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Development of Adobe Flash Learning Media Based on Metacognitive Ability as a Learning Innovation during the Covid-19 Pandemic

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Abstract

This study aims to develop adobe flash learning media based on metacognitive abilities. The research method used is research and development (R&D) with the ADDIE model, which consists of 5 stages: Analysis, Design, Development, Implementation, and Evaluation. This research was conducted at SMA Negeri 1 Bantarkalong in the odd semester of the 2021/2022 academic year. Limited trials were carried out on five students of class XII MIPA 1, and field tests were carried out on class XII MIPA 2, which amounted to 21 people. The validation results of material and media experts stated that the adobe flash learning media based on metacognitive abilities was valid and could be used with some improvements. Based on the questionnaire responses, the limited trial students scored 191 in the "Good" category. At the same time, the results of the teacher's response questionnaire got a score of 132 in the "Very Good" class. Then the teaching activity observation sheet results obtained a teaching implementation score of 94% with the "Very Good" category. In addition, the results of the questionnaire responses from field test students scored 866 in the "Very Good" category.

Keywords: Learning Media**,** Adobe flash, Metacognitive Ability

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INTRODUCTION

The COVID-19 pandemic has brought significant changes, especially in the education sector. Extensive closure of schools, madrasas, universities, and cottages Pesantren is one of the impacts (Setiawan, 2020). Butin the academic year 2021/2022, based on the Joint Decree (SKB) of 4 Ministers NUMBER 03/KB/2021, NUMBER 384 the YEAR 2021, NUMBER HK.01.08/MENKES/4242/2021, and NUMBER 440-717 the YEAR 2021 concerning Guidelines for Organizing Learning During the Covid-19 Pandemic, some of them stated that boarding schools and madrasas could open dormitories and conduct limited face-to-face learning in academic units in stages with the provisions of a transition period of 50% for the first month and 100% for the second month, then the new habit period will be 100%. (Mendikbud, Minister of Religion, Health, and Home Affairs, 2021).

With this decision, teachers must be more creative and innovative in using various learning media to attract students' interest, even though learning takes place in a transitional period and a period of new habits. One of the learning media that can create exciting and innovative learning is interactive multimedia (Manurung, 2020). Making interactive learning media has great potential to support implementing good education and achieving learning objectives (Afif, 2021).

Judging the Graduate Competency Standards (SKL) contained in Permendikbud No. 20 of 2016 requires students to have factual, conceptual, procedural, and metacognitive

knowledge. Although the aspect of metacognitive abilities is relatively new, the teacher must bring up these abilities in every lesson (Lestari, Selvia, & Layliyyah, 2019). According to Flavell, namely the ability of students to have an awareness of the learning process, assess the difficulty of a problem, observe their level of understanding, use the information to achieve goals, and the ability to assess their learning progress (Lidia, Sarwi, & Nugroho, 2018). In reality, metacognitive abilities get less attention in the learning process, even though they have an essential role in solving learning problems (Nurhayati, Ratnaningsih, & Ni'mah, 2022).

This also happened at SMA Negeri 1 Bantarkalong, which was used as a place of research. Based on interviews and filling out the checklist for implementing metacognitive abilities in the classroom on 29 and 31 March 2021, it is known that mathematics teachers are still confused when asked about metacognitive abilities. But based on the results filling out the checklist for implementing metacognitive abilities in the classroom, most of the indicators of metacognitive ability have been implemented. However, there are still some indicators that have not been implemented. This is by Purwanto, Zaturahmi, Hasibuan (2020), who stated that, in general, teachers have not heard the term metacognitive before, so they do not know the meaning of metacognitive and have not maximally implemented the metacognitive strategy.

Then most of the students have difficulty when working on metacognitive ability questions. Most participants could not solve the problem because they did not understand the concept of completion and misunderstood the problem. The aspect of planning on the metacognitive ability of learners is not optimal; learners characterize this have not been able to understand the concept of material optimally, understand the meaning of the question, and have not been able to formulate a solution strategy by the expectations of the question (Ni'mah & Masduki, 2017).

The description above shows that in learning mathematics, metacognitive abilities get less attention. By Yanti's statement (Amir & Kusuma, 2018) the metacognitive aspect received less attention from teachers, and current learning tends to judge the result, not the learning process. Therefore, it is necessary to develop learning media in interactive multimedia that can attract students' interest and develop metacognitive abilities in the learning process.

In the learning process, the use of interactive learning media with the Adobe Flash CS6 application can increase students' learning motivation (Heryadi, Darmawan, & Hernawan, 2017). Besides thatAdobe Flash CS6 can improve students' metacognitive abilities (Pratiwi & Ngasifudin, 2020). Therefore, Adobe Flash is considered suitable for media development learning that can attract students' interest and develop metacognitive abilities in the learning process. Several researchers, in response: to Saputra & Permata (2018) and Setiyani, Putri & Prakarsa (2019), have developed efforts to develop learning media. However, the results of this study still have shortcomings, namely the development of learning media in the form of CDs so that they have not been identified directly on smartphones (Sakinah & Hendriana, 2020). In response, researchers developed learning media that can be accessed on smartphones. So that students can access the learning media anywhere and anytime.

Several previous studies have examined the development of learning media using Adobe Flash. Pratiwi & Ngasifudin (2020) researched the development of social media learning media based on Adobe Flash CS6 to improve metacognition. Furthermore, research on the Development of Adobe Flash-Based Learning Media in 3D Geometry Competence was conducted by Zesra (2020). In addition, research conducted by Nora, Luthfi (2022) that developed the Hy-Quiz learning media using Adobe Flash CS6 and converted to android using Adobe Animate CC 2019. The research found that the Hy-Quiz learning media was suitable as a learning medium for hydrocarbon derivative sub-materials. nomenclature because the Hy-Quiz learning media has met the aspects of validity, practicality, and effectiveness. In addition, the Hy-Quiz learning media can assist students in learning the

nomenclature of sub-materials derived from hydrocarbons and can increase student motivation and student learning outcomes. Then Ariska, Darmadi, & Murtafi'ah (2018) conducted research on the development of learning media using a metacognition-based adobe flash program to increase learning motivation. However, no research has been found on the development of metacognitive-based learning media that can be accessed on smartphones. So that researchers think it is necessary to do research with the aim of developing adobe flash learning media based on metacognitive abilities.

METHOD

This research is research and development or R&D (Research & Development). Media development in this study uses the ADDIE research model developed by Branch.This research was conducted in class XII MIPA SMA Negeri 1 Bantarkalong, Tasikmalaya Regency from June to November 2021. Class XII MIPA students at SMA Negeri 1 Bantarkalongin the odd semester of the 2021/2022 school year consisting of classes XII MIPA 1 and XII MIPA 2. The class was chosen to be used as a research resource in a limited trial and field test. The technique of selecting the data source of this research was purposive consideration of having good communication, and most of them have smartphones that meet the specifications in operating the developed learning media.

The instruments in this study were material and media expert validation sheets, teaching activity observation sheets, and student and teacher response questionnaires. The validation sheet in this study was made with the aim of knowing the expert's assessment of the learning media that has been developed both from the feasibility of content, language, presentation of material, appearance, and content in it. These experts consist of material and media experts; material experts consist of two experts, namely Mathematics Lecturers and Mathematics Teachers. Meanwhile, media experts consist of two experts, namely Lecturers of Information and Communication Engineering (ICT) and Teachers of Information and Communication Engineering (ICT).

This observation sheet is filled out by the mathematics teacher who teaches in the classroom, which is the source of research data in the field test. The teaching activity observation sheet was filled out to control the researcher's ability to manage to learn. Then a student and teacher response questionnaire was made to find out the response of students and teachers to adobe flash learning media based on metacognitive abilities.

This research procedure uses the ADDIE development model from Branch (2009), which consists of 5 stages: Analysis, Design, Development, Implementation, and Evaluation. The development procedure of "Adobe Flash Learning Media Based on Metacognitive Ability" includes the following stages:

Analysis

The first stage is the Analysis stage. The stages carried out in this stage are validating performance gaps, determining learning competencies, identifying target characteristics, identifying required resources, and determining learning delivery systems. The things done at this stage are teacher analysis, syllabus analysis, learning resource analysis, and analysis of student needs.

Design

This stage is carried out to verify the expected performance and select an appropriate assessment method. In this stage, produce a storyboard of the product design. Researchers determine media elements by collecting supporting materials such as images, animations, and sounds.

Development

This stage aims to develop and facilitate learning resources. At this stage, the product design is designed using Adobe Flash Professional CS6 and other supporting applications. The elements that have been collected in the design stage are assembled into a whole unified

product according to the storyboard made in the design stage. Media experts and material experts will assess the finished media before being implemented or tested on users.

Implementation

This stage aims to prepare a learning environment and involve students. The stages in this stage are preparing teachers and students. At this stage, a limited trial was conducted. This stage can be carried out if the results of the media and material expert tests have been declared valid and suitable for use. At this stage, the learning media developed was tested on a small scale to determine the level of readability. After the media was implemented, student and teacher response questionnaires were distributed to find the responses and things that needed to be revised from the developed media.

Evaluation

This stage aims to assess the quality of the process and learning outcomes before and after the implementation of activities. The stages in this stage are determining the assessment criteria, selecting evaluation tools, and carrying out evaluations. At this stage, product implementation is carried out on a larger scale outside the limited trial class.

At this stage, during the learning process, the teacher who teaches in the class fills out the observation sheet on teaching activities to control the researcher's ability to manage to learn. After the learning process, students complete a response questionnaire to the learning media. Comments and suggestions from users at this stage can be considered for product revision to improve the product.

Data Analysis Techniques

Describe the validation sheet of material experts and media experts.

This description was conducted to determine the feasibility of the developed learning media. Material experts provide an assessment of construct validity and content validity, while media experts assess face validity. Construct validity consists of 3 aspects that contain six assessment indicators. Content validity consists of 2 aspects that contain ten assessment indicators. Face validity consists of 3 aspects that contain 12 assessment indicators. Comments and suggestions are used as the basis for revising the learning media until this learning media is declared suitable for use in the learning process.

Counting the results of the questionnaire responses of students and teachers to learning media.

Using a Likert scale, analyze student and teacher responses to adobe flash learning media based on metacognitive abilities. This Likert scale consists of a scale of 4, with respondents' answers in the form of a choice of 4 alternatives, namely 1 (Strongly Disagree), 2 (Disagree), 3 (Agree), and 4 (Strongly Agree). Next, to find out the response of students and teachers to adobe flash learning media based on metacognitive abilities, calculations are carried out, which are then categorized and presented in Table 1, which is adapted from (Nurhayati & Lestari, 2020)as follows:

Table 1. Categories of Student and Teacher Responses to Adobe Flash Learning Media Based on Metacognitive Ability

Total Score (ST)	Interpretation
$S_{min} \leq ST < S_{min} + p$	Not good
$S_{min} + p \leq ST < S_{min} + 2p$	Pretty good
$S_{min} + 2p \leq ST < S_{min} + 3p$	Well
$S_{min} + 3p \leq ST < S_{maks}$	Very good

Describe the observation sheet of teaching activities.

This description is done to control the ability of researchers to manage to learn. This observation sheet consists of 3 aspects, namely the preparation aspect, which contains five questions; the material mastery aspect contains four questions, and the classroom

management aspect contains four questions. This observation sheet uses a Likert scale consisting of4 rating scales, namely1 (Poor), 2 (Enough), 3 (Good), and 4 (Very Good). Next, observation sheet calculations were carried out to find out the category of teaching activity, which were then categorized based on the categorization adopted from Arikunto (Khatimah, Utami, & Mursali,2018) and presented in Table 2 as follows.

Table 2. Categories of Teaching Activities

Learning Implementation %	Category
76% – 100%	Very good
56% – 75%	Well
40% – 55%	Pretty good
20% – 39%	Not good
0% – 20%	Very Not Good

RESULTS AND DISCUSSION

Research and development of learning media that has been carried out based on the development stage using the ADDIE model is described as follows:

Analysis

This stage is carried out to collect information as a consideration in making adobe flash learning media based on metacognitive abilities. The analysis at this stage consists of teacher analysis, syllabus analysis, learning resource analysis, and student needs. The following is the research data at this stage as follows:

Teacher Analysis

From the results of questionnaire data and interviews with three mathematics teachers at SMA Negeri 1 Bantarkalong, which was held on June 23, 2021, the following results were obtained:

Most teachers use the lecture learning method online, but some use discussion and presentation learning methods. The learning media used are textbooks/LKS, power points, and learning videos. However, the media was deemed not enough to support the learning process. Teachers find it difficult to use/use learning media during online learning. Especially on geometric materials that require high visualization. This is by Nurhayati & Lestari (2020), who states that one of the Abstract material is geometry, so it requires relatively high visualization.

In addition, students do not play an active role, have obstacles when the learning process is carried out online, and find it difficult to solve math problems. In the problem-solving steps, specific metacognitive skills contribute to and can help students solve problems (Khery, Subandi, & Ibnu, 2013). Therefore metacognitive skills are needed to solve problems.

The suggestions from the mathematics teachers at SMA Negeri 1 Bantarkalong are learning media that attract students' interest so that students can play an active role in learning. Then the media created is also expected to be a learning media that can support online learning. In addition, the media created should not have too many animations that can distract students from understanding the learning material.

Syllabus Analysis

Based on the teacher's analysis that has been done previously, the teacher finds it challenging to utilize/use learning media during online learning. Especially on geometric materials that require high visualization. Therefore, the material chosen in this media is geometry with the subject of distance in the shape of space. Competencies consist of core competence 3 (knowledge) and core competence 4 (skills). Then the essential competencies in this study consistessentialasic competencies 3.1 and 4.1. Basic competence 3.1 describes the distance in space (between points, point to line, and point to plane). While basic

competence 4.1 is determining the distance in space (between points, point to line, and point to plane).

Analysis of Learning Resources

The learning resources used at SMA Negeri 1 Bantarkalong for learning mathematics in class XII are LKS. Where in the presentation, it feels less attractive; this is because the illustration/image display is black and white. Meanwhile, in the distance material in the spatial structure, media is needed to visualize something abstract to be more concrete to make it easier for students to understand the learning material. In addition, the material explained in the LKS is still considered minimal; there are more examples of questions and practice questions than the material described. In addition, there is no metacognitive ability in LKS, even though metacognitive ability plays a vital role in the learning process.

Analysis of Student Needs

Based on the student needs questionnaire, distributed on July 17, 2022, to class XII students, which consisted of 21 students of XII IPA 1 and 20 of XII IPA 2's. This distribution is done online through Google Forms because students are still going through a transition period of 50% face-to-face and 50% online. The results obtained are as follows:

About 97.6% of students have smartphones and often use them at home for browsing and studying/opening e-books. As many as 63.4% of students think that the explanation given by the teacher is not enough to make students understand the material in mathematics learning when online learning takes place. Most of the students started the process of learning mathematics using multimedia would be exciting and fun learning. This makes 78% of students agree to use multimedia in the learning process, which in this study is a metacognitive-based adobe flash learning media with geometry material.

Based on the description above, it can be concluded that the learning media used is still unsuitable because it cannot facilitate teachers to carry out learning activities optimally. Then the learning media users tend to be monotonous, so it cannot attract students' interest in the mathematics learning process. In addition, the learning media used did not involve metacognitive abilities.

So it takes learning media that can visualize something abstract to be more concrete, attract students' interest, and improve metacognitive abilities. The learning media can be made using Adobe Flash. Therefore, it is necessary to develop a metacognitive-based adobe flash learning media with geometry material, mainly regarding distance in space.

Design

This stage is carried out to verify the expected performance and select an appropriate assessment method. In this stage, it produces a storyboard from product design and collects supporting materials such as pictures, animations, and voiceovers. The stages are described as follows:

Storyboard

Storyboard contains a **collection of sketches** arranged sequentially according to metacognitive-based adobe flash learning media with the subject of distance in spatial shapes. In this learning media, when clicked, the initial display or start page will appear. Then, when the start button is clicked, a loading animation will appear, and the main menu will be displayed when the animation is complete. The main elements in this media are KI & KD, Materials, Sample Questions, Practice Questions, Instructions, Profiles, and Exit.

Collection of Supporting Materials

Researchers determine media elements by collecting supporting materials such as images, animations, music, and sounds. In this study, images and music were downloaded from the internet. Most animations are made by experts in Information Technology (IT), while researchers make others. This happens because researchers still don't understand the Adobe Flash application, so they need help from IT experts. Then the voice filling is carried

out by researchers, from recording and editing to inputting into learning media.

Development

This stage aims to develop and facilitate learning resources. At this stage, the product design is designed using Adobe Flash Professional CS6 and other supporting applications. The elements that have been collected in the design stage are assembled into a whole unified product according to the storyboard made in the design stage. The applications used in addition to Adobe Flash Professional CS6 are MS Word 2013, PowerPoint 2013, Canva, and Audacity.

Ms. Word 2013 is used to input some symbols because Adobe Flash Professional CS6 does not provide the equation menu needed in this media. In addition, Ms. Word 2013 was also used to design some of the navigation buttons. Then PowerPoint 2013 was used to create several articles such as titles, materials, sub materials, and others. At the same time, Canva is used to design the background. Then audacity is used to record and edit sound.

The type of media created is only limited to media in the form of exe and SWF files. The exe file can only be used on a PC/Laptop. Meanwhile, the SWF file can be used on mobile phones, provided the new flash game player is installed first. Flash game player new is an application that functions to open SWF files and has a relatively small size (Nurhayati & Lestari, 2020).

When the media development process took place, the files were corrupt and could not be opened, so the researcher had to repeat several lost steps on the media because they did not have a backup file. This is what was expressed (Zakiah, Suciati, & Wicaksono, 2020). Hardware and software can be damaged in various ways. Virtual file damage such as errors or corruption can occur even if physical damage does not occur. According to Momintan &Charisma (2013), to anticipate the occurrence of this, we can develop backup multimedia application files using CD/DVD storage media, save them to a USB flash disk that is explicitly provided for this multimedia application storage, or it can also use web-based storage media that are available for free such as Google Drive, Microsoft One Drive, Mediafire, and Dropbox.

When using this media, the initial screen or start page appears in Figure 1.

Figure 1. Home Screen or Start Page

Then when the start button is clicked, a loading animation will appear. When the animation is complete, the main menu will be displayed in Figure 2.MenuThe main elements in this media are KI & KD, Materials, Sample Questions, Practice Questions, Instructions, Profiles, and Exit. But the exit button only works on PC/Laptop. Meanwhile, this can be done on smartphones by clicking the back button from the default smartphone and clicking cancel on the flash game player application; new learning media is already out.

Figure 2. Loading Animation Display and Main Menu

The KI & KD menu contains writings in the form of descriptions of essential competencies and animated teacher displays which will later convey core and basic competencies through voice. In this case, the core competencies were not written down because they were considered too long, so they were only conveyed by voice (Figure 3).

Figure 3. Display of KI & KD Menu Menu

Furthermore, the material menu contains sub-materials, namely Distance Between Points, Distance From Point To Line, and Distance From Point To Field, which can be selected by clicking. Then a written description of the material will appear with pictures/illustrations, animations, and sounds according to the selected sub-material (Figure 4).

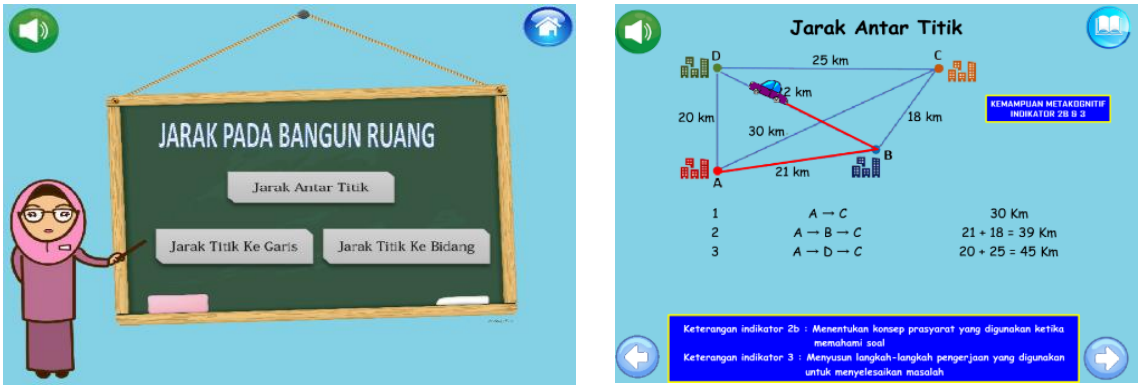

Figure 4. Material Menu Display

The sample question menu contains three sub-materials choices: Distance Between Points, Distance From Point To Line, and Distance From Point To Field, which can be selected by clicking. Then there are examples of questions and their solutions accompanied by pictures/illustrations, animations, and sounds according to the clicked sub-material (Figure 5).

Figure 5. Sample Question Menu Display

Furthermore, the practice question menu contains three sub-materials choices: Distance Between Points, Distance From Point To Line, and Distance From Point To Field, which can be selected by clicking the send answer button. When one of the sub-material buttons is clicked, a practice question will appear according to the choice of the selected sub-material (Figure 6).

Figure 6. Display of Practice Questions Menu

In addition, on the practice questions menu, there is a submit answer button which, when clicked, will connect to the google form link for collecting answers to the exercises that have been done (Figure 7).

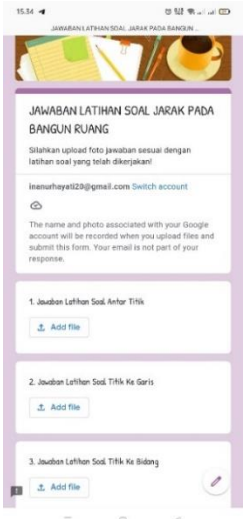

Figure 7. The Display That Appears When the Submit Answer Button is Clicked

Then the instructions menu contains a table in the form of an image of a button icon and a description of the button's function (Figure 8). At the same time, the profile menu contains the profile of the media maker (Figure 9).

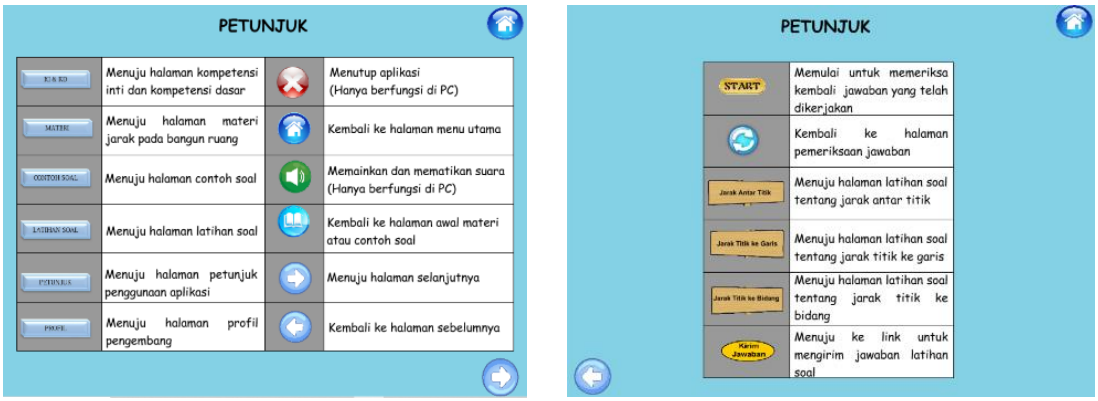

Figure 8. Hint Menu Display

Figure 9. Profile Menu Display

Media experts and material experts assess the finished media before being implemented/tested on users. The expert test was carried out by two material experts: a Mathematics Lecturer and a Mathematics Teacher. As for media experts, it is carried out by two experts, namely Lecturers of Information and Communication Engineering (ICT) and Teachers of Information and Communication Engineering (ICT).

Media expert validation was carried out on November 18, 2022, and material expert validation was carried out on November 21, 2022. Based on the validation results, which were assessed from various aspects, the media was declared valid and could be used with several improvements. Then this media can be used after making some repairs. This is to the statement (Panjaitan, Titin, & Putri, 2020), which states: that the purpose of validation is to assess the validity of interactive multimedia in the hope of producing valid media so that it can be used for learning media. The results of the validation are presented in Table 3 as follows:

Table 3. Validation of Media Experts and Material Experts

Validator	Repair Suggestions	Repair Results
Media Expert	The color must be adjusted to the IMK to be more attractive.	Changes in some of the colors on the media.
	Audio fixed, so it doesn't overlap.	Audio is fixed, so there is no more overlapping audio.
	Fixed navigation buttons to not duplicate	One of the navigation buttons is removed, so no button has the same function across multiple slides.
Material Expert	Some buttons are difficult to understand without explanation.	Menu instructions are more clarified.
	Fix duplicate text display	The text is corrected so that there are no more duplicate texts.
	It is rather difficult to understand the indicators of monitoring the	There is an improvement in the words on this indicator, which is

Validator	Repair Suggestions	Repair Results
	implementation of problem-solving activities so that students check each step of completion and put a checklist on the part that has been checked and is considered correct so that it is necessary to add information if students check the correct or incorrect answers.	to check each step of completion so that in the practice menu, there are several words in the questions that are corrected and from a total of 8 questions to 5 questions only because there are several indicators that are combined only in one question. Meanwhile, in the material menu and sample questions, there is still a slide show that puts a checklist on the part that has been checked and is considered correct, but with improvements to the addition of information if students check the correct or incorrect answers.

Implementation

At this stage, the learning media developed was tested on a small scale to determine the level of readability. This media was tested on five students of class XII MIPA 1 and 3 mathematics teachers on 22 November and 23 November face to face. This is because students have entered a new habit with 100% face-to-face learning with a time limit of 45 minutes to 30 minutes. Next, the response of students and teachers to adobe flash learning media based on metacognitive ability is calculated by referring to Table 1. However, because the number of respondents from students and teachers is different, the calculations are repeated according to the formula in Table 1.

Based on the results of the student response questionnaire, the limited trial consisting of 5 students of class XII MIPA 1 got a score of 191 in the "Good" category. Then as for the comments from the limited trial students, namely the learning media that is interesting, easy to understand, can increase the focus of learning, and can be used for independent study at home. This is in line with the results of research by Nora, Luthfi (2022), who concluded that learning media created with Adobe Flash CS6 and converted to Android using Adobe Animate CC 2019 could help students learn the material, can increase student motivation, and student learning outcomes. Then as for the suggestions put forward in the limited trial student response questionnaire, namely, this media does make it easier for students to learn independently, but most students understand the material must be explained by the teacher face to face. In addition, the explanation of the menu & instructions is preferred so that all students immediately understand the buttons.

While the results of the teacher response questionnaire consisting of 3 mathematics teachers scored 132 in the "Very Good" category, the comments and suggestions on the teacher's response questionnaire to the media developed are that this learning media is very good, the material provided is clearer and easier to understand. Then the advice given is that in everyday learning, it continues to be applied, motivates students even more, and makes learning media even more interesting. So it can be concluded that the adobe flash learning media based on metacognitive abilities got a good response from students and a very good response from the teacher.

(5) Evaluation Stage

The stages in this stage are determining the assessment criteria, selecting evaluation tools, and carrying out evaluations. At this stage, product implementation is carried out on a larger scale outside the limited trial class. Based on the results of the limited trial implementation, there are still shortcomings, namely the need for an explanation of the menu

& instructions first to students before students apply the media. In addition, most students understand the material must be explained by the te face to face so that the blended learning model is considered suitable to be applied in this research. Semler (2014), Moebs and Weibelzahl (2014), and Graham (2014) argue that blended learning is a learning model that combines face-to-face learning and e-learning by using media and learning theories in the process (Wardani, Toenlioe, & Wedi, 2019). E-learning is learning that involves electronics as a tool in the learning process and can be presented online or offline. Lirahman & Heniwaty, 2019).

So there for media adobe flash learning based on metacognitive abilities can be a medium that facilitates the occurrence of e-learning because it uses electronics in the form of smartphones, PCs/laptops, and can be accessed online and offline. It can be accessed offline if the media file has been downloaded and does not require an internet connection anymore; it is enough just to open the media file in the flash game flayer new application. Access online because in this media, there are practice questions whose answers must be sent online by clicking the send button connected to the google form link. Then with the limitation of face-to-face time from 45 minutes per lesson hour to only 30 minutes, this media and learning model is very suitable to be applied.

The learning process using the media adobe flash learning based on metacognitive abilities was carried out in class XII MIPA 2 for as many as 21 people on November 24 and 25, 2022. The first thing that was done was an explanation of how to use the new flash game player application to open media adobe flash learning based on metacognitive abilities. But at this stage, there is still one student whose smartphone does not meet the smartphone specifications that can be used to operate the new flash game player application. Ssmartphonethose that do not match the specifications is also an obstacle in E-Learning learning (Mortadlo, 2021). But these obstacles can be overcome because this study uses a blended learning model, which is carried out in groups so that students can still follow the learning process by looking at the learning media with their friends.

In addition, during the learning process, the teacher who teaches in the class fills out an observation sheet on teaching activities to control the researcher's ability to manage to learn. Uto finds out the ca teaching activity observation sheet is calculated according to theTable 2. Based on the calculation results, the teaching category activity observation sheet obtained a teaching implementation score of 94% with the "Very Good" category. Success in learning is very likely to be influenced by the media learning (Mamin & Arif, 2020). So it can be concluded that the media used is appropriate so that it helps the process of implementing learning very well.

After the entire learning process was completed, students filled out a response questionnaire to the learning media which was conducted on November 26. To find out the category of student responses to adobe flash learning media based on metacognitive abilities, calculations were carried out using the formula that refers to in Table 1. Based on the results of the student response questionnaire, the field test consisting of 21 students in class XII MIPA 2 got a score of 866 in the category " Very good".

CONCLUSION

This research and development use the ADDIE model, which consists of 5 stages: Analysis, Design, Development, Implementation, and Evaluation. During stage Analysis, researchers do teacher analysis, syllabus analysis, learning resource analysis, and student needs analysis. At stage Design, researchers make a storyboard of product design. Researchers determine media elements by collecting supporting materials such as images, animations, and sounds.

At stage Development, product design is designed using Adobe Flash Professional CS6 and other supporting applications. The elements that have been collected in the design stage are assembled into a whole unified product according to the storyboard made in the design

stage. Media experts and material experts assess media before being implemented or tested on users using a material and media expert validation sheet. The material and media expert validation results stated that adobe flash learning media based on metacognitive abilities is valid and usable with some improvements.

At stage Implementation, the researcher conducted a limited trial with five students of class XII MIPA 1 and 3 mathematics teachers. Then the student and teacher response questionnaires were distributed to find out the responses and things that needed to be revised from the developed media. Based on the questionnaire responses, the limited trial students got a score of 191 in the "Good" category. At the same, the results of the teacher's response questionnaire got a score of 132 in the "Very Good" category.

Next is the stage Evaluation; at this stage, product implementation is carried out on a larger scale outside the limited trial class. Based on the results of the limited trial implementation, there are still shortcomings, namely the need for an explanation of the menu & instructions first to students before students apply the media. In addition, most students understand the material must be explained by the teacher face to face so that the blended learning model is suitable for this research.

The learning process using the media adobe flash learning based on metacognitive abilities was s carried out in class XII MIPA 2 for as many as 21 people. In addition, what is done at this stage is that during the learning process, the teacher who teaches in the class fills out an observation sheet on teaching activities to control the researcher's ability to manage to learn. Based on the calculation results, the teaching activity observation sheet obtained a teaching implementation score of 94% in the "Very Good" category. After the learning process, students complete a response questionnaire to the learning media. Based on the questionnaire responses, students scored 866 in the "Very Good" category.

RECOMMENDATION

Researchers hope that this research can contribute ideas to efforts to develop adobe flash learning media based on metacognitive abilities. Then it is hoped that it can provide input for other researchers to analyze the development of adobe flash learning media based on metacognitive abilities. In addition, it is hoped that further researchers will conduct an analysis first to determine the type of smartphone of students so that the smartphone has the appropriate specifications and can be used in accessing the developed learning media. In making learning media, it is better to backup media files that are being developed using CD/DVD storage media, save them into a USB flash disk that is provided specifically for storage of this learning media application, or it can also use web-based storage media that are available for free such as Google Drive, Microsoft One Drive, Mediafire, and Dropbox.

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