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Development of Canva Flash Based Mathematics Learning Media on Matrix Material

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ABSTRACT

Utilization of technology-based media in learning can build student independence so that the student learning experience will have more meaning. This research is aresearch on the development of mathematics learning media. The purpose of this research is to develop a valid and practical Canva Flash Matrix-based mathematics learning media as a mathematics learning medium on matrix material. The method in this study uses a development method based on the ADDIE development model. The subjects used in this study were 20 students of class XI MA Ibadurrochman. The resulting learning media is Canva-based media for material on the Matrix with a discussion of the types of Matrix and operations on the Matrix. Research data were analyzed using descriptive statistical analysis. The data that has been obtained is then analyzed using validation analysis techniques, practicality, developed learning media. The results of the validation test and practicality test resulted in a valid and practical mathematics learning media to be used as a medium in learning based on the results of an assessment that met the criteria. The results of the assessment from the validation of media experts showed an average total score of 3.78. This shows that the media is valid for use in learning. In addition, the media also meets practical standards with an average practicality score of 3.70. Thus, the developed Flash Matrix media fulfills valid and practical aspects. Research also shows that the media can make students play an active role in observing the material presented, so that it can help teachers in the learning process and learning more effectively.

Keywords: *Development, Learning Media, Canva, Matrix.*

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INTRODUCTION

Studying and Learning are the main activities in the world of Education (Hanafi, 2017). Learning is a process that enables the emergence or change of new behaviors that are not caused by maturity and temporary things as a result of the formation of primary responses. Learning and instruction have a close relationship with technological development (Riyana, 2019). The rapid development of communication technology today represents a global technological advancement whose presence cannot be rejected (Fatwa, 2021). This technological development has a significant

impact in all fields, especially in education. The use of technology-based media in learning can build student independence, so that students' learning experience process will be more meaningful (Riyana, 2019). The benefits of technological development include its use in delivering subject matter, especially in Mathematics (Maryani, 2015).

Currently, Mathematics is one of the branches of science that plays an important role in the development of science and technology in its learning, both as a tool in the application of other scientific fields and in the development of mathematics itself (Siagian, 2016). Students in Indonesia are still experiencing difficulties in learning mathematics. Therefore, learning innovations are needed to help students overcome difficulties in learning mathematics (Taub et al., 2020). The importance of innovation and creativity in teaching mathematics using media can be seen in conceptual and constructive activities in the use of learning media. Learning media are tools used by teachers in delivering material to students (Suparwanto, 2017). The media applied can be in the form of documents, presentations, audio video, or computers (Smaldino et al., 2012). Students are asked to independently develop concepts to implement the use of mathematics learning media using tools and materials around the student environment (Ummah et al., 2019). In addition, teachers should be able to use available tools and develop skills in creating learning media that are not yet available. For this reason, teachers must have sufficient knowledge and understanding of learning media (Wahyudi & Choirudin, 2007).

Application-based media falls into the practical category for use in learning. Application-based media that has been developed is very useful for students in their motivation. Students feel more enthusiastic about learning mathematics using media and show improvement in learning outcomes in quizzes given by mathematics teachers (Ulyani & Qohar, 2021). The use of media can stimulate thoughts, feelings, attention, and interest as well as student attention in such a way that the learning process can be carried out well (Sidarta & Yunianta, 2019). The benefits of using media in learning mathematics are as follows: the learning process will attract more student attention thus stimulating motivation to learn; Teaching methods will be more varied, not just limited to verbal delivery by teachers. By studying media, students are expected not to become bored and teachers not to become exhausted of energy; If teachers must teach for every class hour, then the meaning of learning materials will be clearer so that it can be better understood by students. Students don't just listen to teacher descriptions, but also other activities such as observing, doing, demonstrating, and other things with media tools. There are various forms of learning media that can be developed such as visual media. These are learning media that rely on the sense of sight such as photos, illustrations, reminder cards, selected images, picture pieces, paintings, film frames, film series, OHP, graphs, charts, diagrams, posters, maps, etc.

Research conducted by (Permata et al., 2019)mentions that from the results of research and development carried out, it was concluded that valid and practical Mathematics learning media for Matrix material has been produced for class XI at SMK Hasanah Pekanbaru. The media to be used is the most important part in the learning design process. Through this media, messages from teachers to students will be delivered effectively. Learning media is designed and created using the Canva application (Rahmatullah et al., 2020). Canva is an online application that we can use to create learning media. In Canva, many templates are available for use, namely for infographics, graphs, posters, presentations, brochures, logos, resumes, flyers, A4

documents, Instagram posts, cards, newspapers, comic strips, magazine covers, invitations, photo collages, business cards, desktop wallpapers, reports, certificates, book covers, social media animations, announcements, menus, videos, organizational charts, your story, letters, letterheads, proposals, labels, worksheets, class schedules, calendars, ID cards, CD covers, US letter documents, mobile-first presentations, planners, programs, ebook covers, and storyboards. The ways to use this application include: Creating a Canva Account, Creating Designs, Choosing Backgrounds, Editing Backgrounds, Adding Text, Downloading or Sharing Designs (Irkhamni et al., 2021). Not just for presentations, but Canva also provides designs for posters, profile photos, banners, and others (Salam & Adam Mudinillah, 2021).

Based on the experience of researchers and mathematics teachers, while teaching Matrix material using conventional methods, student learning outcomes were quite satisfactory (Ramziah, 2018). However, when students were faced with questions related to word problems in daily life, they had difficulty solving everyday problems by applying Matrix material (Pertiwi, 2018). Matrices is a topic that is quite disliked by most students when studying Mathematics (Istikaanah & Wardayani, 2022). Some errors made by students when solving mathematical problems related to Matrix operations are (1) mistakes when multiplying a real number with a Matrix, (2) errors in operating addition and subtraction of Matrices when dealing with positive and negative numbers, (3) misconceptions when multiplying Matrices, using addition concepts instead, (4) multiplying two Matrices by directly multiplying corresponding entries, (5) calculation errors (Lesmana et al., 2015). One of the causes is the lack of student learning motivation and lack of teacher creativity in using manipulative and non-manipulative media-based learning (Hanipa et al., 2012). Various studies have been conducted regarding the development of Canva-based Media, one of which is a study titled "Development of Canva Application-Based Animation Video Media to Improve Student Motivation and Learning Achievement" which concluded that the media is practical and effective to use (Hapsari & Zulherman, 2021).

Based on research findings from (Manibuy & Saputro, 2014) and research by (Hanipa et al., 2012), both studies explain that students' lack of learning motivation and teachers' lack of creativity in using manipulative media-based learning, along with related research conducted by (Ulyani & Qohar, 2021) which states that media development greatly assists teachers in the learning process. This indicates that it is important to develop Canva-based Flash Matrix media to improve students' mathematical abilities that focus on understanding concepts in Matrix operations and types of Matrices while meeting valid and practical criteria.

METHOD

This research uses Research and Development (R&D) and the model used is the ADDIE Development model which consists of five stages: (1) Analysis (2) Design (3) Development (4) Implementation and (5) Evaluation (Dadi et al., 2019).In this technique, the researcher conducted direct observations about learning methods in class XI of MA Ibadurrochman Malang City with 20 students as research subjects, for two learning days per week, over two weeks. ADDIE uses a systems approach in designing instructional systems. The essence of the systems approach is dividing the learning planning process into several steps. These steps are arranged in a logical order and provide output from each step that is input (Cahyadi, 2019).

The research needs analysis will conduct observations. The aspects examined

include an analysis of learning objectives and problem analysis. The design stage includes the design of media specifications and the interface design of the Flash Matrix media. The development stage consists of lesson plans (RPP), student worksheets (LKPD), Flash Matrix media, and quizzes within the Flash Matrix media. The product developed in this research is a Canva-based Flash Matrix media used for teaching mathematics on the topic of types of matrices and matrix operations. After the initial product is created, the next step is product testing. Product testing in this research consists of expert validation, student trials, and media practicality testing. Validation is conducted to determine the appropriateness of the media used for learning and aims to create high-quality media. The expert validation consists of media validation and material validation, such as worksheets. The validation is carried out by validators expert in media and mathematics education. The implementation stage involves media product validation and group testing. Media validation is the process of assessing the product design by experienced experts (Dewanti et al., 2018). Validation is conducted by providing an assessment of the product based on criteria/aspects/indicators contained in the validation instrument by expert validators (Silmi & Rachmadyanti, 2018). Finally, the evaluation stage is the last phase, which includes revisions and data processing to generate an assessment of the media.

The validation results are used to revise the initial media product. The next step is product trials to determine students' motivation and learning outcomes after using the Canva-based Flash Matrix media on the topic of types of matrices and matrix operations. The research trial was conducted in grade XI at MA Ibadurrochman, Malang City. The trial results were analyzed to determine students' motivation and learning outcomes after using the Canva-based Flash Matrix media. In this study, the researcher used two questionnaire instruments: a validation sheet and a student response questionnaire to assess the validity and practicality of the learning media.

The validity and practicality tests are conducted in several stages as follows:

1. Determining the average validation results from all validators for each aspect using the following formula:

$$\bar{g} = \frac{\sum H}{I}$$

Explanation:
$\bar{g}$ = Average score per aspect
$\sum H$ = Total average score of responses given by respondents for each aspect
I = Number of items in one aspect

2. Mencari rata-rata total ($\bar{X}$) dengan rumus:

$$\bar{X} = \frac{\sum \bar{g}}{M}$$

Explanation:
$\bar{X}$ = Total average score
$\sum \bar{g}$ = Total average of each aspect
M = Number of aspects

The validation criteria used in the development of Canva-based Flash Matrix media are shown in Table 1 below.

Table 1. Criteria for Data Validity of Expert Sheets

No	Achievement Level	Description
1	$\bar{X} > 3{,}50$	Very valid

2	$3{,}00 < \bar{X} \leq 3{,}50$	Valid
3	$2{,}50 < \bar{X} \leq 3{,}00$	Somewhat valid
4	$\bar{X} \leq 2{,}50$	Not valid

If the validity criterion results show that $3{,}00 < \bar{X} \leq 3{,}50$ the media can be used. The practicality criteria used in the development of Canva-based Flash Matrix media are as follows:

1. Determining the average results of the questionnaire from all students for each aspect using the following formula:

$$\bar{P} = \frac{\sum Q}{R}$$

Explanation:
$\bar{P}$ = Average percentage of each aspect
$\sum Q$ = Total score of responses given by respondents for each aspect
R = Number of items in one aspect

2. To find the total average ($\bar{y}$), use the following formula:

$$\bar{y} = \frac{\sum \bar{P}}{S}$$

Explanation:
$\bar{y}$ = Total percentage
$\sum \bar{P}$ = Total average of each aspect
S = Number of aspects

Table 2. Criteria for Questionnaire Response Rating Data Adapted from Akbar (2013)

No	Achievement Level	Description
1	$\bar{y} > 8{,}0$	Very practical
2	$6{,}0 < \bar{y} \leq 8{,}0$	Practical
3	$4{,}0 < \bar{y} \leq 6{,}0$	Somewhat practical
4	$2{,}0 < \bar{y} \leq 4{,}0$	Less practical
5	$\bar{\bar{y}} \leq 2{,}0$	Not practical at all

The Flash Matrix learning media is considered practical if the second class criterion shows a minimum achievement level of $6{,}0 < \bar{y} \leq 8{,}0$.

RESULTS AND DISCUSSION

Product Development

The Flash Matrix learning media is developed using the Canva platform, which can be accessed through the website canva.com. To make it easier for students to access the media, the Flash Matrix media is provided in PDF and PPT formats, and it can be opened using either an Android phone or a laptop. Figure 1 shows the home page, which contains the introduction, learning objectives, and matrix learning material.

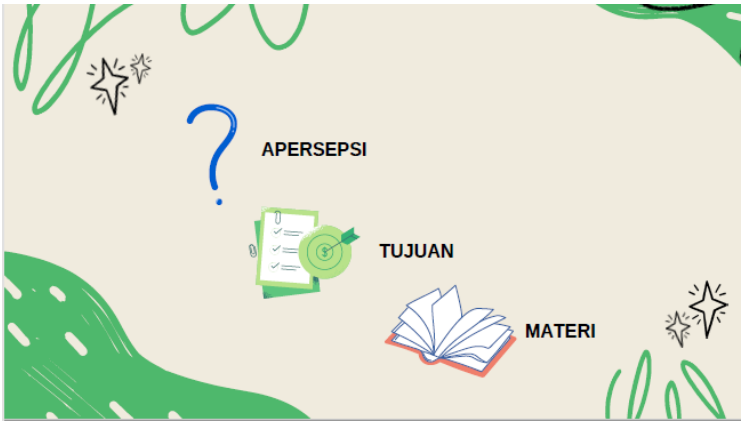

Figure 1. The Home Page

Figure 2 shows one of the contents of the material discussion, followed by a menu to return to the home page and a menu to navigate to the next topic.

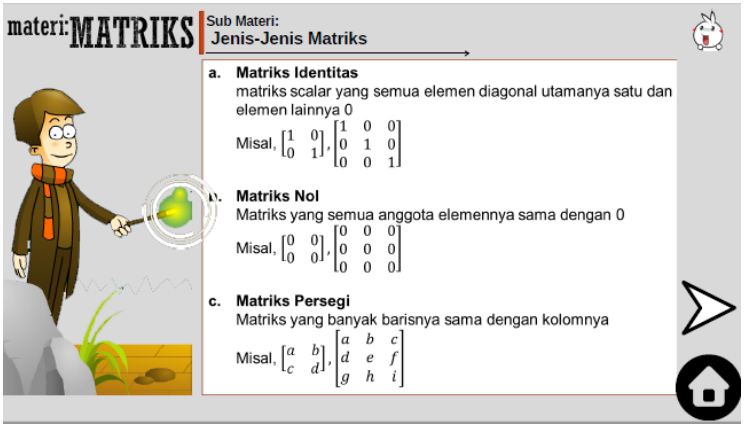

Figure 2. The Content Page

The components included in the Flash Matrix media are as follows:

1. **Home Menu**: This section contains an introduction to the learning material, the learning objectives, and the content that will be taught.
2. **Flash Matrix Media**: Designed using the Canva application, this media includes images, animations, and symbols. The language used in the explanations has been simplified to make it easier for students to understand the material. The case studies presented are constructivist, referring to real-life problems. An example of the content from the Flash Matrix media is shown in Figure 3.

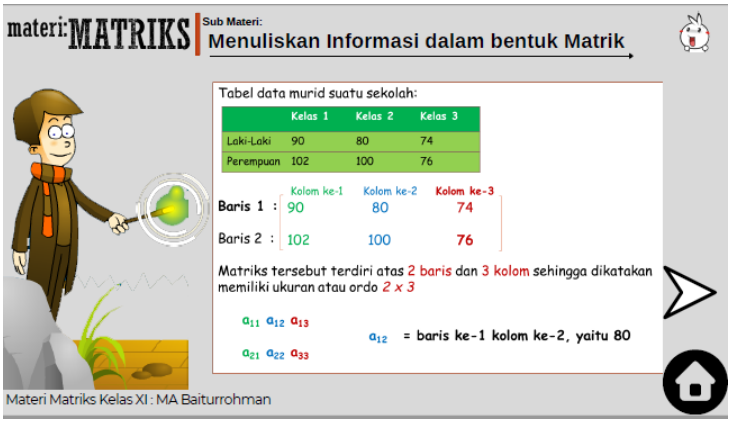

Figure 3. The Content Page of Flash Matrix Media

3. **Summary**: This section contains material on matrices, specifically focusing on the types of matrices and matrix operations.

Product Testing

After the product development process, the next stage is validation. The Flash Matrix media was validated by an expert in the field of educational media**.** Table 3 shows the results of the validation of the Flash Matrix media.

Table 3. Validation Results

No	Aspects	Score
I	**Content of the Learning Media**	
	1. The learning media can help students learn mathematics.	3
	2. The learning media can help students build conceptual understanding of mathematics.	3
	3. The activities provided enable positive interaction between students and the learning media.	3
	4. The activities within the learning media align with the learning objectives.	3
	5. The learning media does not cause ambiguity.	4
II	**Uses of Learning Media**:	
	1. It can be used to help students achieve the learning objectives.	3
	2. It can serve as a supporting tool for mathematics learning in schools.	3
	3. It can encourage students to be more active in their learning.	3
III	**Form and Appearance of Learning Media:**	
	1. The media's appearance is engaging and attractive.	4
	2. The form of the media is proportional and well-organized.	4
	Validation Score	3,78

Based on the expert validation results, a validation score of 3.78 was obtained. It can be concluded that the Flash Matrix media is valid and ready for large-scale testing. The expert validators did not provide any suggestions. The next step is the practicality test of the Flash Matrix media, which involves analyzing feedback from students. This questionnaire was given after the learning activity using the Flash Matrix media was completed. This learning activity represents a small group trial. Table 4 shows the results of the questionnaire completed by a sample of 20 students.

Table 4. Questionnaire Results

No	Aspects	Score
I	**Presentation of Material**	
	1. The Flash Matrix media is easy to use.	3,67
	2. The presentation of problems in the Flash Matrix media helps in understanding the types of matrices and matrix operations.	3,75
	3. I enjoy learning mathematics through this Flash Matrix media.	3,83
	4. This Flash Matrix media encourages my constructivist abilities in understanding the types of matrices and matrix operations.	3,65

	5. The Flash Matrix media makes me actively learn and understand the types of matrices and matrix operations.	3,60
	6. The Flash Matrix media helps me become independent in understanding the types of matrices and matrix operations.	3,60
II	**Language and Appearance of Flash Matrix Media**	
	1. Instructions and information are easy to understand.	3,67
	2. The appearance of the media is engaging.	3,85
	Score	3,70

Based on the score presentation of the questionnaire results in Table 4, the practicality score obtained is 3.70. This indicates that the Flash Matrix media is practical for use in the learning process.

Discussion

This study was conducted at MA Ibadurrochman with the research subjects being 11th-grade students. The main product to be tested is the Canva Flash media, which will be trialed with students on the topic of matrices. Canva Flash is a learning media based on an application that has been converted into a PDF format, making it easier for students to access during the learning process. The Canva Flash product focuses on the matrix topic, specifically in-depth learning about the properties and operations of matrices. In this development study, the Canva-based application, which has been converted into a PDF format, is used and follows the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The discussion of these activities will be explained in the following paragraphs.

Analysis. In this phase, the researcher visited the school where the study would be conducted to communicate with the teachers and students. The research was conducted in an 11th-grade class by providing materials in the form of a Canva-based application that had been converted into a PDF format. The results were quite positive, indicating that the learning media could be used in schools to attract students' interest in the learning process.

Design. The design of the learning application was carried out by creating the material in PowerPoint, based on the analysis of the material to be taught. The PowerPoint was then converted into the Canva application to create an engaging and appealing learning experience for students.

Development. The development phase involved realizing the plans that had been made. The PowerPoint slides were converted into the Canva application, which included interactive icons to make learning more engaging for students. This feature made students excited and enthusiastic about learning. According to (Afandi 2015), learning media must be engaging to ensure that students feel happy and motivated during the learning process. The methods used can be based on the age group of the students, as elementary, middle, and high school students have different levels of interest in media.

Implementation. In this phase, the learning application that was created was converted into a PDF format to make it easily accessible to students. Through the application, students were instructed to follow all the procedures and guidelines provided as part of the learning process. This allowed the researcher to test the feasibility of the product.

Evaluation. The evaluation phase involved testing the validity and practicality

of the product. The evaluation process began with the initial product and continued through to the final product. The results of the validation and practicality tests will be discussed in detail in the following paragraphs.

Based on the results of the validation conducted by the media learning expert, the Flash Matrix media for the topic of types and operations on matrices was evaluated. The validity of the media can be seen in Table 3, where the validation score was 3.78. This indicates that the media is valid to be used. The results of the trial of the Flash Matrix media can be seen in Table 4, where the questionnaire score was 3.70. This indicates that the media is practical for use in learning. This means that the design of the learning media is well-received by the students, both in terms of content completeness and appearance, making it suitable for use at the school where the trial was conducted (Rahmatullah et al., 2020)The Flash Matrix media can motivate students during the learning process and engage them actively in the lesson. Students should be actively involved in the learning process.

The Flash Matrix learning media has been successfully developed because it meets the aspects of validity and practicality in classroom learning. When students used the media, they appeared very enthusiastic about the learning process. It was also evident that students actively participated in observing the presented material, which helped the teacher facilitate a more effective learning and teaching process. This indicates that the media supports student learning activities and motivates students to learn. This aligns with the research by (Mardiana & Qohar, 2017), which stated that the function of media is to support student learning activities and motivate students during the learning process. This study is a recent development as it can be used both offline and online. This is in line with the advancement of science and technology (Jannah & Julianto, 2018).

CONCLUSION

The development research on the Flash Matrix media for mathematics has produced a media that is both valid and practical. The validity score obtained was 3.78/4.00, while the practicality score was 3.70/4.00. The researcher also demonstrated that the Canva Flash Matrix media can support student learning activities and motivate students in their learning. This Canva Flash Matrix media can also be further developed by adding other mathematical topics to the matrix material.

To optimize the use of the Canva Flash-based learning media that has been converted into PDF, the following recommendations are provided: (a) The Canva Flash learning media has only been tested on a small group, due to the limitations of the trial. Therefore, it is recommended that the media be tested on a larger class or in other schools for further evaluation. (b) For further product development, it is important to integrate media that supports students' creativity in thinking and use methods that align with the characteristics of mathematics lessons, both inside and outside the classroom.

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