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THE ROLE OF E-LEARNING IN MATHEMATICS LEARNING AT MUHAMMADIYAH SORONG UNIVERSITY OF EDUCATION

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Abstract. Mathematics is one of the subjects that must be studied by students, especially students at the undergraduate level (S1). paying attention to the objectives of learning mathematics in Permendikbud Number 21 of 2016 requires students to have the ability to think logically, analytically, systematically, critical and creative. However, mathematics learning material that has an abstract nature, makes mathematics difficult by most students. This is one of the causes of not achieving the goal mathematics learning. The concepts can be understood easily when ease to follow the times experienced by students. Stage student development requires students to be able to reason with using things that are abstract and symbolic. One solution to help students understand mathematics material using e-learning. Learning E-learning is an educational concept that utilizes technological advances information and communication, especially in the teaching and learning process. Convenience learning with e- learning also lecturers can prepare learning effectively and efficient by using media and learning resources that are more interesting so that they do not focused on printed books. This can increase student interest in learning where learning is no longer focused on the lecturer and class. The function of e-learning in support learning activities in the classroom, namely as a supplement, complement and substitution. Based on the description of the explanation above, it can be concluded that: The purpose of writing this paper is to describe how the role of e-learning in learning mathematics at the Muhammadiyah University of Education Sorong.

Keywords: guideline; template; authors; abstract; manuscript.

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INTRODUCTION

Mathematics is one of the subjects that must be studied at all levels of education. However, mathematics is often considered difficult for students. The nature of abstract mathematical objects makes mathematical material at school is difficult to understand, so students consider the lesson mathematics is a difficult and complicated subject, the same thing was expressed by (Thurm & Barzel, 2020) who said "Mathematics is considered a difficult science, complicated, and deceptive." Mathematics learning on campus is expected to be something which is fun for students, but in reality there are still many difficulties encountered in learning it. Something that often occur in learning mathematics are students who are less active, less participating and students are impressed only as listeners who are informed by the lecturer. This happens because in part most of the lecturers still use conventional learning methods. even though according to (Balakrishnan & Gan, 2016) lecturers as a lesson planners are required to be able to designing learning by utilizing various types of media and resources appropriate, so that the learning process will effectively and efficiently. Along with technological advances encourage lecturers to teach in accordance with the progress of the times close to life implementation. So mathematical concepts can be understood easily. Especially for students who study mathematics from concrete to abstract mathematics. Mathematics at Muhammadiyah University of Education Sorong requires students to be able to think using abstract things and symbolic (Won, Evans, Carey, & Schnittka, 2015). One solution to help students understand the material mathematics by using e-learning. It is an online application that can connect between educators and students in a study online (Msomi & Bansilal, 2018). With the e-Learning, students can share information and can access the subject matter at any time (Irfan, Kusumaningrum, Yulia, & Widodo, 2020).

From the explanation above, the author considers the importance of the role of E-Learning in Mathematics Learning at Muhammadiyah University of Education Sorong. So that it can be done as an effort to increase student's interest, which learning is no longer focused on the teacher and class.

METHODS

Types of research.

This is a type of literature study research by looking for references theory relevant to the role of e-learning in learning mathematics then the conclusion is in accordance with the reference.

Data Analysis Method

The data that has been obtained is then analyse by the analytical method descriptive. Descriptive analysis method is done by describing the facts that exist and are relevant to the role of e-learning in mathematics is then carried out by doing analysis, not only describe, but also provide

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sufficient understanding and explanation about the role of e-learning in mathematics.

RESULTS AND DISCUSSION

Learning Mathematics at Sorong Muhammadiyah University of Education

Learning is an attempt to establish conditions that support abilities, interests, talents, and needs of students in order to create optimal interactions (Lazakidou & Retalis, 2010). Conditions that support the learning process will encourage students to achieve maximum learning outcomes. According to the Law of the Republic of Indonesia No. 20 of 2003 concerning SISDIKNAS, learning is a process of student interaction with lecturers and resources learn in a learning environment. Thus, learning involves several an important component is the interaction between students and teachers, as well as the environment. Along with something has been said previously, (Piñero Charlo, 2020) states that in the process of learning mathematics, students should be active in doing mathematization process. Mathematization is defined as providing opportunities for students to reconstruct knowledge through activities: observing, classifying, solve problems, communicate, interact with others, including with lecturer, reflect, estimate, draw conclusions, investigate relationship, etc.

a. Function of learning mathematics according to (Farsani, 2016) is as follows: As a tool, this means that through mathematics students can understand and able to inform, for example through equations or tables in mathematical models.
b. As a mindset, learning mathematics is the formation of paradigm to understand any situation means. The mindset developed is a deductive and inductive.
c. As a science, mathematics always looking for the truth and is willing to evaluate the truth temporarily accepted, if new discoveries are found as long as they follow the pattern legitimate thought.

The purpose of learning mathematics at Sorong Muhammadiyah University of Education according to (Baumert et al., 2010) are as follows:

a. Students have abilities which can be used through mathematical activities. Students have mathematical knowledge as a provision to continue their next level of education.
b. Students have mathematical abilities as an improvement and expansion of Mathematics at Muhammadiyah Sorong Education University to be used in daily life.
c. Students have a fairly broad view and have a logical, critical, careful and disciplined and appreciate the usefulness of mathematics.

The scope of mathematics for Muhammadiyah Sorong Education University in Permendikbud Number 58 of 2014 namely: (1) Concepts, operations and number patterns, includes: integers and fractions, sequences of numbers, operations to square root, patterns of

numbers, sequences, and number series. (2) Algebra and relations, including: picture patterns shapes and numbers, sets, algebraic and non algebraic expressions, relations and functions, equations and inequalities (simple linear and non-linear), comparisons. (3) Geometry and measurement, including: basic units and simple derived units, geometry planes, similarity and congruence, measurement of distances and angles, Theorem Pythagoras, transformation, comparison. (4) Statistics and opportunities, including: processing data, data presentation, measures of concentration and spread, empirical opportunities, and opportunities theoretical.

Mathematics at Muhammadiyah Sorong Education University demands participants students are able to do reasoning using abstract things and symbolic. According to (Wulandari, As, Rustamadji, & Triyono, 2021) theory which says that Muhammadiyah Sorong Education University is already in the formal operation stage, but there is nothing wrong if students are still needed to clarify the concept being taught, for example, students use props because of the developmental stage Piaget's mentality is only an estimate. Even though learning mathematics emphasizes a deductive mindset, but according to the intellectual development of students Muhammadiyah Sorong Education University has not entirely used deductive so it is still mixed with inductive. By learning mathematics in students which cannot be separated from the abstract and developmental nature of mathematics students, therefore students need a way of teaching that helps students in understanding the concepts being learned.

E-learning

The origin of the term e-learning is not Explicitly known but is thought to be the term has existed since the 1980 (Aslan, 2011). E-learning terms (Electronic Learning) contains a very broad understanding, so that many experts which describes the definition of e-learning from various points of view. The definition of e learning according to (Al-Adwan, Al-Adwan, & Smedley, 2013), is a description of the use of technology in the learning process that refers to the internet technology network so that use can be instantaneous, easy to store and retrieve and share information with other users. Another opinion according to (Šumak, Heričko, & Pušnik, 2011) e learning is the use of technology, whether it be the internet or the web in learning so that users can access learning anywhere and anytime. Whereas according to (Borba et al., 2016) e-learning is learning that uses computer technology or usually called the internet. Based on some of the opinion can be concluded that e-learning is a learning process that utilizes computer technology and information networks in the form of the internet or web. In general, e-learning just still requires media learning, especially computers and other accessible learning resources by teachers and students. Students also can share information with each other and can access the subject matter at any time.

According to (Nortvig, Petersen, & Balle, 2018) there are three functions of e-learning in support learning in class are as follows:

1. Supplement. It is said to function as a supplement if students have the freedom to choose whether to use learning materials electronic or not. In this case, there is no requirement for students to access material. Even though it is optional, students who take advantage of it will certainly have additional knowledge or insight.
2. Complementary. It is said to function as a complement if the material Electronic learning is programmed to complement the learning materials get by students in class. As a complement means learning material Electronic are programmed to complement remedial materials. It says as remedial when if students able to rapidly understanding the subject matter when delivered at face-to-face class, has an opportunity to access electronic learning materials that are specially developed for them. The goal is to further strengthen the level of mastery of the subject that has been get in class. Said as remedial program, if students whos got a trouble to understanding the material of lessons, has an opportunity to take advantage of the material electronic learning that is specifically designed for them. In order to students easily understand the subject matter presented in the classroom.
3. Substance (substitute). It is said to be a substitution if e-learning is carried out as a substitute for learning activities, for example by using learning activities. There are three models to choose from, namely: (a) completely class learning (conventional), (b) partly conventional and partly through the internet class, or (c) entirely over the internet. E-learning is divided into three classifications according to (El Aissaoui, El Madani, Oughdir, & El Allioui, 2019), as for the classification is as follows:

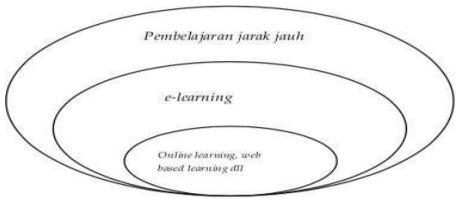
a) E-learning as a network, it means that e-learning can provide information repair quickly, save or retrieve, distribute and share. This requirement is very important in e-learning, so Rosenberg calls it an absolute requirement.
b) E-learning is delivered to users via computer with using internet technology standards.
c) E-learning focuses on the broadest view of learning, solutions learning that outperforms traditional paradigms.

Based on this opinion, there are two types of e-learning that can be used, namely: e-learning in the form of recordings that do not require participants students join in the class, while the second is e-learning which requires all students to be present in learning. The application of e-learning can varied by using a computer that has a variety of softwares, one of them is the microsoft power point which is posted on the website which can be form with graphics, animation, video, audio and

other components so that it can involve students to learn by online.

According to (Naveed et al., 2020), in terms of importance, there are five most important factors that affect the implementation of e-learning, namely: program content, web page access, learner participation, security and support for website, and constitutional commitments. then interactive learning environment, instructor competence, design and presentation.

Based on the opinion above, it can be concluded that e-learning facilitate distance learning of course using the internet for access online learning. The picture of the distance learning context is as follows:



Picture 1. Distance Learning E-learning

Meanwhile, e-learning, which requires students to be present in class, can be seen as a one of the e-learning models. E-learning steps according to (Rüth & Kaspar, 2017) are as follows: Stage of constructivism. Students are given 3 stages of activity, namely repetition previous subject matter, motivate students to use the material will be learned and build understanding of the material from the start (useful for straighten the direction of understanding during the learning process).

1) Cooperative learning stage. Students are allowed to do activities cooperation with them friends in terms of opening e-learning, logging in, studying and to do their job and to build their social spirit. In this stage, mutual assistance between students can increase understanding of the activities students are doing, because of collaborative activities carried out with others students involve the same psychology.
2) Students as facilitators. If you have gone through the two stages above, then next students can access the links to these learning resources for reference individuals, namely optimizing internet facilities which will then form a independence learning culture to students.

According to Mutiyasa, the benefits of e-learning for students are (a) building interaction when students conduct online discussions (b) accommodate student differences, (c) students can repeat difficult subject matter many times, until understanding is obtained, (d) ease of access, anytime and anywhere anywhere, (e) students can study in a free atmosphere without pressure", no embarrassed to ask questions (online), (f) reduce travel time and costs, (g) encourage students to browse information to sites on the world wide web, (h) allow students to choose appropriate targets and materials on the web (i) develop technical skills in using the internet, (j) encourage students to be responsible for their learning and build self-knowledge and self- confidence. Meanwhile, lecturers can provide teaching materials which is up to date to students by providing easy access at anytime and

anywhere, reducing travel and accommodation costs and various benefits other. Other opinions about the benefits of e-learning in learning activities expressed by (Srivastava, 2019) are: (a) training students explore concepts, (b) improve reasoning skills, (c) encourage students think systematically, logically and analytically, (d) increase student interest in learning mathematics.

The Role of E-learning in Mathematics Learning at the Muhammadiyah Sorong University of Education.

Based on Government Regulation no. 19 on National Education Standards, CHAPTER IV, article 19, paragraph (1) states that: the learning process in the unit education is held interactively, inspiring, fun, challenging, motivate students to participate actively, and provide sufficient space for initiative, creativity, and independence in accordance with talents, interests, and physical and psychological development of students. Through e-learning learning atmosphere interactive, fun, and effective can be realized, including in Mathematics learning is considered difficult and boring according to students.

E-learning is a new way of teaching and learning process. E-learning is the basis and logical consequence of the development of information technology and communication. With e- learning, students do not need to sit in the classroom. E Learning can shorten the learning time target and save costs buy package books. E-learning will also focus on student where they are able to learn and access learning information anywhere and anytime so that will be easier, practical and efficient.

Basically, the use of e-learning in mathematics education is very important widely, both as learning media in the classroom and as learning media independent. Learning in the classroom can be done by utilizing the media visual or audio-visual aids in bringing context into the classroom for show students. Application of mathematical concepts without having to seeing firsthand, this learning can be applied to university-level students according to Piaget's theory of mental development, they are in the formal operational stage so that they can start to think abstractly at an early stage. Use of media on students, for example, the use of XL in understanding data processing on the material statistics, simulation of building space and so on. In addition to learning mathematics at a higher level, when entering concepts such as calculus, geometry, numeric, discrete as well as probability and statistics using software such as Mathematica, Maple, Matlab, Fortran, Basica, Geometer Skechtpad, Cabri, Minitab, SPSS, Microsoft and others based on research results shows that it can improve higher order thinking skills and interests on mathematics learn. If you look at the characteristics of mathematics, indeed some materials such as numerical methods or linear programming, the use of computer media is very important necessary because in more complex cases the calculations are carried out manually.

Even though web technology provides

virtual learning, but conventional learning in the classroom is still needed. There are three reasons conventional learning in the classroom is still needed, namely: the need for a learning mechanism that will be experienced directly with all students, the need to provide understanding and learning experiences with work in groups, and the need for providing training with using a computer that will be used as a web-based communication medium (Wagner, Hassanein, & Head, 2010).

Conclusion

Based on the description of the theoretical study described above, the author concludes the role of e-learning in learning mathematics in Muhammadiyah Sorong University of Education are as follows:

a) E-learning makes it easier for lecturers to create effective learning and efficiently anywhere and anytime without being constrained by space and time.
b) E-learning learning plays a role in creating a new learning atmosphere that interesting.
c) E-learning plays a role in increasing student interest in learning by utilizing learning in accordance with the times.
d) E-learning plays a role in improving thinking skills students who are more creative with the various references they get.
e) E-learning acts as a second source of learning for students.
f) E-learning plays a role in facilitating students in solving problems high-level numerical mathematization problems in the presence of various calculation applications.

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