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DEVELOPMENT OF MICROLEARNING OBJECT ON HIGH SCHOOL GEOMETRY MATERIALS

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Abstract: The implementation of this research has the aim of seeing of microlearning material for high school geometry material, to see the location of the microlearning object for high school geometry material. Media Microlearning Object developed using Podcast, Power Point, Poster and Google Form applications that are loaded on the Google site. This study uses the ADDIE development model (Analysis, Design, Develop, Implement, and Evaluate). This research was conducted at SMA Negeri 1 Stabat. The subjects in this study were students of class XI SMA Negeri 1 Stabat and the object of the research was microlearning objects on geometry material. The results of this study obtained a valid and effective object Microlearning product. Where in the aspect of the relevance of the material obtained an average of 3.51 which is included in the valid category and in the media aspect an average of 3.458 obtained which is included in the valid category. Furthermore, the teacher's response obtained an average of 4.1 and from the student response data obtained a value of 88.5%. This means that the learning media for microlearning objects in high school geometry material gets a positive response. and is said to be effective.

Keywords: Development, Microlearning Object, High School Geometry Materials.

INTRODUCTION

Today, technology is developing rapidly. This is in line with the need for technology in human life. Its development has penetrated all aspects of human life, for example in economic, political and cultural aspects. It is also inevitable in the aspect of education. Where thanks to technology, aspects of education have progressed very rapidly. With technology, the implementation of learning becomes more effective and efficient and the implementation of this education is not limited by space and time (Noriska, 2021). Furthermore, Kelly (2021) stated that there was an increase in the use of technology. The Changing Landscape of Online Education (CHLOE) 2021 Survey which is a survey institution in higher education in the United States which is carried out every year that discusses online learning in terms of structure and organization. The institute found that there had been very different changes in the use of technology in education in 2021 compared to 2019.

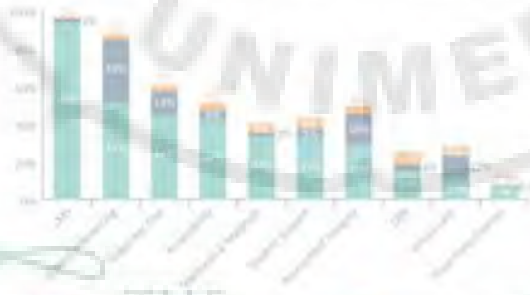


Figure 1. The use of technology in education Pre-2020, 2020 and 2021.

Source: "The Changing Landscape of Online Education, 2021" from Quality Matters and Eduventures Research

Along with technological developments in the education aspect, an innovation in learning has emerged whose implementation is carried out online or what is often referred to as E-learning. E-learning is a learning system that utilizes technology. Submission of subject matter is done digitally, synchronous communication (online communication that occurs directly using media such as video calls or chat) and asynchronous communication (online communication that occurs on a delayed basis using media such as e-mail) between students and teachers as well as between

students. with one another and some elements of e-learning (Agustini, 2021). One of the processes that need to be considered in the implementation of e-learning is the processing of subject matter. The subject matter in e-learning is packaged by utilizing technology, namely applications that support the learning process. Presentation of subject matter is packaged in various formats that are more attractive and dynamic so as to motivate students further in the learning process. In the implementation of e-learning, a strategy is needed to develop the content of the subject matter.

In the odd semester 2021/2022 academic year, the SMA N 1 Stabat school is carrying out limited learning. Where students who attend class are half of the total number of students in one class. Students are divided into two waves every day, morning and afternoon. Even though they have carried out face-to-face learning, the number of lesson hours has not matched the actual lesson hours as before the Covid-19 pandemic. Of course, this also has its problems. With a relatively short face-to-face time, learning materials cannot be delivered thoroughly.

The results of an interview with one of the teachers at SMA N 1 Stabat Mrs. Ervi Susanti, S.Pd, found several facts related to the implementation of this limited face-to-face learning. According to Ervi, in this limited face-to-face learning, it is difficult to complete the learning objectives as a whole, many of the subject matter delivered is only partially, not in depth. This results in students not understanding the material presented. In addition, there are not many material content that the teacher has developed, if there are only presentation slides using Power Point or taking videos from YouTube only. Of course this is very unfortunate. With the material developed digitally, it will be able to assist teachers in delivering subject matter that has not been conveyed during class hours at school. And based on the evaluation after the implementation of learning, many students get scores below the KKM. Teachers also get information obtained from students about how students learn outside the classroom. According to him, students are very difficult and reluctant to repeat their lessons at home. This adds to the severity of students' mastery in understanding the lessons given by the teacher.

Based on the explanation above, further discussion is needed to overcome the problems that occur. In particular, to overcome the problem of the lack of face-to-face time in schools and the lack of subject matter content in digital form. So for that we need a teacher's effort so that all subject matter can be delivered to students to the maximum. One way is to create an e-learning. E-learning can maximize the learning process. Because in e-learning will be provided all the subject matter that students must learn. Where the content of the subject matter can be studied by students anywhere and anytime. Frisnoiry (2020) revealed that students' motivation and learning outcomes can be improved through the use of e-learning in learning. Siregar (2020) also revealed that WEB-based E-Learning is very effective in supporting learning from home.

Next is to develop the content of the subject matter in digital form. One of the elements of e-learning is material in digital form. The subject matter content is packaged in digital form, is interesting and can be remembered or understood thoroughly by students. So that students can increase their study hours independently at home by listening to the content of subject matter digitally. One technique for compiling the content of the subject matter is the chunking technique, which is making the material into small parts. The technique of sorting material with chunking is by changing the subject matter into small pieces of teaching material, hereinafter referred to as microlearning.

Microlearning help students to learn a material with a relatively shorter duration. The available content is smaller and more focused, so the amount of information needed is just right to help students achieve learning goals. Microlearning which can provide various formats according to e-learning needs. Susilana et.al (2020) explained that there are various types of media formats that can be used in Microlearning including explainer videos, animated videos, infographics, PDFs, e-books and flipbooks, kinetic text-based animation, interactive videos, interactive parallax-based scrolling, webcasts or podcasts, expert videos or webinars or recorded webinars, mobile apps, and finally complex branching scenarios. Each microlearning media format has its own characteristics and it is necessary to make adjustments between the media format and the content that will be delivered to students. Not all materials can be presented by all types of microlearning media formats, it is necessary for the teacher's ability to be able to analyze the types of material that are suitable to be delivered with microlearning media formats.

Where with microlearning can help teachers and students complete subject matter that cannot be conveyed when face to face in class. Solid materials will later be separated into microlearning objects, so that complex and large amounts of material can be more easily understood by students. In addition, students can also study independently and can access material anywhere and anytime. Microlearning requires a good design so that the learning process in schools is able to motivate and attract students to learn actively.

This has been proven through research conducted by Noriksa (2021) which revealed that the microlearning developed in his research can facilitate students in learning the lecture material they are taught. In addition, Ariantini (2019) also revealed from the results of his research that the use of microlearning-based learning animations is effective in improving student learning outcomes.

The problems revealed from the explanation above are very complex. Where the teacher has not delivered the maximum material, at least the material content that can help the learning process and the lack of student interest in learning independently. Of course, this should not be allowed to drag on. Therefore, researchers will conduct research to overcome these problems by innovating microlearning development of high school geometry material objects. Where the focus of this research relates to the process of compiling, creating and validating objects from microlearning. Next, look at the feasibility and attractiveness of microlearning objects in high school geometry material by looking at how students respond.

METHODS

Researchers use the development method developed by Reiser and Mollenda or usually known as the ADDIE model which stands for Analysis, Design, Develop, Implement and Evaluate. In line with the name given to this model, the steps for development activities are adjusted to the abbreviation of ADDIE itself, which starts from Analysis, continues with Design, then Develops, then Implements and finally Evaluate. The research was carried out at selected schools which would be carried out at SMA Negeri 1 Stabat. The subjects in this study were students of Class XI SMA Negeri 1 Stabat. While the object of this research is the object of microlearning on the material of geometry.

Researchers in conducting this research through carefully planned stages. This planning is intended to minimize procedural errors and anticipate errors in conducting research. as conveyed by Putrianingsing (2021) planning holds a very important position because with the implementation reference then it is possible to make a plan realized properly.

The stages of the process of implementing this research begin with the analysis stage, where the researcher conducts a preliminary study at the school where the research is conducted, then analyzes the findings. After knowing the needs of the school, the researcher proceeds to the Design stage. At this stage the researcher makes a design to overcome the problems that have been found previously. After being designed, the researcher develops all the designs that have been designed. After everything has been developed or made according to the design, the resulting product can be tested in the field. At this stage, validation of media experts and material experts is also carried out. trials were conducted on teachers and students. and in the final stage, researchers evaluate the overall implementation of the research. here the researchers conducted interviews, observations and field surveys. where the results will be input in improving the product being developed.

In obtaining research data, an instrument is needed. The instruments used in this study are as follows:

- Material Expert Validation Sheet
- Media Expert Validation Sheet
- Teacher Response Questionnaire
- Student Response Questionnaire

FINDING AND DISCUSSION

Finding

This research was conducted using research procedures adapted from the ADDIE Model development method, namely Analysis, followed by Design, Develop, Implement, and finally Evaluate. The

results of the research that have been carried out according to the procedure are described in the following explanation.

- **Analysis**

This analysis phase is the phase where the researcher finds out the needs of the school where the research is carried out and is carried out in a different way making observations at SMA Negeri 1 Stabat. With the results of this analysis, researchers have a benchmark in developing Microlearning Object-Based Geometry material. The results of observations made by researchers in class XI, which in the learning process is still difficult to complete the learning objectives as a whole, many of the subject matter delivered is only partially, not in depth. This results in students not understanding the material presented. In addition, there are not many material content that the teacher has developed, in addition, the curriculum applied at SMA Negeri 1 Stabat uses the 2013 Curriculum (K13). This curriculum asks teachers to incorporate technology in classroom learning. This is what makes researchers think to develop new and more interactive learning media and attract students' interest and curiosity about the learning material being taught.

- **Design**

The planning stage is a follow-up to the analysis stage. In the design process of the Microlearning Object, a design sketch is needed to help make learning media. The sketch is poured in a storyboard and flowchart. The Microlearning Object in the Geometry material developed by the researcher contains a frame consisting of a home page frame, a guide frame, a competency frame and a material frame. Where all the developed Microlearning Object media are put together in a Google Sites.

- a. *Flow chart*

Here is a flowchart of Microlearning Object on Geometry material:

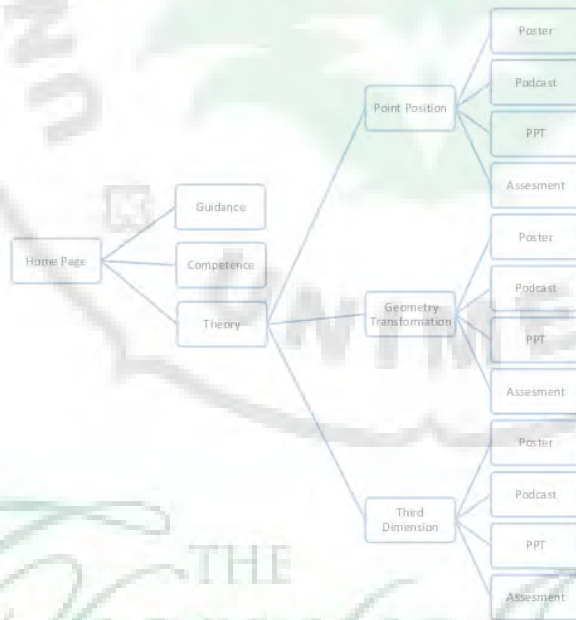


Figure 2. Microlearning Object Site Flowchart Design

- b. *Storyboard*

Based on the flowchart above, the story board can be described as follows:

- 1) Homepage Frames

The initial page frame contains the Site Title, subject description, and student attendance which can be filled directly on the Home page.

2) Hint Frames

This frame contains instructional instructions that will be carried out using Microlearning Objects on Geometry material.

3) Competency Frame

This frame explains what is meant by geometry that will be studied and the description of the content of the geometry material.

4) Material Frames

This frame contains Geometry material which is divided into three namely point positions, geometric transformations and three dimensions. These three sub-materials are displayed in several micro applications, namely in the form of posters, podcasts, PPT and assessments.

DEVELOPMENT

1 In this development stage, several things were carried out, including the following:

a. Making Learning Media **24**

The Microlearning Object-based Geometry material that has been designed and produced prototype I is then made and developed using several applications and converted into the form of posters, podcasts, PPT and online assessments.

b. Product Eligibility Validation **1**

After the Microlearning Object-based Geometry Material has been created, product feasibility validation is carried out. The validation of this learning media is carried out by expert validators and asks for theoretical and practical considerations. Expert validators consist of media expert validators and material experts. The material experts in the process of validating the **21** Microlearning Object media are 2 experts. The validation carried out by material experts is related to the relevance aspect of the material. The implementation of validation by the material **6**eld validator assesses the feasibility and writes inputs and suggestions that function in revising the media. For the results of the validation of the two material validators as follows:

13 Table 1. Material Expert Validation Results

Aspect	Validator Assessment Results		Amount
	1	2	
Content Eligibility	16	17	16.5
Presentation	22	21	21.5
Average	3.6	3.5	3.5

Based on the table above, it can be concluded that the aspect of the relevance of the material get a value of 3.5 which means that it is included in the valid group. Therefore, for all the material on the microlearning object in the high school geometry material that the researcher has developed, it is said to be tested. There are several inputs from the material field validator, namely so that the material or content contained in each application is not too dense so that it seems rushed, so that students can listen and interpret the display well.

The media expert in the validation of microlearning objects on the high school geometry material that has been developed consists of 2 experts. The validation carried out is related to the media display aspect. the implementation of Validation to the media validator measures the feasibility of the media and also the validator provides input as material in improving the m **5**ia to be more feasible. The measurements provided by the media validator are summarized in the following table.

Table 2. Product validation results are seen from the media aspect

Rated aspect	Validator Assessment Results		Average
	I	II	
Media Compatibility	7	8	7.5
The effectiveness of the media used	7	6	6.5
Media Quality	18	17	17.5

Average 10 3.5 3.4 3.45

Based on the table above, the researchers found that the media aspect obtained a value of 3.45 which was included in the valid group. this initializes that the microlearning object media on high school geometry material is feasible to be tested. In addition to numerical assessment, the validator also provides an assessment through inputs that need to be done so that the media is better. suggestions include, so that the appearance of existing objects is more attractive which allows attracting students' interest in learning to use microlearning objects.

IMPLEMENTATION

The implementation stage is carried out to continue the development stage, namely implementing the media that have been created and validated on students who are in the school where the research is located. Microlearning objects in high school geometry material that have been developed are given to students in classroom learning. Researchers tested the media to teachers and students to see how they responded to this Microlearning media. it also tests how the level of effectiveness of the media in learning. The test was conducted on 1 subject teacher and 41 students from SMA Negeri 1 Stabat. Because this test requires a mobile device, the researchers previously coordinated with the teacher that students were allowed to use cellphones when conducting trials in learning.

Before carrying out the experiment, students listen to instructions regarding the microlearning object media in this high school geometry material. Furthermore, at the time of implementation, students are given the freedom to explore sites that contain microlearning objects on high school geometry material. Students are independently given the freedom to know the contents of the site that has been built. The reason for doing this activity is to expect students to be enthusiastic when studying microlearning objects. when the teacher and students have carried out learning using microlearning objects, then this implementation ends with the provision of a questionnaire on the last day of the trial given a questionnaire to the teacher and students by the developer. The aim is to see how far the response of teachers and students after utilizing microlearning objects on high school geometry material that has been developed.

Table 3. Teacher Response Results

	Q ₁	Q ₂	Q ₃	Q ₄	Q ₅	Q ₆	Q ₇	Q ₈	Q ₉	Q ₁₀	Average
Teacher's Response	5	4	4	4	4	4	4	4	4	4	4.1

Table 4. Student Response Results

	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈	R ₉	R ₁₀	Average
Res ponse	97.6%	80.5%	100%	85.4%	80.5%	90.1%	92.7%	90.1%	80.5%	87.8%	88.5%
Note:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

The table above shows that learning media using microlearning objects in high school geometry material if viewed from the teacher's response has an average of 4.1 and if viewed from student response data the average response of learning activities with microlearning objects on geometry material SMA has a score of 88,5%. The high results of good assessments by students indicate that the microlearning object learning media in high school geometry material can be said to be effective.

EVALUATION

The final stage of the ADDIE model is the evaluation stage. which discusses and evaluates all activities that have been carried out previously. The conclusions obtained at this final stage include input from validators, teachers and students regarding microlearning objects, so that the final microlearning media is created that can be used in Geometry learning in high school.

DISCUSSION

The final product of this research is Microlearning Object media on high school geometry material. The developed media is based on Microlearning. Where microlearning is a learning method carried

out by teachers in a shorter way. If interpreted simply, microlearning is a learning method for the short term. Rafli (2022) Microlearning is part of the E-Learning method that presents material briefly and focuses on the core material. This way is an ideal way to find answers quickly to specific questions with the guide content in the form of media that have been prepared to add to the appeal. But actually, there is no standard definition for this microlearning. However, many agree that microlearning is a short learning method.

This is reinforced by the opinion of Mohammed (2018), et.al which asserts: "Discipline in learning is the key to success in learning. Microlearning makes the material in a lesson easier to remember for a long time and to understand." The statement above confirms that the requirement for successful learning is to carry out organized learning activities. With organized micro learning, it can make it easier to understand the subject matter and easy to remember for a longer time.

In this study, the material raised is Geometry. Where Geometry is the study of the relationship between geometric objects, such as points, lines, shapes, and angles. Naturally, through this Microlearning can really help teachers in explaining in detail and can show directly the Geometry material with various types of applications. This Microlearning Object was developed with several applications that were poured into Podcasts, Power Point, Posters and Google Forms.

The implementation of this research begins with analyzing the school's needs in learning mathematics. After going through the analysis, it is known that learning Mathematics in Geometry material has not been effective. The class teacher explained that the students were not interested in seeing the shapes in the textbook because they were not very interesting. Therefore, Microlearning was chosen to solve this problem. Because based on many studies, it is stated that Microlearning is able to make all learning more effective in general. This is expressed by Shatte (2020): "Overall, the application of microlearning to higher education has demonstrated a range of benefits for both objective and subjective student outcomes."

Furthermore, it is emphasized by Dolansikski (2020): "Microlearning is a method that focuses on concepts, using multisensory and multimodality in a short period of time." With this explanation makes us more confident that Microlearning can make learning more focused. This has become a steady researcher in choosing to float the Microlearning Object media. Then the media is designed and developed and goes through the validation stages to media experts and material expert. The results show from media expert is 3.45 and the material expert is 3.5 which shows both are in the valid category. This means that the media can be used for testing. After the trial, a response questionnaire was given to the teacher and students. The result in the teacher's response questionnaire found an average value of 4, 1 and when viewed from the student response data, the average value of student responses was 88.5%. This means that the two groups of respondents gave a positive response. This proves that the microlearning object learning media in high school geometry material can be said to be effective.

The use of technology has been widely carried out by all humans in this world. Likewise in the world of education. Since the Covid-19 outbreak, technology has greatly helped the process of implementing distance learning. There are also many applications that can support the implementation of distance learning. And many researchers have researched the usefulness of technology-based media in the world of education. As research conducted by Frisnoiry (2022), found that the development of electronic books was very helpful in increasing digital literacy in students. The results of his research also received a positive response from teachers and students for the use of electronic books in learning Mathematics.

Microlearning itself is a product of technology. Where microlearning is an educational teaching method used to train users on various platforms. And this microlearning itself has been widely used in various fields. Education is one thing that is certain. Shail (2019) in his Research states that by dividing the material into smaller and shorter parts, it allows students to focus more on one part of the material at a time. This means that in this way it is possible for teachers to be able to formulate micro learning intuitively and can guide students towards certain learning goals.

From the discussion above, conclusions can be drawn regarding current learning where information and communication technology should be utilized for the development of information and communication technology-based teaching materials. One of the forms is by developing microlearning teaching materials. Because Microlearning itself is the result of the existence of technology. And Microlearning itself can be widely used or can be developed based on various

situations of its use. But what needs to be remembered is that the selection of media must also be based on the suitability of the material to be delivered. This is in line with what was conveyed by Wati (2020) that teachers must be able to sort out the learning media that will be used in delivering material with material and also in accordance with the conditions of students.

CONCLUSIONS

Based on the research results of Microlearning Development of Geometry Material Objects for SMA, it can be concluded that the process of developing Microlearning Objects for High School Geometry using the ADDIE development model is carried out in 5 stages Analysis-Design-Development-Implementation-Evaluation. In the analysis phase, the researcher made observations at SMA Negeri 1 Stabat by conducting interviews with the Mathematics teacher and students in the class. Furthermore, in the design stage, researchers began to design and create interactive learning media by considering the results of these observations. The next stage is the development stage,

Suggestions that can be considered as outcomes of Microlearning research and development Geometry Material Objects for SMA, namely Microlearning Objects for High School Geometry are worthy of consideration as a source of independent learning that can be used in the learning process in the classroom as well as for learning at home as well as the creation and development of Microlearning-based learning media. Objects need to be mastered by subject teachers, so that teachers can create their own learning media, which are in accordance with the needs and characteristics of students.

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