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Development of Interactive Learning Media Based on Adobe Flash CS6 for Vector Material in Grade X of High School

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Abstract

Interactive multimedia-based learning media is very necessary and is expected to improve the quality of learning. This study aims to determine the validity and practicality of interactive learning media based on Adobe Flash CS6 on vector material for class X of high school. This type of research is development research (Research and Development) using the ADDIE development model which consists of: Analysis, Design, Development, Implementation and Evaluation. Data collection techniques in this study use non-test techniques with data collection instruments in the form of validation sheets and practicality sheets. The validation sheets are filled in by lecturers and teachers while the practicality sheets are filled in by students. The data analysis technique used is quantitative descriptive data analysis. The results of the average validation analysis based on expert opinions are 90.81% which is included in the very valid category, while validation in terms of the assessment aspect of this learning media obtained an average of 90.44% which is included in the very valid category. Then the results of the average practicality analysis based on the questionnaire filled in by students are 90.86% which is included in the very practical category. Based on the results of research and development of interactive learning media based on Adobe Flash CS6 for class X SMA material, it can be concluded that learning media has been produced that has been tested for validity and practicality.

Keywords: adobe flash cs6; interactive learning media; vector material; addie model; validity and practicality.

Introduction

Education is a conscious and planned effort aimed at creating a learning atmosphere and process that allows students to actively develop their potential. According to (Sihombing, 2021), one area of education that plays a crucial role in improving the quality of education is mathematics education. Various educational reform efforts are being undertaken to improve the quality and quantity of education. To improve the learning process, teachers are required to create more innovative learning experiences that will encourage students to learn optimally, both in independent learning and in the classroom. According to (Muhammad & Yolanda, 2022), within the world of education, mathematics is a crucial field, both for students and for the development of other scientific fields. Mathematics's position within education holds significant benefits. According to (Yolanda & Wahyuni, 2020; Kamarullah,

2017; Novitasari, 2016; Rohman & Syaifudin, 2021), mathematics is a fundamental science found at every level of education. It offers numerous benefits in life, from the smallest to the largest. To support the mathematics learning process, appropriate learning media are needed to facilitate student understanding. According to (Saputra & Permata, 2018; Sultan et al., 2021), utilizing appropriate media in the learning process can help students visualize abstract mathematical concepts, thereby motivating them and fostering their interest in learning. Therefore, teachers must be able to select the right media for the learning process.

One classification of learning media is interactive multimedia, which consists of various elements such as photos, text, sound, graphic art, animation, and video, supported by tools that can be controlled by students or used independently, anywhere and anytime. According to Yolanda & Wahyuni (2020), the development of information technology in the world of education is inseparable from the advancement of information technology. Several forms of technological development, such as computers, electronics, and telecommunications, are used to process and distribute information in digital form (Khalisa et al., 2021).

Producing interactive learning media requires the assistance of supporting software. According to Yolanda et al., 2021, interactive learning media is expected to improve student learning outcomes. In this case, the researchers used Adobe Flash CS6 software. Adobe Flash CS6 is an improvement on the previous version of Adobe Flash, which is designed to create vector-based animations with small file sizes (Rezeki, 2018; Hasan et al., 2021). According to Prayitno et al., 2022, Adobe Flash is a computer software product and a flagship product of Adobe Systems.

Based on the results of an interview conducted by researchers on November 24, 2022, with a teacher at YLPI Pekanbaru High School, it was stated that the school had never previously used interactive learning media assisted by Adobe Flash CS6, either for Vector material or other materials. The teacher further emphasized that the learning process using PowerPoint has only been implemented in the last few months because only adequate facilities in the form of an infocus have been available. However, the PowerPoint learning media used is still monotonous and not interactive. Furthermore, when researchers interviewed one of the students of class X IPA 1, most students said they still lack interest in learning mathematics. This is due to the mathematics learning being difficult to

understand and less interesting as well as the learning media being still standard or even not using media.

Therefore, researchers are interested in creating interactive learning media that is fun and engaging for students using Adobe Flash CS6 software. According to Rahmaibu et al., 2016; Supriyadi, 2016, the software offers several advantages, including: This study contributes to mathematics education by emphasizing the practical integration of interactive multimedia learning with vector material through offline digital media that can support student engagement and independent learning.

1. Adobe Flash offers advantages, including smaller final Flash files (after publishing).
2. Adobe Flash can import almost all image and audio files, making Flash presentations more lively.
3. Animations can be created, run, and controlled.
4. Adobe Flash can create executable files (*.exe) so they can be run on any PC (Personal Computer) without first installing the Flash program.

Based on previous research conducted by (Muthoharoh & Sakti, 2021) in this study, the validation results by material and learning media experts showed that the final product of interactive media based on Adobe Flash CS6 was categorized as very valid, with an average total assessment of 85.7%, effective because it obtained a score of 100%, and practical with a percentage of 100% when used. In addition, it was known that students responded positively by showing that the taxation learning media provided a sense of enthusiasm when used. Learning outcomes also increased significantly. Furthermore, in the study (Zulkarnain & Jatmikowati, 2018) in this study, the product was tested with a questionnaire assessment based on product trials tested on 3 validators, namely: 1 media validator and 2 material validators and 29 students, to determine the validity and practicality of this learning media. The results of this study explain that this Android-based learning media is of good quality. Supported by the percentage of completeness value obtained of 80% which is included in the very good criteria, so this Android-based learning media is included in the effective category. So, based on the data obtained, this product meets the three criteria of validity according to experts, practicality, and effectiveness. It can be concluded that the Android-based Adobe Flash CS6-assisted learning media on the topic of triangles is of good quality. The similarities between these studies are that they are both development research,

using the same application. However, the difference lies in the material presented: the researcher presented triangle material, while the researcher presented vector material.

Method

The participants involved in this study consisted of 20 Grade X students from SMA YLPI Pekanbaru who participated in the limited practicality trial. The validation instruments were reviewed by two university lecturers and one mathematics teacher. The practicality questionnaire was designed using Likert-scale indicators covering usability, attractiveness, effectiveness, and clarity of learning media. Reliability testing was conducted through internal consistency analysis before implementation.

In this study, the type of research conducted is the Research and Development (R&D) method. The Research and Development (R&D) method is a type of research that produces a product. According to (Maydiantoro, 2019)) Research and Development is a research method to develop and test products that will later be developed in the world of education. According to (Hanafi, 2017)) R&D is research that produces a product. According to (Muthoharoh & Sakti, 2021) the research and development method is a research that develops products that can be used in the world of education. The purpose of this study is to develop interactive learning media based on Adobe Flash CS6 on class X SMA vector material that has been tested for validity and practicality. The following is the development model design:

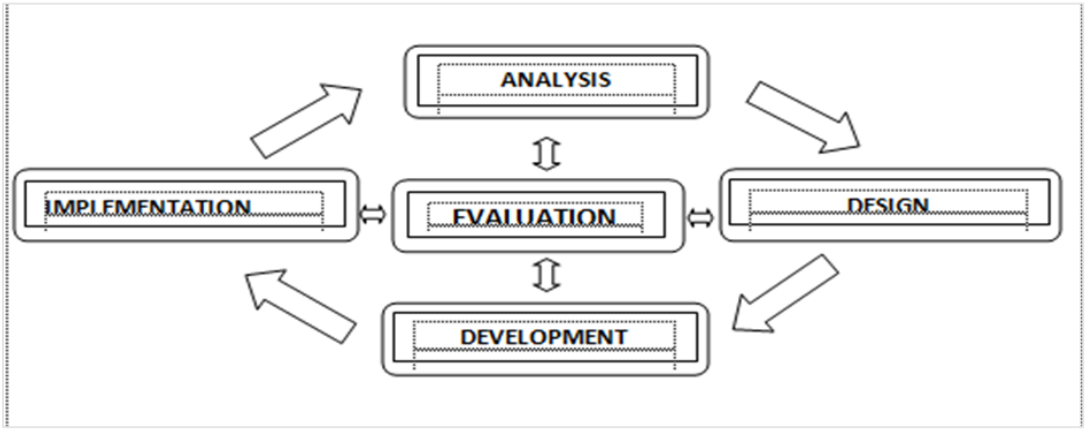


Figure 1. ADDIE Development Model Design

According to (Sugihartini, 2018; Fitriyah et al., 2021; Manurung, 2021) In developing interactive learning media, several stages are carried out, namely: (1) The

analysis stage is the first stage carried out to determine the problem that is used as the basis for research on the development of the media that will be used. At this stage, the researcher conducts interviews aimed at finding information related to the teaching and learning process. (2) The design stage, this stage carries out the design for developing learning tools in the form of a syllabus and RPP for 4 meetings on vector material accompanied by core competencies and basic competencies as well as a cumulative achievement index. Then the design for developing learning media uses the Adobe Flash CS6 application, at this stage the researcher designs the media to be developed, (3) The development stage At this stage, namely producing a design into reality, if the design requires an application (software) in the form of learning multimedia, then it needs to be developed. In this study, the media developed was in the form of software based on the Adobe Flash CS6 application that can be used offline on a laptop. The development steps at this stage include several activities, including: developing instructional materials according to the syllabus/lesson plan, compiling materials according to the syllabus, and evaluation (including assignments, practice questions, etc.). (4) Implementation stage, this stage aims for teachers to prepare the learning environment and engage students well in the learning process. At this stage, trials are carried out to determine the level of practicality of the developed learning media to test its practicality.

The data collection technique used by the researcher is a non-test technique with a validation instrument, namely a validation sheet. Then, validation is carried out by mathematics education lecturers at the Islamic University of Riau, namely: Validator 1 and validator 2 as material and media experts, as well as a mathematics teacher at YLPI Pekanbaru High School, namely: Validator 3 as a material expert. The validation sheet contains 17 statements divided into three aspects: media aspects, material aspects, and language aspects. The media validity score is given on a Likert scale of 1-4. According to (Akbar, 2013), to analyze the level of validity, the formula used is:

$$V_1=\frac{TSe}{\text{TSh}} \text{ X } 100\%$$

$$V_2=\frac{TSe}{\text{TSh}} \text{ X } 100\%$$

$$V_3=\frac{TSe}{\text{TSh}} \text{ X } 100\%$$

Furthermore, a combined validity calculation was conducted to determine the final average validity based on the experts' judgments using the following formula:

$$V = \frac{V_1 + V_2 + V_3}{3}$$

V = validitas gabungan

V_1 = validitas ahli ke 1

V_2 = validitas ahli ke 2

V_3 = validitas ahli ke 3

TSe = Total skor empiris (hasil validasi dan validator)

TSh = Total skor maksimal yang diharapkan

Akbar (2013) stated that validity assessment can refer to the following criteria.

Table 1. Practicality Criteria

Quality Score	Criteria
85,01% - 100%	Very valid, can be used without revision
70,01% - 85%	Fairly valid, can be used but requires minor revision
50,01% - 70%	Less valid, recommended not to be used
01,00% - 50%	Invalid, should not be used

Furthermore, Yanto (2019) revealed that the formula for analyzing the level of Practicality descriptively is as follows:

$$P = \frac{TSe}{TSn} \text{x } 100\%$$

Description:

P = Percentage of practicality

n = Total empirical score

N = Maximum expected value

Table 2. Practicality Criteria

Quality Score	Criteria
81% - 100%	Very Practical
61% - 80%	Practical
41% - 60%	Quite Practical
21% - 40%	Less Practical
0%-20%	Not Practical

(Yanto, 2019)

Results and Discussion

Adobe Flash CS6 Media Validation Results

Validation results for learning media:

The validation results indicate that the developed learning media achieved high feasibility based on material, media, and language aspects assessed by experts.

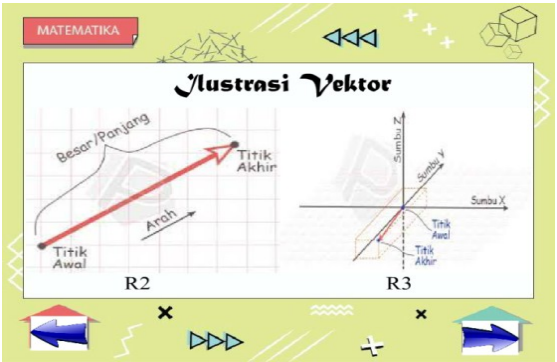
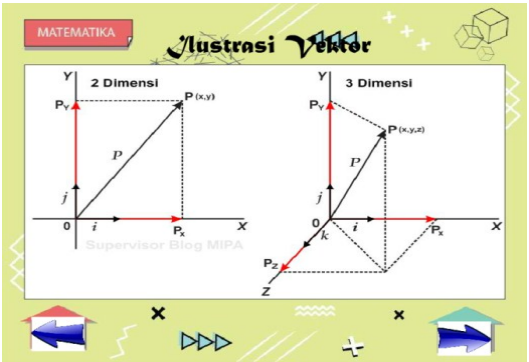
Table 3. Learning Media Validation Results

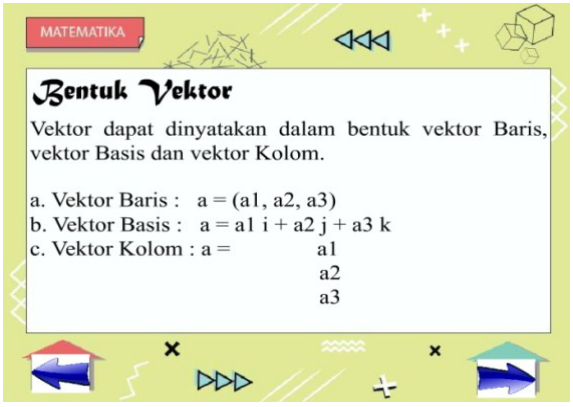
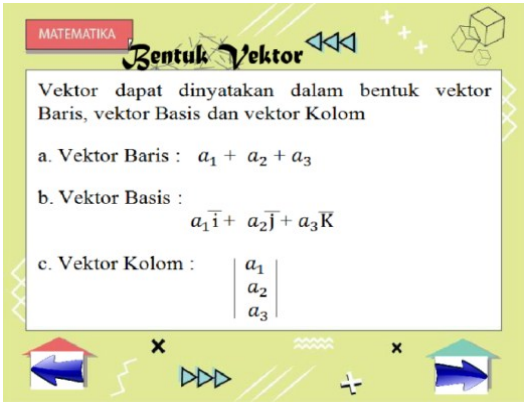
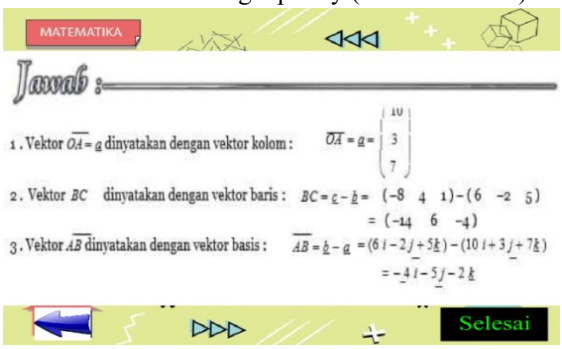
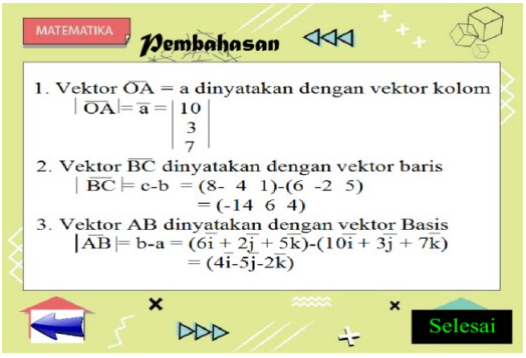
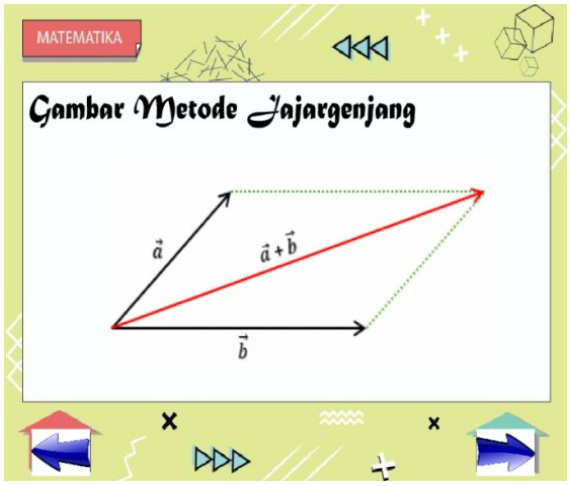
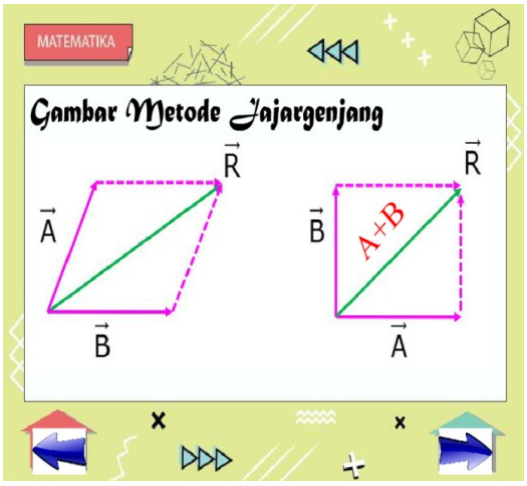
No	Aspect Assessed	Assessment Results	Category
1.	Material	93,45%	Very Valid
2.	Media	88,99%	Very Valid
3.	Language	88,88%	Very Valid
	Average Percentage %	90,44%	Very Valid

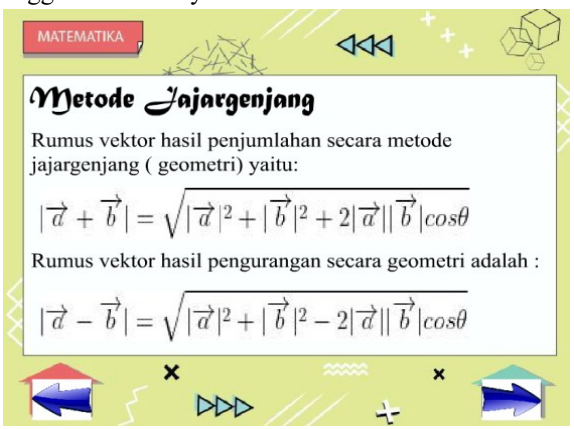
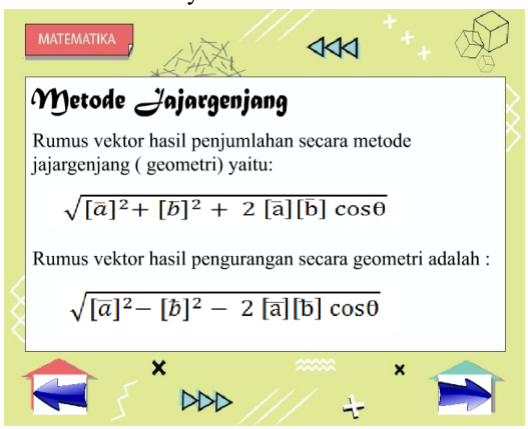
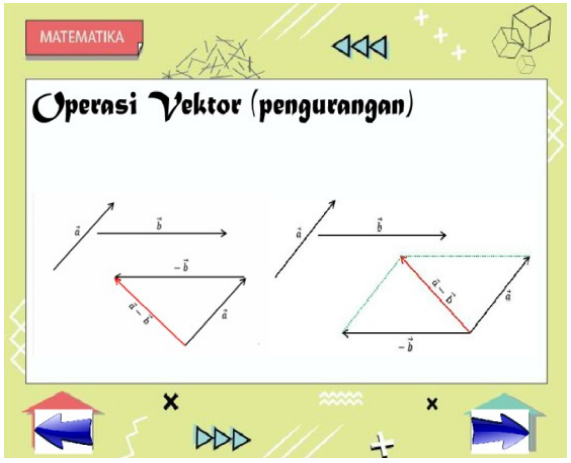
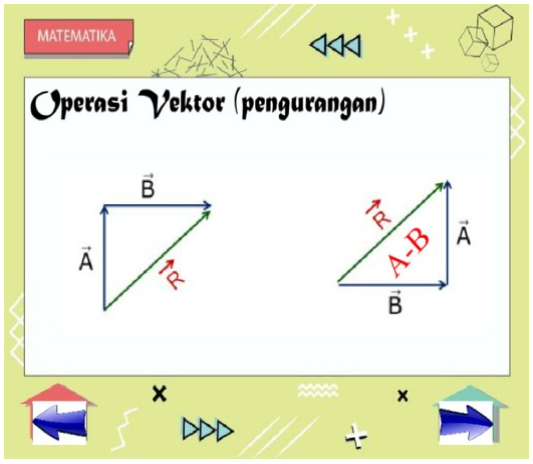
Based on the table above, the average aspect received a very valid rating, with the highest rating being the material aspect and the lowest rating being the language aspect. Therefore, it can be concluded that the learning media for sessions 1–4 meet the very valid rating and can be used in the teaching and learning process at school.

After the design validation was completed by the experts or validators, any deficiencies in the learning media were revised based on the suggestions from the three validators. The revisions to the learning media are as follows:

Table 4. Revision of Learning Media

Before Revision	After Revision
Suggestion: In the image material section of the vector illustration, it is broken. 	Revision: Vector illustration images are no longer broken. 

Suggestion: It is recommended that the text be typed in Microsoft Word, captured using snipping, and then imported.	Correction: The writing of the symbols has been revised to ensure correctness and appropriateness.
	
Suggestion: The text writing is unclear and difficult to read due to low image quality (blurred/broken).	Correction: The text is now clearly readable.
	
Suggestion: Improve the image used in the parallelogram method addition material.	Correction: The image is now clear and no longer blurry/broken.
	

Suggestion: The symbols in the formula are unclear.	Correction: The symbols are now clear.
	
Suggestion: The presented image is unclear or blurry/broken.	Correction: The image is now clear and no longer blurry/broken.
	

Practicality of Adobe Flash CS6 Learning Media

The practicality of interactive media was carried out through a limited trial on 20 students, to find out the students' responses and to find out the practicality of the media, a trial was carried out.

Table 8. Practicality Assessment Results

Assessed Aspect	Average	Practicality Level
This learning media saves time in the learning process	92.5%	Very Practical
This learning media can be used as an independent learning resource by students	92.5%	Very Practical
This learning media is easy for students to use	92.5%	Very Practical

This learning media is equipped with user instructions, making it easier to operate	80%	Practical
I can understand the learning material more easily by using this learning media	97.5%	Very Practical
This interactive learning media makes me interested in learning mathematics, especially this material	92.5%	Very Practical
I feel that there is new information presented in this interactive learning media	81.25%	Very Practical
The images or objects used in this learning media are appropriate to the material	80%	Practical
The display in this learning media is attractive and does not make the learning process boring	100%	Very Practical
The color combination used in this learning media is appropriate	88.75%	Very Practical
The material presented is in accordance with the curriculum and learning objectives	96.25%	Very Practical
The material presented in the learning media is more detailed and easier to understand	100%	Very Practical
The material in this learning media is accompanied by complete example problems and explanations	87.50%	Very Practical
Total	**90,86%**	**Very Practical**

Discussion

The purpose of this study was to determine and describe the validity and practicality results of developing interactive learning media based on Adobe Flash CS6 on vector material for grade X senior high school students. The development of this Adobe Flash CS6-based interactive learning media employed the ADDIE development model according to Safitri and Aziz as well as Hayati and Lailatussaadah, which was modified according to the researcher's needs, with product testing focused on validity and practicality. The stages carried out included the analysis stage, design stage, development stage, implementation stage, and evaluation stage. The findings of this study also indicate that interactive multimedia can support students' motivation and visualization of abstract mathematical concepts, especially in vector material.

To determine the validity of the learning media, validation was conducted based on validators' judgments. This validation process involved two lecturers and one mathematics

teacher. Through the validation process, weaknesses and suggestions for improvement could be identified and used to produce valid learning media.

According to Putri and Damayanti (2019), validity assessment of the developed media consists of three aspects: (1) the material aspect, related to the systematic and clear presentation of the material and clearly formulated questions; (2) the language aspect, related to the use of understandable language and clear sentence structure; and (3) the media aspect, related to the ease of operating the media and the ability of users to interact with it.

Based on the opinions above, the researcher designed media validity instruments according to the research needs, which included: (1) the content/material aspect, consisting of the suitability between the title and the material content, inclusion of core competencies and basic competencies, inclusion of indicators and learning objectives, suitability of the material with learning achievement indicators and objectives, explanations that are easy to understand, suitability of practice questions with the presented material, and suitability of images or objects with the material; (2) the media aspect, consisting of ease of operation, clear instructions for use, properly functioning and user-friendly navigation buttons, appropriate color combinations, suitability of displayed images or objects with the material, appropriate and attractive audio usage, and the inclusion of instructional videos to facilitate understanding of the material; and (3) the language aspect, consisting of understandable language, language that follows proper spelling conventions, and communicative language usage.

Furthermore, validation was conducted by three experts, namely two lecturers from the Mathematics Education Department at Universitas Islam Riau and one mathematics teacher from SMA YLPI Pekanbaru. The results of the validation analysis of the learning media showed an average score of 90.81%, which falls into the very valid category, while the validation results based on the assessed aspects obtained an average score of 90.44%, also categorized as very valid. Subsequently, classroom trials were conducted during the learning process to determine the practicality of the learning media.

To evaluate the practicality of the learning media, a practicality test was conducted using student respondents. This practicality test involved 20 students of grade X at SMA YLPI Pekanbaru. Through this practicality assessment, weaknesses and suggestions for improvement could be identified and used in implementing the interactive learning media in classroom learning activities. The practicality test conducted with 21 students from class X

IPA of SMA YLPI Pekanbaru resulted in an average practicality score of 90.86%, which is categorized as very practical. However, the use of Adobe Flash CS6 may face sustainability limitations because modern browsers no longer fully support Flash-based applications. Therefore, future studies are encouraged to adapt the media into newer platforms.

Ethical Considerations

Permission to conduct this research was obtained from SMA YLPI Pekanbaru. All participants were informed about the purpose of the study, and student confidentiality was maintained throughout the research process.

Conclusion

Based on the results of the research data analysis in chapter 4, it can be concluded that the interactive learning media based on Adobe Flash CS6 for class X SMA vector material is included in the very valid category, with an average validation based on expert opinion of 90.81% which is included in the very valid category, while validation in terms of the assessment aspect of this learning media obtained an average of 90.44% which is included in the very valid category. Furthermore, its practicality has been tested with a very practical category, with an average practicality based on a questionnaire filled out by students of 90.86% which is included in the very practical category. Based on the results of research and development of interactive multimedia-based mathematics learning media using Adobe Flash CS6 for class X SMA vector material, it can be concluded that the learning media has been produced with tested validity and practicality. The weaknesses of this research are: 1) In creating interactive media it takes quite a long time, about one month. 2) When using learning media in the learning process, all changes that occur are not saved and will be deleted or returned to their original state if the learning media is exited or closed. 3) Writing mathematical symbols in the Adobe Flash CS6 application is limited due to the absence of an equation feature in the application. In addition, future studies are recommended to examine the effectiveness of the developed media on students' mathematical achievement and conceptual understanding using experimental research designs.

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