The implementation of blended learning to improve understanding of mathematics

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Abstract. The presence of blended learning in the world of education in Indonesia giving new colors will bring major changes in the learning process at school. Blended learning is one learning model that combines traditional learning with online learning. The blended learning model goes hand in hand with Education 4.0, learning activities are integrated with cyber technology both physically and not. The purpose of this study was to make a systematic, factual, accurate description of the facts, the nature and relationship between the cases investigated [8] regarding the response to applying blended learning. The method used is a qualitative method which includes literature studies, observation and interviews. Literature studies are conducted to collect information data through articles in journals, seminars and books related to blended learning. Data collection was carried out by direct observation of the conditions in the field of responses of mathematics teachers at the Pancur Batu Middle School level regarding the demonstration of blended learning using Moodle cloud e-learning. Interviews were conducted to find out the opinions of teachers regarding the application of blended learning to learning now. Survey results that the average teacher supports learning using blended learning. Students who are taught with blended learning feel happier and attractive not easily bored during the lesson. Blended Learning can improve student activity, understanding concepts and student learning outcomes.

1. Introduction

Education in Indonesia must be able to do more to move forward in the industrial revolution 4.0, through the use of digital technology and the implementation of computing into the use of the learning process. But at the same time Indonesia needs to immediately improve the capabilities and skills of human resources, reliable analysis and operators as the catalyst industry to achieve high productivity and competitiveness. The face of investing in human resources uses more brain creativity in making and designing internet and digital applications? Why the results of a recent World Bank study state that Indonesia needs 45 years and almost half a century to pursue science

4.0 education is a term commonly used by experts in education to describe various ways to integrate virtual world technology both physically and not into learning. This is a transformation from 3.0 education including neuroscience meetings, cognitive psychology, and educational technology. Education 4.0 is a symptom that responds to the need for a fourth industrial revolution in which humans
and machines are aligned to find solutions, solve problems and of course find the possibility of new innovations [1].

Along with the development of the internet rather than shifting learning strategies and emerging learning, information, and communication technology based strategies from e-learning models, smart class technology, virtual classes, blended learning, etc. [2]. One model that can be used in learning involving face-to-face activities and the use of technology is the blended learning model [3]. Blended learning is a learning strategy that is flexible because it does not depend on the time and place for learning. This study offers some convenience because learning with a computer does not completely eliminate face-to-face learning [4] and [5].

"A handbook from a globally blended learning perspective", local design says that blended learning has advantages, including: (1) Flexibility, meaning students can contribute to discussions at the time and place they choose individually. (2) Participation, which means that all students can participate in the learning process because they can set the time and place to participate. (3) Learning, has more time so that it can be more careful in debating and more deeply reflecting views and opinions [4].

"We can be pretty sure that the tendency of mixed learning systems will improve" [4]. However, it should be noted that the success of blended learning does not occur automatically, a major factor in the success of blended learning namely considering pedagogy and instructional design related to how best to utilize technological tools, how to facilitate interactions between students, how to motivate students, and materials the best sets are delivered via the Internet rather than face to face.

The definition of blended learning, namely (1) a combination of traditional learning with a web-based learning approach, (2) a combination of media and tools in the e-learning environment, (3) a combination of several approaches to learning, the use of learning technology [6].

Blended learning as "This is an opportunity to integrate innovative advancements and technologies offered by online learning with interaction and participation offered in the best of traditional learning". That what happens in conventional classes where educators and students meet directly with online learning, which can be accessed anytime and anywhere. The other forms of blended learning are virtual meetings between educators and students. Where they allow different creatures in the world. but can give each other input, ask, answer, interact between students or between educators and students with students [7].

Blended learning means "The combination of learning from 'media' (technology, activities, and types of events) to create optimal learning for students. The term "blended" means a mixture of traditional and modern equipped with other electronic devices. In this context, the blended learning program uses various forms of e-learning, complemented by teachers and other technologies ". Based on this opinion, Blended learning is a combination of learning from the characteristics of traditional learning environments and electronic learning or a mixture of combining aspects (electronic format) as web-based learning, video streaming, synchronous audio communication and traditional "face to face" asynchronous learning [1].

Based on the identification of the problems described above, the formulation of the problem in this study is how the role of blended learning to improve mathematical understanding and the purpose of this study is to determine the role of blended learning to improve mathematical understanding

2. Method
The method used in this writing is a qualitative method which includes literature study, observation, and interviews. The literature study that the author is doing is collecting data directed to find data and information through articles in journals, books, and seminars, especially those related to blended learning. Observation is the second step in collecting data after the authors conducted a literature study. Data collection was carried out by direct observation of the conditions in the field regarding the response of mathematics teachers at the Pancur Batu District Junior High School level to the application of blended learning using e-learning moodlecloud. In addition, interviews were conducted to find out the opinions of teachers regarding the application of blended learning for present learning that will be applied during the teaching process.
This research includes the type of descriptive research can be interpreted as a study related to an object, a set of conditions, a system of thought or an event in the present. The purpose of descriptive research is to make a systematic, factual, accurate description of the facts, the nature and relationship between the cases investigated [13] regarding the response to the application of blended learning. The data to be collected and analyzed are qualitative data from literature reviews from various related libraries as well as case studies conducted in junior high schools in the stone spur district, especially for information on the application of blended learning. Qualitative data is a broad and well-defined source of description and contains in-depth explanations of processes that occur within a certain scope and locally [17].

3. Result and Discussion

This section discusses the results of the literature review on blended learning ideas. Blended learning comes from the words mingling and learning. In other words, Blended learning can be interpreted as a combination of learning, is a combination of face-to-face classroom learning and online learning using computer applications connected to the internet. Some experts define Blended learning with different editors, but in the same or almost the same concept [10].

Figure 1 explains blended learning is an approach to learning that combines conventional learning (face to face) and distance learning with online learning resources with a variety of media choices (text, images, sounds, videos, diagrams) that can be accessed by teachers and students from internet [11].

Some definitions of blended learning can be concluded that blended learning is learning as a combination or combining face-to-face learning (face-to-face) with ICT media, such as computers (online or offline), Multimedia, virtual classes, internet and so on.

Table 1. Results of teacher observations and interviews about mixed responses to learning in the Pancur Batu sub-district schools

| No | Name Schools                          | Learning That Is Used Today | The Response Of Teachers About Blended Learning | Reasons against |
|----|---------------------------------------|----------------------------|-----------------------------------------------|-----------------|
| 1  | SMP Negeri 1 Pancur Batu              | Kooperatif                 | 73%                                           | Very old to learn |
| 2  | SMP Methodist Pancur Baru             | Problem                    | 95%                                           | Must Learn ICT   |
| 3  | SMP Swasta Bakti                      | Scientific                 | 82%                                           | It is very difficult |
| 4  | SMP Negeri 2 Pancur Batu              | Kooperatif                 | 70%                                           | Not Conducive   |
| 5  | MTSs Al-Washliyah Pancur Batu         | Conventional               | 43%                                           | Don't have a laptop |
| 6  | SMP Swasta Era Utama                  | Conventional               | 40%                                           | Don't have a laptop |
| 7  | SMP Swasta Rakyat                     | Conventional               | 47%                                           | Don't have a laptop |
| 8  | SMP Swasta Ypi Tanjung Anom           | Convesional                | 54%                                           | Facilities do not support |
| 9  | SMP Tunas Harapan                    | Kooperatif                 | 63%                                           | It is very difficult |
| 10 | SMP Swasta Rakyat Sei Glugur          | Conventional               | 44%                                           | Blind technology |
Survey results as seen in Table 1 The average learning support teacher uses blended learning. They are hard constraints in the use of technology in learning takes place, with the reason that many teachers are learning again and confused men want to learn where and with whom. The teachers did not receive guidance / training so as not to be blind to technology, so the strategies used were accounting only. With the mastery of technology education in Pancur Batu Subdistrict it will be more advanced and interest will be more attractive to student learning.

Figure 2. Log in for teachers and students

Figure 3. Online Learning Portal used

Figure 2 describes the e-learning web page to fit on each account with a username and password that has been registered for the teacher, admin and students for the online learning process to run smoothly. If the participant is an e-learning class not yet registered on the account and he will not be able to take online classes. After the web opens the web window will appear as in Figure 3 in the window that there is a book that includes material that students will learn, videos that learn to better understand the material, and there are many quizzes to test the level of understanding of students' ongoing material. Quiz made by the teacher with a limited time limit, the number of random questions for each student so as to avoid the negligence / laziness of students in evaluating learning on the material.
Figure 4. List of students taking online classes

Figure 5. Menu on e-learning web

Figure 4 describes the e-learning webpage to see all students currently present online. On the page that the teacher can monitor students who are online, students who have finished going to class and students who just never go to online classes because there are "time account users. In Figure 5 there are various menu options available on the learning web to help process learning and can increase teacher creativity in designing online learning will be used so that no more teachers are expected to be unable to operate technologies such as laptops, so teachers must always be ready to face technological development going forward to advance early childhood education.

Integrated learning forces us to consider the characteristics of digital technology, in general, and information communication technology (ICT), more specifically [12]. Suggests the answers offered by Alan Turing: that digital ICTs can process their own information, in the same sense as humans and other biological lives. ICTs can also communicate information with each other, without human intervention, but as a related process designed by humans. We have evolved to the point where humans are not always "looped" technology, but must be "in loop" to design and adapt processes [13].

Sejumlah peneliti telah menyesusun transformatif dan penelitian inovatif untuk pembelajaran campuran yang memiliki potensi untuk meningkatkan efektivitas [14] dan [15]. Secara umum, penelitian telah menemukan bahwa
Blended Learning dapat meningkatkan keberhasilan dan kepuasan siswa [16] dan [17] serta meningkatkan komunitas siswa [18] bila dibandingkan dengan pembelajaran tatap muka.

Then to support research using Blended Learning based on research results [19], entitled "the application of Blended Learning with learning strategies based on Edmodo PDE-ODE application to improve student learning achievement" concluded the application of integrated learning with application-based learning. Edmodo's PDE-ODE strategy can improve the learning achievement of class VIIIIF MTs N.

In line with the results of this research [20] in the form of projects based on blended learning models to support students' creativity in designing mathematics learning plans in elementary schools. This learning model proved to be valid and practical based on expert learning tests (online and face to face), expert material / learning materials and teaching and testing media in small groups by my colleagues and students. The learning model also proved effective based on the Paired-Samples T test results from pretest and posttest students.

The research development made by [21] with the title "development of Blended Learning at Jakarta State University" resulted in a form of prototype online blended learning that exists in the web-based portal of the Educational Learning Courses owned by the office. web-bali.net and the overall design of mixed learning for POB courses. This research method uses the development of the Integrative Learning Design Framework (ILDF) model developed by Bannan-Ritland. In general, the results of this study with formative test results attempted that products be categorized both through expert review and one-to-one trials and small group trials. The results of multiple regression analysis show that the features of mixed learning design (technology quality, online tools, and face-to-face support) and student characteristics (attitudes and self-regulation) predict student satisfaction as a result. The results show that some student characteristics / backgrounds and design features are significant predictors of student learning outcomes in mixed learning [22].

The results of the study show that mixed learning is ready to be implemented and is urgently needed in higher education because they must prepare students to be ready to work in the global market, and meaningful assessments must be related to real life problems for sustainable learning. Assessments can be done in various ways, including the provision of project assignments, online quizzes, and tests at the end of learning. The implication for undergraduate science students is to gain new learning experiences, to have more flexible learning time with in-depth courses, and to get meaningful assignments through project assignments [23].

The results of the study concluded that the media use of Blended Learning I-Spring Suite 8 supporters was able to influence changes in student behavior on all dimensions of scientific attitudes who wanted to know, appreciate data or facts, critical thinking, discovery and creativity, open mindedness and cooperation, and perseverance. The appearance of e-learning media supported by student worksheets makes students eager to start early, core to the end of learning [24].

Then the conclusions from the results of the research carried out and based on the learning outcomes of previous blended learning must be valid for all the middle class as well as from basic education or up to college. The progress of developing technology is inevitable, by utilizing our technology, the world will become an education that is more advanced than both sides of the teacher or his students. Students who are taught by mixed learning feel happier and more attractive not easily bored during the next lesson hours. Mixed can increase student activity, understand concepts and student learning outcomes. Of all junior high schools, the Pancur Batu sub-district which examined the responses of mathematics teachers strongly agreed that blended learning was applied to the learning process of mathematics.

3.1. The purpose of Blended Learning
There is purpose of Blended Learning (1) Help educators to develop better in the learning process, in accordance with learning style and references in the study. (2) provide practical opportunities that realistic for teachers and educators to study independently, usable, and it continues to grow (3) Improved scheduling flexibility for educators, by combining the best aspects of face to face and instructions online. Face-to-face classes can be used to engage students in an interactive experience. While online classes
provide students with rich multimedia content knowledge at any time, and anywhere as long as educators have access to the internet [25].

3.2. The advantages and disadvantages of Blended Learning

The advantages of this model are: (1) time saving, cost-effective (2), (3) more effective and efficient Learning, (4) the participants in accessing learning material, (5) enables learners to learn the subject matter independently (6) Utilize materials available online, (7) learners can conduct discussions with teachers or other learners outside of face-to-face Teaching, (8) don't spend too much energy to teaching, (9) Adding material enrichment through internet facilities, (10) expand the range of learning/training, (11) optimal results as well as enhance the attractiveness of learning, and etc [22].

As for drawbacks: (1) it is difficult when applied to infrastructure does not support, (2) Not the spread of facilities owned by the participant, (3) internet access which is not evenly distributed at each place, and so on.

4. Conclusion

By making use of a computer or the internet network is available, students can learn to be more self-sufficient and can develop knowledge widely, also with the internet, a model of delivery information can be through many paths such as based IE multimedia combining text, diagrams, and pictures with video and sound very supporting ability of transmitting information that is meaningful and will be virtual. Along with the development of the internet than any learning strategy shifts and emerging strategies-based learning, information, and communication technology from the e-learning model, smart classroom technology, virtual classroom, blended learning, etc. One of the models that can be used in learning that involves face-to-face activities and the use of technology is a blended learning model.

Blended learning is a learning strategy that is flexible for not depending on the time and place to learn. The study offers some convenience because learning with the computer does not completely eliminate the face-to-face learning. Blended learning is a learning that incorporates or combining face to face learning with ICT, media such as computers (or online offline), multimedia, virtual classroom, internet and so on.

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