INTEGRATED E-LEARNING DESIGN IN MATHEMATICAL SCIENCES

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Abstract: *Mathematics is the foundation of science in the industrial era 4.0. The need for technology has become an industry-standard in today's modern era and the need for quality human resources in the IT field. The purpose of this study is to analyze the integrated e-learning design in mathematics. The research method used is a descriptive method by collecting data and describing students' problems around mathematics. The object of this research is the students of Universitas Komputer Indonesia. The results showed that E-Learning is one of the media in improving and improving the quality of student learning applied in mathematics because mathematics is the basis of science and technology for modern science. It is because the integrated e-learning design makes it easier for students to find formula knowledge. In conclusion, the use of e-learning is one way to improve the understanding of mathematics among students. Besides, it can be a reference for all formulas and branches of mathematics believed to help students find the mathematical solutions needed.*

Keywords*: E-learning, mathematical, science*

INTRODUCTION

Subsequent revolutions have resulted in manufacturing since the first Industrial Revolution, from water and steam-driven machinery to electrical and digital automated processing, making the manufacturing process more complicated, automatic, and sustainable so that people can quickly, effectively, and persistently operate machines. Vaidya, et al. (2018) Training in engineering has become a crucial factor in the state's competitiveness and is the cornerstone of its technical and economic independence. With the widespread use of data and in different domains of modern society, communication innovations have contributed to updating the methods and ways of training competitive professionals. Askhamov, et al. (2016) The use of e-learning is becoming a global issue now. In the educational field, many institutions already use it. In the age of globalization, development is hasty by enhancing technology, enabling students to learn more quickly and efficiently. Sihotang (2017). E-learning is currently the common term used to describe the

various uses of information and communications technologies to enhance learning and teaching. It takes the form of online courses and training, by which the courses and training are delivered via the Internet. Aldowah, et al. (2017) Mathematics is a central component of science and technology and plays a vital role in the world's comprehension, control, and creation of different resources. Murtiyasa (2015). Training in mathematics is crucial in future engineers' professional development because mathematical disciplines guarantee students' preparation for professional work. After all, they are characterized by inter-subject communication and strict relationships of cause and effect, evidence and validity of scientific statements and theories, experimental proof of ideas, quantitative and qualitative. Askhamov, et al. (2016).

There are some previous studies related to e-learning. Ahn et al. 2018 explain the MCIEC model that is addressing the advancement of e-learning in developing countries. These concepts suggest the MCIEC (motivation, meaning, interactivity, assessment, and connectivity), model. The model recognizes five main aspects of successful learning in mathematics: inspiration, meaning, interactivity at the front end of the planning and delivery of lessons, and complex assessment and communication at the back end of the planning and delivery of lessons. Ahn, et al. (2018). On the other hand, mathematics is a critical element of science and technology and has a vital role in understanding, controlling, and developing various resources. Murtiyasa (2016). In this study, the discussion focuses on the integration of mathematics with other disciplines of science. The TIMSS survey, conducted by The International Association for the Evaluation and Educational Achievement (IAE) based in Amsterdam, focuses on students' math and cognitive content domains. The content domain includes numbers, algebra, geometry, data, and opportunities, while the cognitive domain includes knowledge, application, and reasoning. The survey was conducted every four times were in 1999, Indonesia in the 34th position out of 48 countries. In 2003, Indonesia was at the 35th position out of 46 countries and in 2007 and 2011 at the 36th position out of 49 countries. Murtiyasa (2015). By looking at the survey results, it is only natural that Indonesia is only a consumer in technology development matters, even based on the Ministry of Education and Culture's website. The high school mathematics national exam's average value in 2019 is 39.33. (Yuwono, 2018; Handayani, et al. 2020; singh, et al. 2021)

Different from the previous study that more focus on the advancement of e-learning. This research aims at making e-learning in mathematics the reference source. Subsequently, this e-learning design would guide all the mathematical sciences to help students find the requisite mathematical solutions. This study used descriptive qualitative analysis methods by conducting literature analyses of different studies and circulating group questionnaires.

RESEARCH METHOD

This study used descriptive qualitative methods with distributed questionnaires and a literature approach. This research focused on identifying data quality issues than on the number of samples taken. The questionnaire was distributed to the Universitas Komputer Indonesia students with 14 respondents.

RESEARCH RESULTS AND DISCUSSION

E-learning has resulted in significant changes occurring in learning activities, especially in the current era of digitalization. Technology plays an important role in the world of education, both in learning and teaching activities. In addition, e-learning has an essential function in learning activities, namely as an addition, complement and substitute. The E-learning platform is a module based on software that integrates various management devices, communication, assessment, and checking. E-Learning in this study uses a website platform. Suppose the materials are packed on a CD-ROM or other media to learn materials transmitted through a web browser in a web program. In that case, electronic education is related in the same way. Singh, et al. (2021). The critical role of designing e-learning concerns the design of the digital technology involved and the design of appropriate assignments and activities, and the design of lessons and teaching in general, three interrelated design levels. Drijvers (2015).

A. UML

To model and state the roles of the services the device offers to users, use case diagrams are used. Integrated application of E-Learning Mathematical Sciences. On a device, which has a scenario in it, users can communicate and take action. The use case is shown in Figure 1.
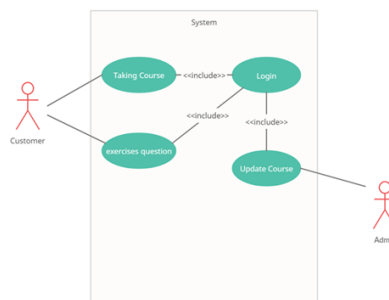

Figure 1. Use Case Diagram

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B. *Benefits of E-learning*

The existence of e-learning can shorten learning time and make study costs more economical e-learning allows student and material engagement. Educators can exchange knowledge and access learning materials at any time and frequently. With such circumstances, students can further improve their mastery of learning materials by e-learning the process of knowledge creation in the classroom. However, students can actively engage in the teaching and learning process. Hartanto (2016). A survey

conducted on students using a Google Form about how much they understand the material explained by the teacher or lecturer can be concluded that most of them do not understand the material described. The completion percentage is shown in Figure 2.
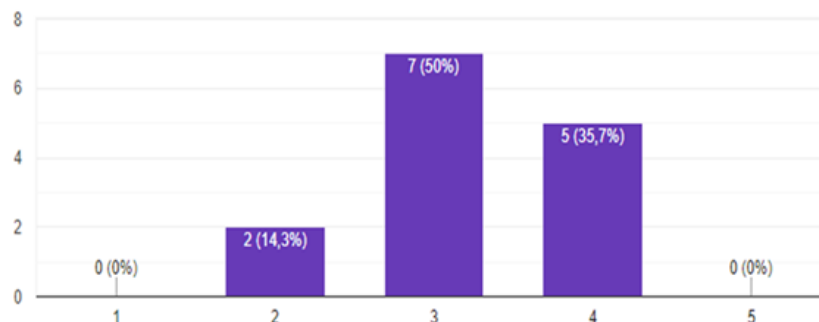

Figure 2. The understanding of students related to learning material

Data taken from the Ministry of Education and Culture regarding national exams in mathematics subjects in 2019 throughout Indonesia shows poor, with an average value of 39.33, the lowest of other subjects based on Figure 3.
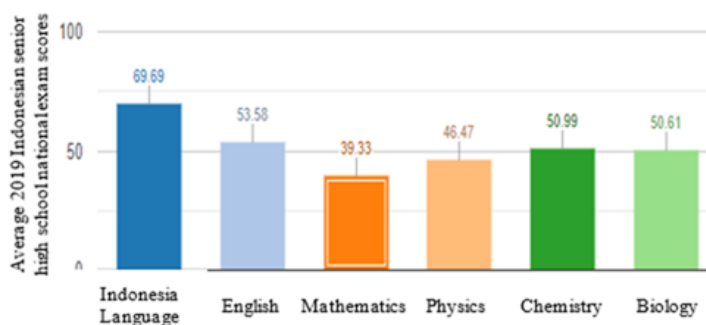

Figure 3. Indonesian senior high school national exam in 2016.

Source: https://hasilun.puspendik.kemdikbud.go.id/

Students in school learn mathematics as useful life knowledge, but they learn to learn mathematics. Novriani, et al. (2017). However, they still have difficulties in this subject. Novriani, et al. (2017). Student difficulties in understanding lessons can be caused by teachers' limited ability to deliver the material. However, the application of e-learning is not a substitute for teachers but as a supporting facility in teaching and learning activities.

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CONCLUSION

The use of e-learning is one way of improving the understanding of mathematics among students. Sophisticated technological advances create fierce global competition that demands the creation of competent human resources in technology. The advancement of Information Systems creates the formation of new scientific disciplines, which are related to mathematics. Making e-learning specifically for

mathematics, in which there are complete and integrated references with other disciplines, will help students.

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