BLENDED LEARNING AS A LEARNING INNOVATION IN THE ERA OF THE INDUSTRIAL REVOLUTION 4.0 AT THE UNIVERSITY

Nurqadriani[1], Muh. Nur Fithri D[2], Marjuni[3], & Suriyati[4]

[1,2]STAI YAPIS Takalar
[3]Universitas Islam Negeri Alauddin Makassar
[4]IAIM Sinjai

Correspondence Email: anhyaryani0@gmail.com

ABSTRACT

In the era of the industrial revolution 4.0, educators must be able to innovate, especially in the teaching and learning process, so that learning can be more optimal and exciting. Technological developments require educators to have skills, be able to innovate, think critically, communicate, and master technology. This research aims to find out how universities utilize blended learning as an innovation in learning in the 4.0 industrial revolution era in universities. This type of research is library research which discusses blended learning as a learning innovation in the era of the industrial revolution 4.0 in tertiary institutions. The technique used in this study to collect data is using documentation obtained through books and journals that are relevant to the topics discussed in this paper. This study uses data analysis techniques, namely content analysis. Learning innovations using blended learning provide opportunities for students with various characteristics to learn independently and sustainably throughout their lives so that learning will be effective, efficient, enjoyable, and fun. The design is based on Behaviorism and cognitive constructivist learning theory with the specifications of its components including 1) learning outcomes, 2) material organization maps, 3) reference lists, 4) teaching materials/materials, 5) synchronous and asynchronous learning activities, 6) learning designs asynchronous, 7) synchronous learning design, 8) synchronous learning flow.

Keywords: Learning at University; blended learning; Industrial Revolution 4.0

1. INTRODUCTION

Studying in tertiary institutions is an active process for students in obtaining new and existing information and knowledge. In lectures, students can connect their college knowledge with the realities in the outside world and the surrounding environment. Brunner stated, that there are three kinds of cognitive processes, namely: 1) the process of obtaining new information, through reading

activities, listening to explanations of the material being taught, listening to audiovisuals, and others; 2) the process of transforming the information received, namely the knowledge received by students to suit their needs; and 3) test the relevance and accuracy of knowledge (Sundari, Endang, 2013). This shows whether students have obtained great benefits in their daily lives through the information they have obtained. However, in reality, in learning, there are still many students who apply the information obtained through the learning process so the implementation is not following the theory.

Therefore, learning in tertiary institutions means that there is an interaction between lecturers and students face-to-face in class. Mostly, lecturers will become active instructors or facilitators more dominant than students. A lecturer usually gives more explanations and students tend to listen to the lecturer's lectures. Even though students are teenagers who have grown up, such activities will make them bored and sleepy in class.

The effectiveness of learning should be described from the activities and characteristics of students during the learning process. Face-to-face learning which lecturers often carry out in class, is no longer in the current era. Supposedly, the context of learning in tertiary institutions is diverted from conventional face-to-face learning to online technology-based learning. However, this is not easy for every lecturer and student to apply, even in universities. Stein argues that there are 5 (five) challenges in realizing online technology-based learning, namely: a) making the transition to online learning; b) building an online space for learning; c) preparing students to study online; d) managing and facilitating online classes;

Technological developments that have an impact on the learning system in Indonesia, especially in tertiary institutions, require the creativity of lecturers and students. A lecturer who acts as a facilitator for students needs feedback from students, and vice versa, students also need feedback from lecturers. Thus, there will be an effective and optimal knowledge transfer between lecturers and students. However, what often happens is not as expected and online learning programs in various tertiary institutions are not running optimally.

Recommendations given to improve learning are by combining face-to-face learning and online learning. This learning system is known as blended learning. The blended learning system is a learning system that uses a face-to-face system combined with online learning. Blended learning

does not completely replace face-to-face conventional learning or eliminate online learning, but can maximize learning by using online and face-to-face systems.

Combining the advantages of online learning with various interactive learning media, with face-to-face learning, will increase student creativity. In addition, blended learning is proven effective in improving the quality of learning outcomes. Yana, in his research on the effectiveness of blended learning, showed that the average learning outcomes of students in online learning were better than those of those who received face-to-face learning (Yana, Dewi, Adam, 2019). Blended learning applied to TTK courses carried out in one semester has the advantage that the preparation and relevance of the material presented are excellent (Setiawan, Risky, 2019). In addition, the research conducted by Haeruman obtained results that blended learning is effective in learning mathematics because it makes it easier for educators and students to access learning anywhere and anytime without being limited by space and time (Haeruman, Leni, Dwi, Qorry, 2021).

2) METHODS

This type of literature research discusses blended learning as a learning innovation in the era of the industrial revolution 4.0 in tertiary institutions. The technique used in this study to collect data is to use documentation from books and journals relevant to the material discussed in this paper. This study uses data analysis techniques, namely content analysis.

3) RESULTS AND DISCUSSION

Learning at University in the Industrial Revolution Era 4.0

Learning in tertiary institutions still has a concept, meaning that lectures must be face-to-face in class. Lecturers and students undergo a learning process that implements a teacher center system, namely the lecturer dominates the learning activities while the students only listen to the lecturer's explanation. While the learning process will be more effective if there is reciprocity between lecturers and students.

At this time, most students already can use internet technology. Students are used to carrying out daily activities with Android, from morning to night. Thus, the learning process that is still conventional will be boring for students. An effective way that can be used is to apply internet technology in various aspects of life, especially in the learning process.

Technological developments in the era of the industrial revolution 4.0 have had a major impact on the characteristics of life in various fields. A person is required to have adequate competence and skills. Because in the era of the industrial revolution 4.0, the integration of the use of technology and the internet which is so sophisticated and massive has also greatly influenced changes in the behavior of the business world and the industrial world, the behavior of society and consumers in general. The world of work in the era of the industrial revolution 4.0 is an integration of the use of the internet in production lines in the industrial world that utilizes technological and information sophistication. Characteristics of the 4.0 industrial revolution era include digitalization, production optimization, and customization, automation and adaptation, human-machine interaction, value-added services and businesses, automatic data exchange and communication,

The government and universities in Indonesia must be able to prepare Indonesia's human resources in facing the industrial revolution era 4.0. Education curricula and methods must adapt to an increasingly competitive business and industrial climate and keep abreast of technological and information developments. Universities must strengthen their ability to respond to the needs of the world of work, business, and industry with innovation and an interdisciplinary curriculum.

University must become a disruptive innovation engine. The trick is to create a curriculum and learning method that is flexible and contextual and must be able to become a channel of thought through research and various innovations. Innovation is the keyword. New ways must be developed. The desire of students and lecturers to innovate must be grown. The agenda for change always adjusts to the changes and developments of the times.

The role of the University is vital, especially in the development of science and technology. The demand for a quality learning process is increasing along with the development and changing times. The learning process is more contextual and scientific to form the character of students who have a scientific spirit (scientists). As well as the demand to produce quality graduates. Therefore, a variety of learning resources is needed. But faced with the fact that the learning resources in the library are very limited. His collection of books and compact disks is often obsolete. Renewing the collection of books and CDs certainly requires a huge cost. The solution is through the application of Information and Communication Technology (ICT). Because in the era of the industrial revolution 4.0, The paradigm used is far different from that of the industrial age. The learning

approach used is a mixed approach, namely a combination of approaches from the lecturer, learning from other students, and self-study.

There are many ideas put forward by experts, experts, education observers, and other stakeholders to optimize education in the industrial revolution 4.0 era, one of which is blended learning-based learning. Mosa (2006), states that the combination of two main elements, namely face-to-face classroom learning and online learning, is called blended learning. One type that can be used is the online – face-to-face – online. This method is expected to encourage more open knowledge to improve the quality of superior and competitive human resources and be able to answer the challenges of change and development of the times.

Basic Concepts of Blended Learning

Etymologically, the term blended learning consists of two words: blended and learning. The word blended means a mixture, together to improve quality to improve or a formula for a combination or combination alignment (Heinze and Procter, 2006). While learning has a general meaning, namely learning, thus at first glance, it implies learning patterns that contain elements of mixing or combining one pattern with another. The mixed pattern is the two main elements: classroom lessons and online learning (Mosa, 2006).
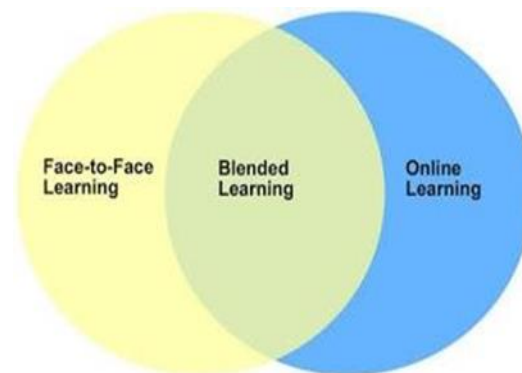

Figure 1. Blended Learning modified from Mosa (2006)

Bersin (2004) defines "blended learning is the combination of different training "media" (technologies, activities, and types of events) to create an optimum training program for a specific audience. The term "blended" means that traditional instructor-led training is being supplemented

with other electronic formats in the context of this book, blended learning programs use many different forms of e-learning, perhaps complemented with instructor-led training and other live formats. Furthermore, Diaz & Brown (2010) stated, "blended learning mixes face-to-face activities, some performed synchronously, some asynchronously". John & Pegler (2007) provides a definition " Blended learning is learning that combines different technologies, in particular a combination of traditional (e. g. face-to-face instruction) and online teaching approaches and media".

The blended learning strategy is learning that integrates traditional face-to-face learning and computer-based learning (online and offline) as well as a variety of communication options that can be used by teachers and students (Dwiyogo, 2011). Blended learning is a flexible learning strategy because it does not depend on the time and place for learning. This learning offers several conveniences because learning with a computer does not eliminate face-to-face learning.

In simple terms, it can be said that blended learning is learning that combines face-to-face (conventional learning, where educators and students interact directly with each other, and each of them can exchange information about learning materials), independent learning (learning with various modules that have been provided) as well as self-study online.

Blended learning is present and future learning that teachers need to master. The learning integrates traditional face-to-face learning and computer-based learning (Dwiyogo, 2018). The advantages: 1) flexibility, 2) participation, and 3) learning has more time (Marsh, 2012). The goal is to provide opportunities for various student characteristics so that independent, sustainable and lifelong learning occurs so that learning will be effective, more efficient, and more interesting (Rooney, 2003). Blended learning is proven to be effective in improving the quality of learning outcomes.

The meta-analysis conducted by Means on the effectiveness of blended learning publications stated that the average learning outcomes of students in online learning were better than those who received face-to-face learning (Means, Toyoma, Murphy & Baki, 2013). In learning Science, can positively impact learning outcomes skills, attitudes, and learning outcomes can reach the highest level. (Almaseid, 2014).

Implementing blended learning requires an application, namely the Learning Management System (LMS). LMS is an application or software used to manage online learning, covering several

aspects, namely material, placement, management, and assessment (Mahnegar, 2012). One of the conditions for its use in the learning process, educators and students must be connected to an adequate internet network. LMS has several features that can support the online learning process: discussion forms, curriculum learning resources, quizzes, assignments, types of academic information, and student data management.

Several types of LMS can be utilized in the learning process, namely: Schoology, Learnboos, Edmodo, Moodle, Blackboard, WebCT, and others (Dwiyogo, 2018). Schoology is an LMS in the form of a social web that offers learning the same as in the classroom for free and is as easy to use as social media Facebook. Schoology is an interesting and fun e-learning platform for learning. The advantages compared to other LMS include using terms that we usually use on social networks Facebook, Moodle, and Edmodo such as recent activity, message, course, resource, groups, assignment, and attendance (Amiroh, 2013). Schoology has facilities that Edmodo and Moodle don't have. Another advantage is that attendance/absence figures are available. Analytical facilities will also monitor student activity in each course assessment, discussion and other activities. Sicat's research (2015) results show that Schoology is effectively used to apply blended learning. Many interesting features that students can access will motivate them to be involved in learning. Joshua (2015) proved that there was an increase in the high category for the motivational aspect of students taught using Schoology.

Blended learning applications can be made through problem-based learning Dwiyogo (2018). Problem-based learning (PBL), is an innovative learning model that makes problems the basis or basis for students to learn, based on the constructivism learning theory promoted by Piaget and Vygotsky. Its characteristics are 1) the learning process is student-centered, 2) the problems presented are learning stimuli, 3) new information is obtained from independent learning (self-directed learning), and 4) problems are a vehicle for developing problem-solving skills. problem (Barrows, 1996). The syntax includes the stages: problem orientation, organizing students, guiding individual and group investigations, and developing and presenting the work. Through problem-based learning, students will learn based on problems that must be solved, then track the concepts, principles, and procedures that must be accessed to solve these problems. Likewise, the evaluation must be based on process and results, carried out through a portfolio-based performance assessment. Assessment is not based on teaching authority, but there needs to be self-assessment by students and assessments of other students (Dwiyogo, 2018).

Blended learning needs to be supported by an LMS application used to manage online learning. One of them is the Schoology application program. Schoology is a web page in the form of a social web, offering to learn the same as in class for free and easy to use like Facebook, and being an e-learning platform that is interesting and fun in learning. Offer facilities to lecturers through available features to load various forms of learning activities and learning materials needed by students in their lectures. Availability of attendance/absence features by selecting attendance, permission, late, or absent. Every student activity will also be monitored through analytical facilities in the section course, assessment, discussion, and other activities prepared for students, through Schoology, learning becomes very easy.

Taking into account the characteristics of students and lecturers, available facilities and infrastructure, as well as conceptual blended learning, an alternative blended learning strategy model for learning in tertiary institutions that can be developed is a model based on constructivism behaviorism learning theory, with a synchronous blended learning format, applying PBL, using LMS Schoology application, supported by multimedia learning media such as video and audio. Variations in the amount of face-to-face and online time in the semester, 50% face-to-face and 50% through e-learning. Evaluation of results is a process and results with a performance assessment approach based on portfolio and self-assessment. This strategic model is expected to be able to increase students' understanding of the material which in turn will be able to improve communication skills and learning problem-solving. In general, the contents of this blended learning design model include:

a. learning Outcome,
b. material organization map,
c. Reference list,
d. teaching materials,
e. Synchronous and asynchronous learning activities,
f. asynchronous Learning Design,
g. Synchronous learning design, and
h. Synchronous learning flow

Each learning activity is divided into three main activities, namely: online – face-to-face - online, described as follows:
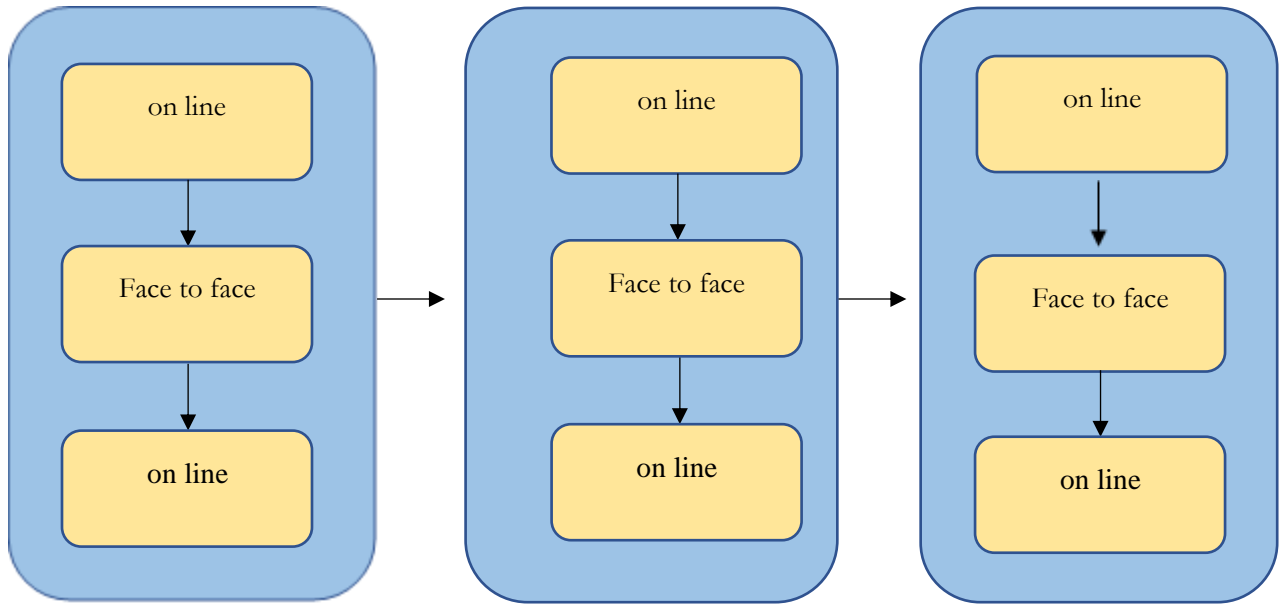
Figure 2. Design of Blended Learning in universities

In each activity shown in Figure 2, the stages of problem-based learning are carried out. Pre-face-to-face online activities contain problem-orientation activities, namely: explaining learning objectives, explaining required logistics, proposing phenomena, demonstrations, or stories to raise problems, and motivating students to be involved in solving selected problems. In face-to-face, there are activities of organizing students and guiding group and individual investigations.

Then in the final stage, namely online post-face to face developing and presenting the work and analyzing and evaluating the problem-solving process. The stages of problem-based learning can be seen in Figure 3 below:

on line → **Stage 1**

Stage 2

Stage 3

Guiding individual as well as group

Stage 4

Stage 5

Analyze and evaluate the problem solving
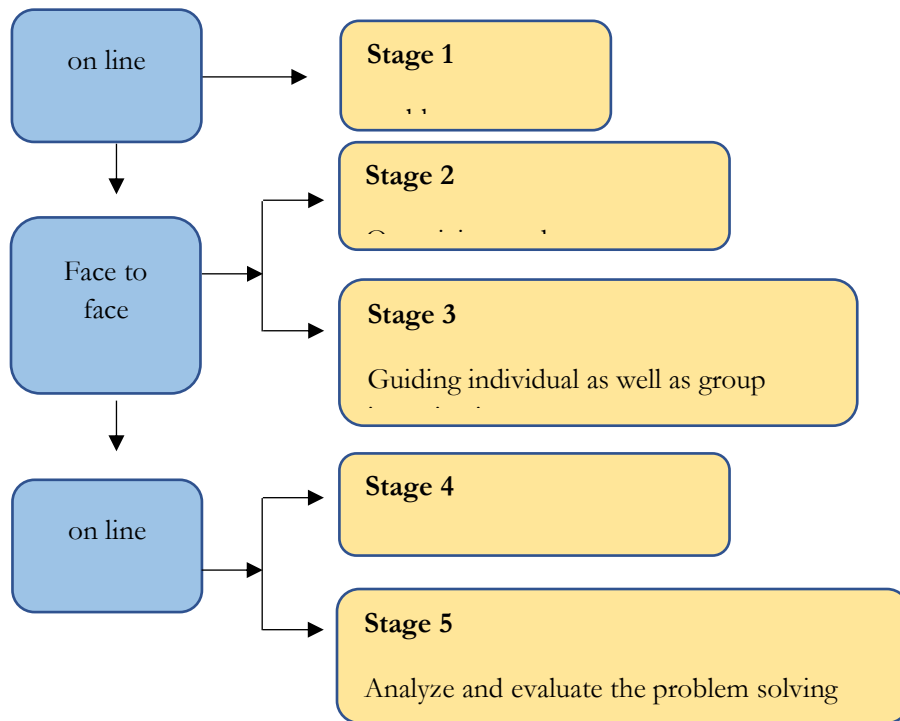
Face to face

on line

Figure 3. PBL stages in blended learning

Learning that applies blended learning as shown in Figure 3 which is implemented properly will contribute positively to learning. One of them is to save more time. Implementation of blended learning will enable students to complete learning assignments in a short time (McCarthy and Murphy, 2010: 67). However, in the process of implementing blended learning, there are several aspects to consider, namely the characteristics of the learning objectives we want to achieve, relevant learning activities and choosing and determining which activities are relevant to conventional and which activities are relevant for online learning (Prayitno, 2013). Another consideration relates to learning tools, such as textbooks, practice questions or learning achievement tests, and online classes.

The textbook contains materials as the initial provision for students in the learning process. Furthermore, practice questions which contain contextual problems, are made with the aim that students practice questions related to the learning activities that have been carried out. The last thing developed is an online class, which is used as a place for pre-face-to-face and post-face-to-face activities. In this class, there are student worksheets, handouts, and practice questions that can be accessed by students anytime and anywhere

Blended Learning Framework

Learning settings in the blended learning design model, take the essence of e-learning (Riyanto and Mumtahana, 2018). In general, e-learning or online learning is asynchronous, where teachers/lecturers and students as students do not meet simultaneously. There are four classifications of e-learning, namely: 1) e-learning without the presence and without communication, 2) e-learning without presence but with communication, 3) e-learning combined with occasional presence, and 4) e-learning is used as a tool for teaching in the classroom (Ranganathan, Negas, and Wilcox, 2007). Based on this classification, six concepts of bent learning were developed as follows (Dwiyogo, 2018). Type I face-to-face learning is carried out in the teacher's physical presence through physical presentations but without electronic communication. Type II independent learning is carried out without presentations and the teacher's physical presence but without electronic communication. Type III learning is asynchronous, learning is carried out without the physical presence of the teacher but carries out electronic communication that is not synchronized. Electronic communication between teachers and students is not carried out at the same time and place. This format is asynchronous because teachers and students do not meet in the same room. Type IV, synchronous blended learning, learning is done through virtual and synchronous electronic communication. This format is called synchronous, because the teacher and students are present in real time, even though they are not physically present. Type V asynchronous blended learning is carried out with occasional teacher presence and combined or mixed electronic communication. This format is a blended or hybrid e-learning format with occasional teacher presence. Type VI synchronous blended learning is carried out in the presence of a teacher with electronic communication. Electronic communications are packaged in asynchronous and synchronous formats. The presence of the teacher can be alternated between physical and virtual. Some class meetings are held in physical presence, namely face-to-face in class like traditional learning, while other meetings are held virtually (synchronously). Learning settings are described in the following quadrants:
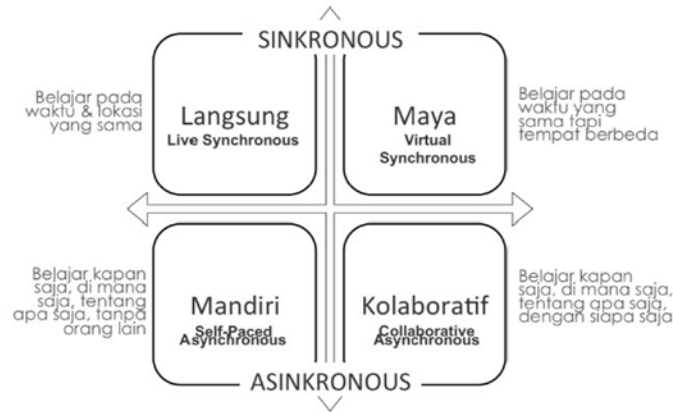
Figure 4. Learning Setting Quadrant (Chaeruman, 2013; Riyanto and Mumtahana, 2018)

Direct Synchronization is learning that occurs when the learner and the learner are at the same location/space and time. In this case, it's the same as face-to-face. Learning activities learning in direct sync are the same as face-to-face learning activities, for example, lectures, discussions, field practices, and others. Virtual sync is learning that occurs in a situation where learning and teaching are at the same time, but the places are different from each other. Learning activities in virtual sync can occur through synchronous technology such as video conferences, audio-conferences, or web-based seminars (webinars).

Independent Asynchronous is learning occurs in an online independent learning situation. Learning participants can learn anytime, anywhere, according to their conditions and learning speed. Independent asynchronous learning activities include reading, listening, watching, practicing, simulating, and practicing by utilizing certain relevant learning objects (digital material). There are more learning activities online, although it does not rule out the possibility of offline learning. Collaborative asynchronous is learning occurs in collaborative situations (involving more than one person), between one student and another student or another person as a resource. Collaborative asynchronous learning activities are facilitated by discussion forums, mailing lists, assignments, and others (Chaeruman, 2013, 2017). The settings and learning activities in the context of blended learning can be illustrated in table 1 below:

Table 1. Blended learning settings and activities

Synchronous Learning		Asynchronous Learning	
Face to Face	**Synchronous Maya**	**Collaborative Asynchronous**	**Asynchronous Standalone**
a. Lecturer lecture b. Study c. group discussion d. Field trips (all) traditional learning methods)	a. Conference audios b. Video Conference c. Chat	a. Discussion forum b. E-mail c. Mailing list d. Blogs e. wiki	a. online tests/assessments b. Duty c. searching material d. study teaching materials in various formats (text, graphics, audio, video, animation, etc.)

Source: Chaeruman, 2013

Constructing Blended Learning

According to Chaeruman (2017), there are five main steps in constructing blended learning, as follows:

Step 1. Formulate learning outcomes. Learning achievement is the learning achievement at the course level, after students take part in a course as a result of the learning process. Learning outcomes consist of several levels, namely the college level, study program level, and course level.

Step 2. Determine and organize learning materials. Mapping and organizing learning materials is an effort to determine and classify learning materials into the subject matter, sub-topics, and subject matter according to predetermined learning outcomes.

Step 3. Select and determine synchronous and asynchronous learning activities. Selecting and determining synchronous and asynchronous learning activities is an effort to determine whether certain achievements and subjects or sub-topics will and can be achieved through asynchronous or synchronous learning strategies. This step presents the criteria for selecting and determining relevant learning strategies as a guide.

Step 4. Designing asynchronous learning activities. Designing asynchronous learning activities concerning the subject matter to be pursued through asynchronous learning strategies. This stage consists of two steps: preparing an asynchronous learning design, as an outline of the design; and 2)

constructing an asynchronous learning flow as a more detailed asynchronous learning flow for each subject matter as a learning object.

Step 5. Designing synchronous learning activities. Designing synchronous learning activities consists of two steps: 1) preparing a synchronous learning plan, as an outline of the design; and 2) constructing a synchronous learning flow, as a more detailed synchronous learning flow for each subject matter as a learning object.

Blended learning design in learning

Learning has two dimensions, namely the dimensions of strategy and learning outcomes (Dwiyogo, 2018). Learning outcomes that are very important in learning are when students are skilled in solving problems. Problem-solving skills are one of the higher-order thinking skills because problem-solving results include skills: thinking, collaboration, connection, communication, and others (Gagne, 1985, NCTM, 2000). So, with problem-solving skills, students can transfer their knowledge to similar and new problems. Through problem-solving students can transfer their knowledge, both similar and new problems. While the strategy is based on technological developments and learning theory philosophy.

The behaviorism view (stimulus and response) put forward by Pavlov, Skinner, Watson, Hull, Guthrie and Thorndike (in Gredlesr, 2011), assumes that learning experiences will occur when students are given a stimulus through various online-based learning media. The stimuli from the media help and encourage students to respond so that they are accustomed to learning. In designing a blended learning system, how to design learning that provides stimuli through learning components to increase student responses. Meanwhile, according to the cognitive constructivist view put forward by Piaget and Jerome Bruner in Gredler (2011) students have potential that can be developed, to shape the learning experience is done by increasing their insight. Its application in the design of blended learning systems is how to design learning systems that can develop students' cognition to improve their understanding. From the two perspectives of Behaviorism and Cognitive Constructivism learning theory, the learning experience through interaction can be enhanced through learning activities. If in behaviorism learning activities by providing stimuli to students, then cognitivism learning activities allow them to explore the knowledge they need. These two things in the design of a blended learning system are not contradictory but complement each other. It means,

by increasing the resonance of the application of the two different learning theory views, it can optimize blended learning, for example giving assignments through online learning and discussing and discussing them in face-to-face meetings. Such is the practice of behaviorism, giving assignments as a stimulus, and tasks written in our responses. While the discussion and discussion is a cognitive process because during the process takes place there is a process of meaning. For example, providing stimulus in blended learning through learning websites specifically designed for learning with teaching material content that has been arranged in such a way. Then, with a learning website container equipped with a Schoology application, students can explore various other knowledge that is relevant to learning objectives. Blended learning, with the flexibility and choice of varied media, can increase student interaction to provide them with learning experiences. The blended learning design is based on two learning theories of behaviorism and constructivism.

The design of blended learning in learning is carried out a combination of online and face-to-face learning. In addition, blended learning is also supported by multimedia learning media, including video and audio learning media, which are expected to increase students' understanding of the material provided. This blended learning design includes: 1) learning outcomes, 2) material organization maps, 3) reference lists, 4) teaching materials/materials, 5) synchronous and asynchronous learning activities, 6) synchronous and asynchronous learning designs, 6) asynchronous learning designs, 7) synchronous learning design, and 8) synchronous learning flow. The description of each component can be adapted to the course material and course learning outcomes refer to learning outcomes.

The blended learning design model was developed based on behaviorism and cognitive constructivist learning theory, with a synchronous blended learning format, applying PBL, using LMS with Schoology applications, and supported by multimedia learning media such as video and audio. Variations in the amount of face-to-face and online time in the semester, 50% face-to-face and 50% through e-learning. Evaluation of learning outcomes is a process and outcome with a performance assessment approach based on portfolio and self-assessment. Specifications for the components of the blended learning design model include: 1) learning outcomes, 2) material organizational maps, 3) reference lists, 4) teaching materials/materials, 5) synchronous and asynchronous learning activities, 6) synchronous and asynchronous learning designs, 6) asynchronous learning design, 7) synchronous learning design, 8) synchronous learning flow.

REFERENCES

Amiroh. (2013). Antara Schoologi, Moddle dan Edmodo. Diunduh dari http://amiroh.web.id/ tanggal, 15 Juni 2016.

Almasaeid, T., F. (2014). The Effect of Using Blended Learning Strategy on Achievement and Attitude in zzzTeaching Science Among 9th Grade Students. European Scientific Journal, 10(31), 133-145.

Arifin, Z. (2017). Mengembangkan Instrumen Pengukur Critical Thinking Skills Siswa pada Pembelajaran Matematika Abad 21. Jurnal Theorems, 1(2), 92–100.

Barrows, H. (1996). Problem-Based Learning in Medicine and Beyond: a Brief Overview. New Direction for Teaching and Learning. Jossey: Bass Publisher

Buchori, M. (2000). "Peran Pendidikan dalam Budaya Politik di Indonesia," Basis (Juli-Agustus 2000) Bersin, J. (2004). The blended learning book: best practices, proven methodologies, and lessons learned.

San Francisco, CA: Pfeiffer Publishing

Chaeruman, U., A. (2013). Merancang Model Pembelajaran Blended Learning. Jurnal Teknodik,17(4), 300-409

Chaeruman, U., A. (2017). PEDATI Model Desain Sistem Pembelajaran Blended. Direktorat Pembelajaran Direktoral Jenderal Pembelajaran dan Kemahasiswaan Kementerian Riset, Teknologi dan Pendidikan Tinggi

Daniel, M. & David, R. (2008). Effective Teaching: Teori dan Aplikasi Edisi Kedua. Yogyakarta: Pustaka Pelajar

Daryanto, & Karim, S. (2017). Pembelajaran Abad 21. Yogyakarta: Gava Media.

Diaz, V. and Brown, M. (2010). Blended learning: A report on the ELI focus session. Educause Learning Initiative. https://net.educause.edu/ir/library/pdf/ELI3023.pdf. Google Scholar. Diunduh 12 Maret 2018

Dikdasmen. (2017). Panduan Implementasi Kecakapan Abad 21 Kurikulum 2013 di Sekolah Menegah Atas. Jakarta: Dit. PSMA Ditjen Pendidikan Dasar dan Menengah.

Dwiyogo, W. (2014). Analisis Kebutuhan Pengembangan Model Rancangan Pembelajaran Berbasis Blended Learning (PBBL) Untuk Meningkatkan Hasil Belajar Pemecahan Masalah. Jurnal Pendidikan dan Pembelajaran, 21(1), 71-78.

Dwiyogo, D. (2018). Pembelajaran Berbasis Blended Learning. Depok: Rajawali Pers.

Fehr, H. (1963). The role of physics in the teaching of mathematics. The Mathematics Teacher, 56(6), 394-399.

Gagne, R.M. (1985). The Condition of Learning Theory of Instruction. New York: Rinehart.

Garrison, D.R. & Vaughan, N.D. (2008). Blended learning in Higher Education. San Francisco: Jossey- Bass.

Gazali, R. Y. (2016). Pengembangan Bahan Ajar Matematika untuk Siswa SMP Berdasarkan Teori Belajar Ausubel.Jurnal pendidikan matematika, 11(2) (online). Diunduh dari http://journal.uny.ac.id/index.php/Pythagoras. Pada tanggal 27 September 2017.

Garrison, R., & Anderson, T. (2000). Transforming and enhancing university teaching: Stronger and weaker technological influences. Dalam T. Evans & D. Nation (Eds). Changing university teaching: Reflections on creating educational technologies (pp. 24-33). London: Kogan Page.

Gredler, M., E. (2011). Learning and Instruction. Jakarta: Kencana.

Heinze, A. & Procter. (2006). Online communication and information technology education. Journal of Information Technology Education. (5), 236 Heinze, A. & Procter. (2006). Online

communication and information technology education. Journal of Information Technology Education. (5), 236

Husamah. (2014). Pembelajaran Bauran (Blended Learning). Jakarta: Prestasi Pustakarya Hudoyo, H. (1990). Strategi Mengajar BelajarMatematika. Malang: IKIP Malang.

Hudoyo, H. (2001). Pengembangan Kurikulum dan Pembelajaran Matematika, (Malang: IKIP Malang, 2001)

Joshua, J.,W., N, 1), I Putu Agus Swastika, I P.A dan Estiyanti, N. M. (2015). The Effectiveness of E- Learning Implementation using Social Learning Network Schoology on Motivation & Learning Achievement in STMIK Primakara Bali. Prosiding Seminar Nasional Pendidikan Teknik Informatika (SENAPATI 2015) Singaraja – Bali, -, 96-106.

Mahnegar, F. (2012). Learning Management System. International Journal of Business and Social Science, 3(12), 144-150Marsh, D. (2012). Blended learning: Creating Learning Opportunities for Language Learners. New York: Cambridge University Press

Means, B., Toyoma, Y., Murphy, R & Baki, M. (2013). The Effectiveness of Online and Blended Learning: A Meta-Analysis of the Empirical Literature. Teachers College Record, 115(030303), 1-47

McCarthy, M. A., & Murphy, E. A. (2010). Blended learning: Beyond initial uses to helping to solve real-world academic problems. Journal of College Education &Learning, 7(6), 67-70.

Mosa, E. (2006). Puntoedu: A Blended E-Learning Model. Current Developments in Technology-Asisted Education, 6 (4), 1744-1749. (https://www.academia.edu/2769153/Puntoedu_a_blended_e-learning_modelhttps://www.academia.edu/2769153/Puntoedu_a_blended_e-learning_model diakses pada tanggal 25 juni 2018

NCTM. (2000). Principles and Standards for School Mathematics. Reston: NCTM.

NEA. 2017. Preparing 21st-century students for a global society: An Educator's Guide to the "Four Cs". USA: National Education Association.

Latterell, C. M. 2008. What is Good College Mathematics Teaching? Diunduh dari http://www.cimt.plymouth.ac.uk/journal/ pada tanggal 12 Desember 2014.

Littlejohn, A. & Pegler, C., 2007. Preparing for Blended e-Learning. New York, USA: Routledge.

Lubis, D. S., Surya, E., & Minarni, A. (2015). Peningkatan Kemampuan Pemecahan Masalah Matematik Dan Kemandirian Belajar Siswa SMP Melalui Model Pembelajaran Berbasis Masalah. Jurnal Paradikma, 8(3)-

Lewis, R. (2002). The hybridization of conventional higher education: UK perspective. International Review of Research in Open and distance learning, 2(2).-

Prayitno, W. (2013). Implementasi Blended Learning Dalam Pembelajaran Pada Pendidikan Dasar dan Menengah.

Ranganathan, S., S., Negash and Wilcox, M., V. (2007). "Hybrid Learning: Balancing Face-to-Face and Online Class Sessions," Proceedings of the Tenth Annual Conference of the. Southern Association for Information Systems Jacksonvill dalam Dwiyogo, D. (2018). Pembelajaran Berbasis Blended Learning. Depok: Rajawali Pers.

Ruseffendi, E., T. (1988). Pengajaran Matematika Modern Dan Masa Kini: Untuk Guru Dan SPG. Bandung: Tarsito.

Rooney JE (2003). Blended learning opportunities to enhance educational programming and meetings.

Assoc. Manage., 55(5): 2632.

Sicat, A. S., & Ed, M. A. (2015). Enhancing College Students ' Proficiency in Business Writing Via Schoology. International Journal of Education and Research, 3(1), 159–178.

Suhendi, H. (2017). Teori belajar matematika menurut Brunner, Gagne, Thorndike, Skinner, Piaget (online).https://hendisuhendi2012.wordpress.com/2013/06/08/teori-belajar-matematika-menurut- bruner-gagne-thorndike-skinner-piaget/. Pada tanggal 20 Oktober 2017.

Stein, H., (2000). A Model of Virtual University. Turkish Online Journal of DistanceEducation, 1(2), 1-4. Suriasumantri, J., S. (2001). Filsafat Ilmu: Sebuah Pengantar Populer, Jakarta: Pustaka Sinar Harapan Suriasumantri, J. S. (1997). Ilmu dalam Perspektif. Jakarta: Yayasan Obor Indonesia.

Trilling, B. & Fadel, C. 2009. 21st Century Skills: Learning for Life in Our Times. San Francisco: John Wiley & Sons, Inc.

Wardhani, S. (2010). Implikasi Karakteristik Matematika dalam Pencapaian Tujuan Mata Pelajaran Matematika di SMP/MTs. Yogyakarta: PPPPTK Matematika.

Wijaya, Y. E., Sudjimat, A. D., & Nyoto, A. (2016). Transformasi Pendidikan Abad 21 Sebagai Tuntutan Pengembangan Sumber Daya Manusia di Era Global, Prosiding Seminar Nasional Pendidikan Matematika 2016- Universitas Kanjuruhan Malang, 263–278.