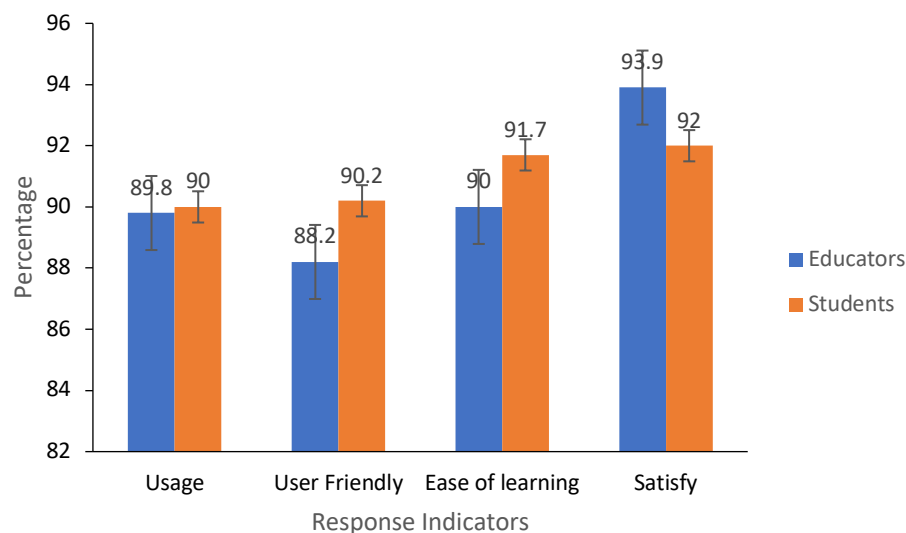


Figure 4. User Response Rate

Figure 4 shows a positive assessment of the use of the respondents on the use of the learning system that was built. The use of web-based online classes makes it easier to change the face-to-face learning system. With the same equipment and learning patterns, students do not feel there is a significant difference except for the satisfy indicator which is very high compared to the others. In learning activities, increasing the level of user satisfaction of students for all assessment indicators is a key to success in attracting student motivation [26]–[28]. Different things can be seen with the response of educators who show a positive response with an average of about 90%. This shows a stable response from educators to the use of the developed learning system.

By utilizing the Blended Learning Model, it can improve the academic abilities of students amid the COVID-19 pandemic. Academic ability is a person's ability and proficiency in the academic field. The academic field includes all the knowledge taught in formal education. Academic ability is closely related to cognitive or Intelligence Quotient (IQ). In contrast to attitudes and behaviors related to affective and competencies that lead to psychomotor abilities. Academic ability will affect other learning outcomes both on attitudes and behavior as well as student competence. Academic ability or academic achievement. With blended learning, students' mastery of concepts is better. Blended learning can improve student performance. This can be seen from the increasing number of online students in learning, as well as conducting online discussions. Blended learning that combines face-to-face and e-learning methods can involve students actively and allow students to get feedback. Web-based learning can grow students' independence to construct their knowledge, indicated by an increase in mastery of concepts, an increase in science generics, and students giving good responses. The highest form of a student's and human's thinking is reasoning [14], [15], [23], [25]. In simple terms, reasoning can be defined as the process of drawing conclusions based on the proportions that preceded it. The ability to reason in understanding the concept in question is to compare between concepts (identify concepts, classify, give examples), apply concepts, and conclude a concept or theory. Teaching and learning materials delivered in online learning consist of text, graphics, animation, simulation, audio, video, and multimedia. With these various forms of material, it

can make students' mastery of concepts better which in the end the ability of students to compare concepts (identify concepts, classify, and give examples), apply concepts, and conclude a concept or theory will be better too or in other words. other reasoning would be better.

CONCLUSION

The conclusions that can be informed from the implementation of this development research are 1. Determination of the 'Flipped Classroom' Blended Learning blended learning system. This lesson has been understood and needs adjustments to the meeting process compared to 50:50; 2. The use of web-based online classes makes it easier to change the face-to-face learning system; 3. Optimization is needed to increase the percentage of quality produced in the application of the selected blended system. This is considered very necessary for the process of developing research actions taken to advance and improve planned learning outcomes so that the system can run well with the appropriate supporting learning tools.

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