



Development of Adaptive E-Learning Content to Increase Learning Effectiveness

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Abstract— The development of technology that is increasingly sophisticated and facilitates human work in all fields, is put to good use by people who understand the huge positive impact it has. The use of adaptive E-Learning content to enhance learning will have a major impact on Education. The adaptive E-Learning system was developed on the assumption that individual learning models are able to provide better results than other learning models. Therefore, the learning process in today's era can no longer be done traditionally, it must be able to adapt to the times. Educators must be able to balance it with methods that suit the needs of students. So that they can develop their potential and be able to have high self-esteem. As well as being able to be competitive and compete with many people of their age for creative content. The data obtained through the distribution of questionnaires. The questionnaire was made using the Google form with 15 statements about the effectiveness of E-Learning in learning. The results of this study explain that it is proven that the development of E-Learning content that is maximally adaptive according to existing procedures, can increase the effectiveness of learning by educators for students. This will realize that learning can be achieved in accordance with what has been set. The method used in this study is a quantitative method by collecting population and samples. The conclusion from this study is that the development of adaptive E-Learning content is proven to be implemented properly and efficiently to increase the effectiveness of learning in the classroom. The limitation of this research is that researchers only conduct this research at the elementary school level, which incidentally requires the use of adaptive E-Learning technology in the learning process, which is of course very beneficial for educators and students to improve the quality of education.

Keywords— Adaptive, E-Learning content, Learning

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I. INTRODUCTION

Education is very important in this life, especially education at school. But it must also be balanced with early education, namely family (Bernacki et al., 2020). To shape the character of a child, of course, it must start early. The goal is for them to be ethical in accordance with the prevailing norms and so that at school they can respect teachers. (Mustafiyanti et al., 2023). So as to be able to absorb the knowledge conveyed by the teacher. How important ethics are, even to the point of being an assessment at school and affecting whether a child rises or falls. So it is necessary to pay great attention to the attitude of children from this early age. Because early childhood education can affect how the child's attitude will be embedded and used to be good towards others. With good ethics, of course they will be able to condition themselves to anything well. (Utami et al., 2023). Adaptation to various changes can also be done, one of which is the development of this sophisticated digital world. Rapidly developing technology will certainly have a big impact on all areas of life, especially in the field of education. (Saskia et al., 2023). Many will get good effects from maximizing this advanced technology. By utilizing it well, it will be able to bring great changes to human life (Liam et al., 2023). Therefore, special attention is needed to be able to carry out its utilization seriously and persistently. Not only using it, but also creating it.

Technology that makes long distances feel close, is able to find information from around the world quickly, as a tool that facilitates human work, so that it will save costs, time, and energy (Putri et al., 2023). Of course, humans will openly accept the presence of this technology. It will even be dependent on the sophistication that can help make human work easier. From all circles, they really need to do activities (Dito & Pujiastuti, 2021). But not only are there positive impacts on technology,

there are also many negative impacts. Especially in childhood and adolescence who are addicted to playing online games, which only waste time and money, not even rarely who are addicted to it (Sousa & Rocha, 2019). Eye diseases caused by prolonged use of cell phones, problems of not wanting to help with parents' homework, many criminals who are willing to become thieves to get money to buy internet packages, and many more (Frank et al., 2019). These problems can all be anticipated by equipping and supervising the use of technology by parents. And there must be cooperation with several parties, in order to make it happen. It is also necessary to exchange ideas about this problem, so that suitable ideas in solving it can be obtained appropriately.

Rapid information technology makes it easy for people to obtain information. (Bernacki et al., 2020). The development of information technology spurs the emergence of various applications including in the world of education which is often called e-learning. E-learning is a type of teaching and learning that allows the delivery of teaching materials to students using the internet or other computer network media. (Coman et al., 2020). E-learning is an innovation that has a very large contribution to the process of changing teaching and learning, where the learning process is no longer just listening to the material from the teacher in the classroom but the teaching material can be visualized in various formats that are more dynamic and interactive so that students will be more motivated to engage in the teaching and learning process. (Robbins, 2004). This can make the class productive and hone students' creativity in creating e-learning content. Assignments given by the teacher will also be easy to do with maximum utilization. (Dalenogare et al., 2018). Likewise, teachers will easily evaluate student learning outcomes. The learning method of course must also be able to balance with this e-learning content

learning media in order to maximize learning outcomes. (Sediyono et al., 2022). It is also necessary to pay attention to the way students learn, each of which is different, to be able to provide good learning and according to student needs.

E-learning is a type of learning that utilizes internet media. The development of cell phone technology to date has made cell phones have complete features and even approach the function of a computer. (Prasetyo & Brataningrum, 2022). Now with the features possessed by cell phones, one can access the internet via cell phones and does not need to use a computer. By utilizing this sophisticated mobile phone, one can access e-learning easily. (Widyasusanti et al., 2021). E-learning is a form of application of technology in the field of education in the form of virtual world schools. E-learning is an attempt to make a transformation of the teaching and learning process in schools in a digital form bridged by internet technology. E-learning systems have been widely developed by various educational institutions and have become very important in carrying out distance education. (Murtadho et al., 2022). The current e-learning system generally presents the same presentation of learning materials for each user because it assumes that the characteristics of all users are homogeneous. Whereas in reality, each learner has different characteristics, so there needs to be great attention to how to use it. (Yuniar Setyaputri et al., 2022). This causes what is learned not to match what is desired. In the emerging education system technology (Mutlu-Bayraktar et al., 2019), It is necessary to have an e-learning system that is able to accommodate the problem of different characteristics of learners, which can understand the preferences of learners and try to provide/deliver content and use methods that are in accordance with the characteristics of learners.

The term E-learning refers to the delivery of learning materials to anyone, anywhere, and anytime using information technology in an open, flexible, and distributed learning environment. (Mazaya, 2022). E-Learning includes various

applications and processes such as computer-based learning, web-based learning, virtual classroom, etc (Gumono et al., 2022). More specifically, e-learning is the utilization of internet technology to distribute learning materials, so that students can access from anywhere. With the internet that is already available, the editing of adaptive learning content can be done anytime. (Dwi Pamungkas et al., 2022). So there are no limitations or reasons for not being able to utilize e-learning in this day and age. (Firza et al., 2022). The development of this adaptive e-learning content intends to provide enthusiasm and be able to innovate, be creative, and be proactive in facing changes. (Djusrar et al., 2022). A student is also required to interact socially and personally to adjust to the norms or standards that apply in their environment. And this adaptive value is a person's best response when meeting friends or a new environment. (Azzuni et al., 2022). That way they will be easy to get along with and adapt to anyone and be ready to develop anywhere. There will also be self-confidence and resilience in facing problems. It can also be said that adaptive is a person's ability to make adjustments to new environments, factors or areas. (Nurkholis et al., 2022). Adaptive e-learning content will certainly have a positive impact on the development of education, with the development of learning content.

Learning by utilizing e-learning needs supervision from the teacher for the implementation of learning, teachers in this learning case are difficult to supervise whether students learn or not, even students who learn the teacher still cannot see whether in learning the student reads the material to completion or not. (Pino, 2021). So that e-learning is very necessary to have supervision from teachers, so that the effectiveness of real learning can be achieved. As well as students so that they can make the best possible use for learning at school (Junedi et al., 2020). At home, parents also play a very important role in monitoring how students learn using e-learning content. (Salamiyah & Kholiq, 2020). Previously, teachers and schools had to work together to introduce technology-based learning to

parents, so that they understand and can control student learning at home. However, there are still parents who are stuttering with the development of technology (Fitrianita & Thohari, 2022). In fact, this makes a great opportunity for children to use technology at will. As a result, it can have a negative impact on the level of intelligence of students (Asmanda et al., 2022). It is necessary for parents to be enthusiastic about learning to keep up with these developments. In order to be ready to educate their children at home, so that when at school they are able to think and apply learning at school optimally.

According to (Kusworo et al., 2021), stated in his research entitled development of adaptive E-Learning system based on Vark learning style on IP address material, aims to develop an adaptive e-learning system in learning that can make it easier for students to receive lessons from teachers, and can understand and analyze lessons as they exist. According to (Alwiyah & Sayyida, 2020), stated in his research entitled the application of e-learning to improve student creativepreneur innovation, aiming to develop the quality of college graduates and complete competitiveness qualifications, and competition and innovation that can be used for social life through entrepreneurship. According to (Kimianti & Prasetyo, 2019), stated in his research entitled the development of problem-based learning-based science e-modules to improve students' science literacy that is creative and innovative by utilizing technological development. According to (Rachmayanti, 2022), stated in his research entitled the application of adaptive learning regarding social education content, aims to take advantage of technological developments in learning and social education using adaptive e-learning, so as to maximize learning outcomes.

Researchers seek to develop adaptive E-Learning content to increase the effectiveness of learning that is interesting and makes students interested. So that the expected learning objectives can be realized, and will make it easier for students and teachers to carry out the teaching and learning

process in the classroom. The purpose of this research is to improve the effectiveness of learning by utilizing adaptive e-learning content in order to advance education to be more qualified. As well as making the nation's successors literate in technology that is variously available and can easily be utilized for learning. Students and teachers can also work well together to realize the learning objectives to be superior and students can compete healthily. Students also develop adaptive to technological advances, become creative and innovative in developing future careers. Parents who put their hopes in them are also proud and can also enjoy their hard work so far. Family happiness is also radiates the success of a child. It all has to be prepared and able to adapt to the ever-changing circumstances in this borderless era of globalization.

I. RESEARCH METHODS

The method in this study uses quantitative methods. The definition of quantitative method is research based on empirical experience that collects data in the form of numbers that can be counted and are numerical. Quantitative research is an effort to investigate problems, existing problems are the basis used by researchers in taking data. (Sari et al., 2022). Then determine the variables and measured with numbers to analyze in accordance with the procedures of the applicable statistics. The purpose of this research is to help draw conclusions or generalize the theory. This research method is defined as part of a series of systematic investigations of phenomena by collecting data to be measured by mathematical or computational statistical techniques. (Firmansyah et al., 2021). This research is mostly conducted using statistical methods in collecting quantitative data through research studies. The research process follows a planned procedure. The purpose of quantitative research is to develop nomothetic science, which is science that seeks to make laws from generalizations. The subjects studied, the data collected, and the data sources needed, as well as the data collection tools used are in accordance with what has been planned previously. Data collection

is done through measurement using objective and standardized tools. Involves calculating numbers or quantifying data and researchers place themselves separately from the object of research. Data analysis is carried out after all data is collected.

Quantitative research methods in analyzing data, researchers are required to understand statistical techniques. Research results in the form of generalizations and predictions, regardless of the context of time and situation. This research in its implementation is based on pre-planned procedures. The steps of quantitative research are the formulation of problems, which are questions about empirical objects that have clear boundaries and can be identified factors related to them. (Fuadiah, 2022). This framework is arranged rationally based on scientific premises that have been tested by taking into account empirical factors relevant to the problem. Formulation of hypotheses which are temporary answers or conjectures to the questions posed whose material is the conclusion of the developed framework. Hypothesis testing which is the collection of facts relevant to the hypothesis proposed to show whether or not there are facts that support the hypothesis. (Risadiana Chandra Dhewy, 2022). Drawing conclusions which is an assessment of whether the proposed hypothesis is rejected or accepted. The purpose of quantitative research has several points, such as for the development of mathematical models because this research does not simply use theories taken through literature reviews and theories. But also the importance of building hypotheses that have a relationship with the phenomena to be studied using this research method. Quantitative research has an important purpose in making measurements which are the center of measurement. This is because the results of measurements can help in seeing the fundamental relationship between empirical observations and the results of data taken quantitatively. Another goal is to help determine the relationship between variables in a population.

Included in helping determine the research design, there are two designs in this study, namely descriptive studies and experimental studies. Descriptive research if the researcher only tests the relationship between variables once, while for experimental research the researchers will take measurements between variables conducted before and after the study. The characteristics of quantitative research are needed so that someone who does not understand this research method is easy to mark. Quantitative research is also Quantitative research has several points in its characteristics, first highlighting a more specific problem as the focus of the research being conducted. Then it is used to answer specific problems raised as research material, and the most important characteristic of quantitative research is that it is not result-oriented. Rather, it is more about the process, even though the material under study is very unique, the process still emphasizes the scientific research setting. The next characteristic is the researcher in this case as a basic instrument in data collection. Then the research design used is temporary, this research is carried out using observation, interviews to data analysis techniques. The results of this research are in the form of qualitative data even though it does not use concepts and hypotheses. Finally, it must have credibility, audibility, transferability and confirmability to see the data as a whole. The theory used is grounded theory, while in conducting data analysis descriptive reporting is used. Some of the characters described can be used in distinguishing types of research.

II. RESULT DISCUSION

This research is the development of adaptive e-learning content to enhance learning creativity. Content is information available on electronic products. This term can refer to the content of Facebook status, Instagram, Twitter, TikTok, YouTube, and various other social media platforms. Creating content in this digital era is getting easier and cheaper, some are even free. In addition, you can also have a website and social media accounts

in an instant. The type of content can be in the form of writing or text that will usually be found on the pages of books, website pages or blogs. Then on post captions on various social media platforms. Generally, the type of written content contains text that is tailored to the wishes and objectives of the content creation of the blog or website owner. Then the type of visual content which is usually in the form of two-dimensional art that has a function to convey a certain context. Furthermore, the type of audio content is sound content that can be listened to. The next type of content is infographics, which is a form of data visualization that conveys complex information to readers so that it can be understood more easily and quickly. Links are a characteristic of online media content or web pages in the form of anchor

text and the URL of a particular web page. The clicked link will display a different page from the one being opened by the internet user. Next is the electronic book (E-Book) or electronic book is a book in the form of a file / file that can be downloaded and opened on a computer, cellphone, or laptop device. Examples of written content, short stories, novels, encyclopedia books, poetry, news texts, and others. Examples of other content, in the form of photos, memes, flyer banners, voice notes, music, creator content, youtube videos, tiktok videos, movies, games, and so on.

E-Learning is an electronic learning system in the form of information technology established in the field of education in the form of a website that is accessed anywhere. E-learning is the basis and logical consequence of the development of information and communication technology. With this technology, learners do not need to sit in the classroom to listen to every word of the teacher directly. E-learning can shorten the target schedule of learning time, and of course save costs that must be incurred by the study program or education program. E-learning has shortened learning time and made learning costs more economic. It also facilitates the interaction between learners and

materials, learners and lecturers or teachers as well as fellow learners.

Learners can exchange information and can access learning materials at any time and repeatedly without any time and place restrictions. With this technology, it is easier for educators to update learning materials that are their responsibility in accordance with the latest scientific development demands. Also develop themselves or conduct research to improve their insight, and control the learning activities of students.

Adaptive learning media is learning media that is created, used, and adapted to the conditions and needs of students. It is also a computer-based media that is able to change its status in response to user actions. An adaptive program is one that uses the modeling capabilities of a computer program to receive input from the user, change the state of the model, and display the resulting output. Adaptive media focuses on intrinsic feedback. Which is feedback on student Actions which is the weakest link in the process.

Traditional education. For the learning process to be fully supported, students must receive meaningful intrinsic feedback on their Actions relating to the nature of the task goal. This feedback is inherent in the Action and does not require third-party judgment on the quality of the Action. A requirement for the interactive level of the conversational framework is that the feedback must be meaningful to the student. This is important because although it occurs as an essential part of the Action, they must find it easy to interpret in relation to the goal they are trying to achieve. With all the conditions in place, it is possible for students to know how close they are to good performance, and what else they need to do. The teaching and learning effectiveness of students and teachers will also be conducive. The purpose of learning will also be maximally achieved with the implementation of interactive learning media, such as this adaptive e-Learning content. As follows 15 statements about E-Learning content development.

Table					9	Make students interested in developing innovative skills	30%	65%	0%	0%
Statement	Strongly Agree	Agree	Disagree	Strongly Disagree						
Adaptive E-learning content has a major positive impact on education	45%	60%	0%	0%	9	Make students interested in developing innovative skills	30%	65%	0%	0%
					10	Cooperation between parents at home and teachers at school in the use of e-learning content by students	40%	75%	0%	0%
This content makes it easier for students to understand classroom lessons	55%	65%	3%	0%						
Interactive learning media such as e-learning content provides student learning attractiveness	40%	55%	0%	0%	11	Facilitate communication and exchange information with fellow students	65%	55%	0%	0%
					12	Easily accessible anywhere and anytime and by anyone	35%	60%	0%	0%
Makes it easier for teachers to teach because they have creative and innovative teaching aids	30%	70%	4%	0%	13	Learning can be provided in a variety of interesting styles	60%	55%	3%	0%
					14	Promote higher quality and superior education	35%	55%	0%	0%
Accelerate learning to students with an easy online system	45%	80%	0%	0%	15	Students become more competitive with the field they are good at, especially in the IT field	40%	50%	3%	0%
Various kinds of learning can utilize e-learning content	50%	55%	0%	0%						
Advancing the next generation of the nation to develop rapidly	40%	65%	3%	0%						
Can be easily accessed by capitalizing on the internet	25%	70%	4%	0%						

In the table above there are several statements from several questions in the maximum development of adaptive e-learning content to improve the effectiveness of learning. The statements generated from the questions are very helpful for researchers in researching the benefits of developing this e-learning content. The questions

asked were 15 pieces containing a number of statements regarding the development of learning content that is adaptive to the development of the globalization era. The statement containing that adaptive e-learning content has a major positive impact on education, obtained a percentage of 45% in the strongly agree category. Whereas in the agree category, it gets a percentage of 60%, in the disagree category it gets a percentage of 0% and in the strongly disagree category, it gets a percentage of 0%. Furthermore, in the statement that, this content makes it easier for students to understand lessons in class, obtained a percentage of 55% in the strongly agree category. While in the agree category, the percentage is 65%, in the disagree category, the percentage is 3% and in the strongly disagree category, the percentage is 0% as well.

Furthermore, the statement stating that interactive learning media such as e-learning content provides student learning attractiveness, obtained a percentage of 40% in the strongly agree category. While in the agree category, the percentage is 55%, in the disagree category, the percentage is 0%, and in the strongly disagree category, the percentage is 0%. In the statement stating that it makes it easier for teachers to teach, because they have creative and innovative teaching aids, obtained a percentage of 30% in the strongly agree category. Meanwhile, in the agree category, the percentage is 70%, in the disagree category, the percentage is 4% and in the strongly disagree category, the percentage is 0%. Furthermore, the statement stating that accelerating lessons to students with an online system, got a percentage of 45% in the strongly agree category. While in the agree category it gets a percentage of 80%, in the disagree category it gets a percentage of 0% and finally in the strongly disagree category it gets a percentage of 0% as well.

The statement that various kinds of learning can utilize e-learning content gets a percentage of 50% in the strongly agree category. While in the agree category, it gets a percentage of 55%, in the disagree category it gets a percentage of 0% and in

the strongly disagree category it gets a percentage of 0% as well. Furthermore, in the statement that advancing the nation's next generation to develop rapidly, obtained a percentage of 40% in the strongly agree category. Meanwhile, in the agree category, the percentage is 65%, for the disagree category, the percentage is 3% and in the strongly disagree category, the percentage is 0%. In the statement that it can be accessed with only the internet, obtained a percentage of 25% in the strongly agree category. Meanwhile, in the agree category, the percentage was 70%, in the disagree category, the percentage was 4% and in the strongly disagree category, the percentage was 0%. Furthermore, in the statement that it makes students interested in developing innovative skills, obtained a percentage of 30% in the strongly agree category. While in the agree category, it obtained a percentage of 65%, for the disagree category, it obtained a percentage of 0% and likewise in the strongly disagree category obtained a percentage of 0% as well.

In the statement stating that cooperation between parents at home and teachers at school in the use of e-learning content by students, obtained a percentage of 40% in the strongly agree category. While the percentage of 75% in the agree category, for the disagree category obtained a percentage of 0%, as well as the category strongly disagree obtained a percentage of 0%. The statement that it makes it easier to communicate and exchange information between fellow students, obtained a percentage of 65%. While in the agree category, the percentage was 55%, in the disagree category, the percentage was 0% and in the strongly disagree category, the percentage was 0%. Furthermore, the statement that it is easily accessible anywhere, anytime, and by anyone, obtained a percentage of 35% in the strongly agree category. Meanwhile, a percentage of 60% in the agree category, for the disagree category obtained a percentage of 0% and in the strongly disagree category obtained a percentage of 0%.

Furthermore, the statement stating that learning can be provided in various interesting styles, received a percentage of 60% in the strongly agree category. Meanwhile, in the agree category, the percentage is 55%, in the disagree category, the percentage is 3% and for the strongly disagree category, the percentage is 0%. In the statement that advancing education is of higher quality and excellence, obtained a percentage of 35% in the category of 35% in the strongly agree category. While the percentage of agreeing obtained a percentage of 55%, in the category of disagreeing obtained a percentage of 0% and a percentage of 0% in the category of strongly disagreeing. Finally, the statement that students become more competitive with the fields they master, especially in the IT field, obtained a percentage of 40% in the strongly agree category. Meanwhile, in the agree category, it gets a percentage of 50%, in the disagree category it gets a percentage of 3% and in the strongly disagree category it gets a percentage of 0%. The 15 statements above prove that it is very important to use interactive learning media for students in understanding and capturing lessons at school.

The result of this research is that it is very influential on learning outcomes if developing adaptive e-learning content is maximized for learning effectiveness. Many positive impacts are beneficial for students and teachers. Such as making it easier for students to understand lessons and making it easier for teachers to provide lessons in an interesting and effective way to use. The purpose of this research is to develop adaptive e-learning content in the development of appropriate and expected learning. As a result of distributing questionnaires containing 15 statements about the effectiveness of this adaptive e-learning content, it can have a tremendous influence on the development of student education. Students become more superior in developing creative and innovative content about learning. In order to produce benefits for themselves and others.

III. CONCLUSIONS

Based on the discussion of the above research, it can be concluded that the development of adaptive e-learning content to increase the effectiveness of learning can maximally provide great benefits for the advancement of quality education. Students and teachers can also carry out learning easily and conducive to teaching in the classroom. And can make the next generation become creative and innovative in developing e-learning technology in learning. Competitions can also be followed at various levels because of mastering good skills regarding adaptive content creation to improve the quality of learning, this also makes students develop in thinking and ready to realize the desired learning objectives. High competitiveness to this technological advancement is also inevitable, they will also adapt to the development in this era easily. Learning techniques must also be considered in order to be able to achieve qualified goals. Learning methods must be in accordance with the needs of students, because they have different ways of learning, this must be considered for the effectiveness of students in order to achieve the targets that have been given. Cooperation between related parties is very influential for students and teachers carry out the learning process. The research method uses quantitative methods by distributing questionnaires about e-learning content development. From the distribution of the questionnaire it can be concluded that it is very important for a learning media to facilitate teaching and learning. One of them is by using this adaptive e-learning content to improve learning. Because the good effects obtained are real, such as more focus on students learning in class and not being bored and interested in learning in class. So that students become more curious about new things and develop their minds towards new things. They will be open to new environments and adapt easily. Students become more challenged with the tasks they get, especially those related to creative

content creation. Because they will compete to create content that can be learned by their friends and they will get a good assessment by the teacher.

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