



## Adobe Flash-based Edutainment Media: is it suitable for learning math?

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### ARTICLE INFO

#### Article history:

Available online April 20, 2023

#### Kata Kunci:

Adobe Flash, Edutainment, Media Pembelajaran, Validitas, Praktikalitas

#### Keywords:

Adobe Flash, Edutainment, Instructional Media, Validity, Practicality



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### Abstrak

Perkembangan teknologi informasi dan komunikasi (TIK) begitu cepat di era digital saat ini, sehingga penting untuk membuat materi pembelajaran yang dapat diakses melalui berbagai perangkat digital. Tujuan dari penelitian ini adalah untuk membuat media edutainment dengan aplikasi adobe flash yang dapat diterapkan untuk pembelajaran aritmatika. Penelitian ini merupakan penelitian pengembangan (R&D) yang menggunakan model pengembangan Borg and Gall (R&D) dan dibatasi pada beberapa tahap. Tahapan-tahapan tersebut adalah: a) pengumpulan informasi; b) perencanaan; c) pembuatan produk; dan d) validasi dan pengujian. Sebanyak 34 siswa yang menjadi subjek uji coba serta validator materi dan media diberikan kuesioner. Analisis kualitatif deskriptif digunakan untuk analisis data. Hasil pengembangan menjelaskan bahwa validasi media pembelajaran matematika berbasis Adobe Flash oleh ahli materi menghasilkan skor keseluruhan 78,7%, termasuk dalam kriteria "Layak". Berdasarkan hasil validasi ahli media, kriteria "Layak" terpenuhi dengan persentase 76,54% dari total skor. Selaras dengan temuan dari respon siswa menghasilkan nilai keseluruhan dengan persentase 81,21% yang berada pada kriteria "Sangat Layak". Berdasarkan hasil penelitian ini, Adobe Flash merupakan salah satu alternatif yang dapat digunakan untuk membuat media pembelajaran yang menghibur untuk pendidikan matematika.

### Abstract

The development of information and communication technology (ICT) is so fast in today's digital era, so it is important to create learning materials that can be accessed through various digital devices. The purpose of this research is to create edutainment media with adobe flash application that can be applied for arithmetic learning. This research is a development research (R&D) that uses the Borg and Gall (R&D) development model and is limited to several stages. These stages are: a) information gathering; b) planning; c) product manufacturing; and d) validation and testing. A total of 34 students who became test subjects as well as material and media validators were given questionnaires. Descriptive qualitative analysis was used for data analysis. The development results explained that the validation of Adobe Flash-based math learning media by material experts resulted in an overall score of 78.7%, including the criteria of " Feasible ". Based on the results of media expert validation, the " Feasible " criteria were met with a percentage of 76.54% of the total score. In line with the findings from student responses, the overall score is 81.21%, which is in the "Very Feasible" criteria. Based on the results of this study, Adobe Flash is an alternative that can be used to create entertaining learning media for mathematics education.

### INTRODUCTION

Learning media is an important tool in the teaching and learning process. With learning media, the learning process becomes more interactive and fun (Puspitarinim et al., 2019). In addition, learning media can also help students to more easily understand the material being taught (Mardiana et al., 2021). In today's digital era, the development of information and communication technology (ICT) is very rapid, so it is necessary to develop learning media that can be accessed through various digital devices such as computers, laptops, tablets, and smartphones (Handican & Setyaningrum, 2021). This can make it easier for students to access learning materials anytime and anywhere, and can improve students' digital skills. In addition, the

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development of learning media can also help in overcoming educational problems in remote areas or in areas that are difficult to reach (Basar et al., 2021). Mathematics learning is no exception.

A key aid in the process of learning mathematics is educational media. Students who struggle to understand mathematical ideas from text or verbal explanations can benefit from learning media (Suarsana et al., 2019). For example, using visual media such as images, videos, or animations can help students to better understand geometry concepts or mathematical equations (Velichová, 2022). Learning media can also be used to provide exercises and problems that can help students to better master mathematical concepts (Arnawa & Andalas, 2021). In addition, learning media can also be used to improve students' ability to think critically and creatively. Interactive learning media such as educational games or learning applications can help students to be more active in learning and applying math concepts in more real situations (Wijaya et al., 2020).

In today's digital era, learning media can also be used to overcome educational problems in remote areas or in areas that are difficult to reach (Rayuwati, 2020). With the existence of learning media that can be accessed through various digital devices such as computers, laptops, tablets, and smartphones, students can learn math anywhere and anytime (Sharples & Spikol, 2017). Overall, learning media can help students to better understand mathematical concepts, improve critical and creative thinking skills, and make it easier for students to access the learning materials needed.

The actuality on the ground has not demonstrated Indonesia's mastery of maths. Data indicate that Indonesian math proficiency is still low. The outcomes of the 2018 PISA test, administered by the Organization for Economic Co-operation and Development (OECD), are one example of this. The PISA results show that the average score of Indonesian students in mathematics is only 397, which is below the average score of students from other countries in Southeast Asia such as Malaysia, Thailand, and the Philippines (OECD, 2018). In addition, data from the Education Research and Development Agency (BP3) shows that the national exam results of SMA/MA students in Indonesia in mathematics are also still low. In 2020, only about 60% of students passed in math. This data shows that there are still many students in Indonesia who have difficulty in mathematics and need to be given greater attention and support in learning mathematics. This is necessary to improve students' math skills and prepare them for global competition.

Therefore, efforts and innovations in learning are needed to answer these challenges, one of which is to develop edutainment learning media based on adobe flash. Edutainment media is learning media that combines elements of education and entertainment (Handican & Setyaningrum, 2020). This media can be used to increase student interest and motivation in learning and edutainment is often used in learning in the fields of math, science, language, and history (Corona et al., 2013).

Edutainment media can be in the form of educational games, videos, animations, or applications that are fun and interactive. Educational games for example can help students to learn math in a fun way. Videos or animations can help students to understand abstract concepts better (Salsabila, 2020). Edutainment applications can be used to provide exercises and problems that can help students to better master the concepts taught (Zirawaga et al., 2017). In addition, edutainment media can also be used to improve students' ability to think critically and creatively. Interactive edutainment media can help students to learn in a more active way and apply concepts in more real-life situations.

Media for education (edutainment) can be created with the use of programs like Adobe Flash. Learning media created with Adobe Flash software is referred to as Adobe Flash-based edutainment media. In order to produce interactive multimedia content, such as games, animations, films, and applications, Adobe Flash is a program.. Edutainment media developed using Adobe Flash can be used to increase student interest and motivation in learning. Adobe Flash-based edutainment media can be an interesting alternative in learning. This media can be used to increase students' interest and motivation in learning and make the learning process more interactive and fun.

Some examples of research relevant to Adobe Flash-based edutainment media development research by Mahendra et al., (2021) - This research develops Adobe Flash-based math educational games and tests their effectiveness in improving the learning outcomes of elementary school students, Research by Astuti et al. (2019)- This research develops Adobe Flash-based interactive learning media for mathematics subjects and tests its effectiveness in improving student learning outcomes and research by Harsa & Napitupulu (2019)- This research develops Adobe Flash-based interactive-learning media for mathematics subjects and tests its effectiveness in improving junior high school student learning outcomes.

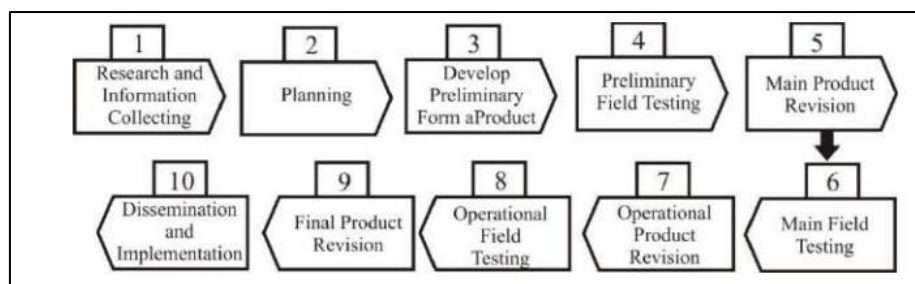
The difference between this research and the studies mentioned above is that this research will develop edutainment media that are specific in certain fields or subjects, the methods used to test the validity of the media, and the population used in the study. So the difference can be seen from the objectives and methods used in the study.

Based on what has been explained above, this research examines how to develop edutainment media through adobe flash that is valid and practical. To achieve these goals, the edutainment media developed must be valid in a pedagogical context and must meet high quality standards in terms of design, interactivity, and technical capabilities. In addition, the edutainment media should be practical and accessible to users, so that they can easily utilize this learning resource.

## METHOD

This research is included in the type of research and development or often known as Research and Development (R&D). The development model used is the Borg and Gall model, the Borg and Gall development model is one of the models used in the development of learning media (Maydiantoro, 2021). This model was developed by Borg and Gall in 1983 and is one of the most popular models in learning media development. The Borg and Gall development model focuses on a systematic and structured development process (Supriyono, 2022). Each stage in this model is expected to produce effective and quality products that can be used in the teaching and learning process (Muhardi et al., 2017). This model also focuses on developing media that suits the needs of students and can be used in real learning situations.

The ten steps of research and development (R&D) according to Borg and Gall can be described as Figure 1 below.



**Figure 1.** Research procedure of Borg and Gall model (Assyauqi, 2020)

The choice of this model is based on 2 things, namely 1) Systematic and structured, where this model offers a systematic and structured framework in developing program evaluation research, so that researchers can follow regular and clear steps and 2) has high quality standards, where this model considers high quality standards in terms of measurement instrument design, instrument validation, and data processing. This helps to ensure that the research results are reliable and valid. The Borg and Gall research and development steps are further divided into several levels, as shown in Figure 2 below.

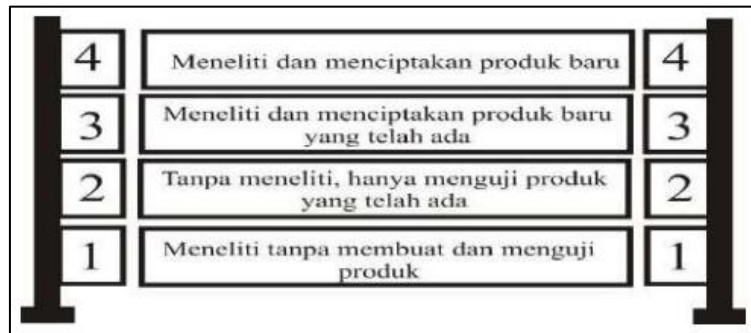


Figure 2. Levels of research based on the level of novelty (Assyauqi, 2020)

This study only uses a development model adapted from the Borg and Gall development model at level 1 with only a few steps without using all or all ten steps in Figure 1. The details of research and development at level 1 are as follows.

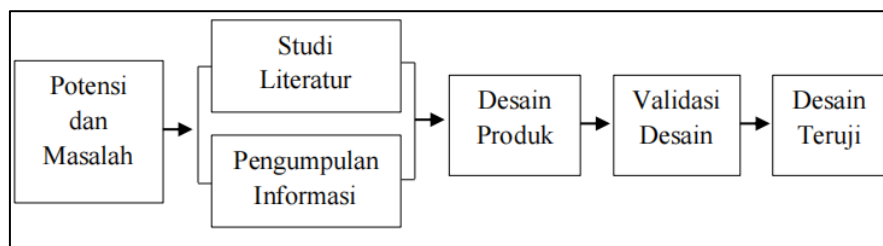


Figure 3. Borg and Gall Level 1 Procedure (Assyauqi, 2020)

Respondents in this study consisted of 34 students, 5 experts consisting of academics in the field of mathematics education (lecturers and teachers). The instruments used are media validation instruments, material validation instruments, student response instruments. Each instrument has carried out a content and construct validation process. The following is the lattice of each instrument used.

Table 1. Research Instrument Grid.

Instrument	Aspects	Indicator
Media Validation	Navigation	Ease of Navigation, Layout, and Functionality
	Text	Appropriateness of type, size, color, and legibility
	Language	Appropriateness of discussion, and comprehension
	View	Appropriateness of color, sound, image, layout, and background
	Media Presentation	Design coherence, ease of use, ability to increase motivation, knowledge, and self-learning
Material Validation	Content	Suitability of material with KD, objectives, coverage, content, ease of material, and suitability of examples and evaluation questions
	View	Appropriateness of presentation of the sequence of material and evaluation questions
Student Response	Ease	Ease of use and understanding of the material
	Motivation	Interest and attention
	Attractiveness	Display quality and attractiveness
	Usability	Positive impact, added skills and applicability

Source: Researcher Synthesis Results

Data analysis was carried out by descriptive quantitative data analysis in the form of converting the calculated scores into percentages and then adjusted to the assessment criteria as in table 2 below.

**Table 2.** Criteria for Validator and Student Assessment Results

Percentage	Decision
81%-100%	Very Feasible
61%-80%	Feasible
41%-60%	Feasible Enough
21%-40%	Not Feasible
0%-20%	Very Unfit

Source : Widyoko (2013)

## RESULT AND DISCUSSION

### Result

A early stage in the creation of Adobe Flash-based mathematics learning media entails obtaining data regarding the issues that crop up while students are learning the subject. The findings of this initial study serve as guidance for creating learning media concepts for mathematics disciplines that will be further refined. Additionally, carrying out a field study while reviewing the Competency Standards (CS) and Basic Competencies (BC) to acquire a grade VII Junior High School mathematics topic, specifically one involving the construction of cubes and beams.

The second stage, known as the planning stage, entails deciding on the goal of creating mathematics learning media in order to make the process of learning mathematics enjoyable, inspire learners with new innovations in learning, encourage learners to concentrate on learning, and make it simpler for learners to comprehend content in mathematics subjects. Additionally, gathering information on cube and beam building components from math textbooks and student math workbooks. Figure 4 shows the Adobe Flash-based edutainment media presentation.



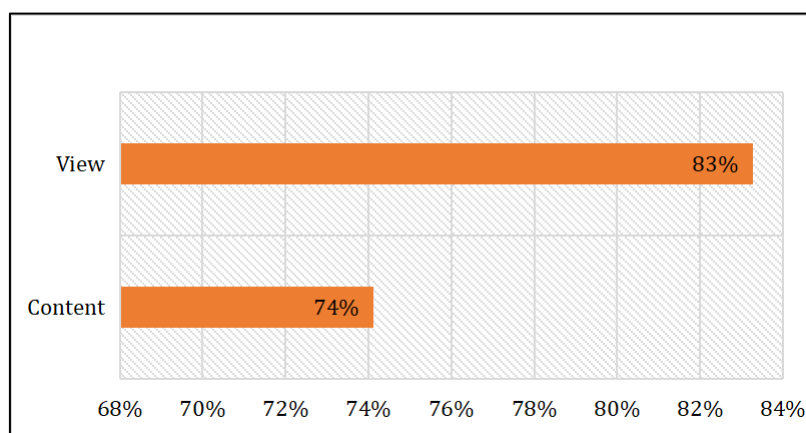
**Figure 4.** Adobe Flash-based Edutainment Media Display

This development also did not escape the changes suggested by the validators. Product revisions are made at each stage if you get constructive improvement comments, so that this edutainment media has gone through several compatible stages. The following is the final result of the material display in this adobe flash edutainment media. The display in Figure 5 explains how the material is organized based on student needs related to the desirability and attractiveness of the display.



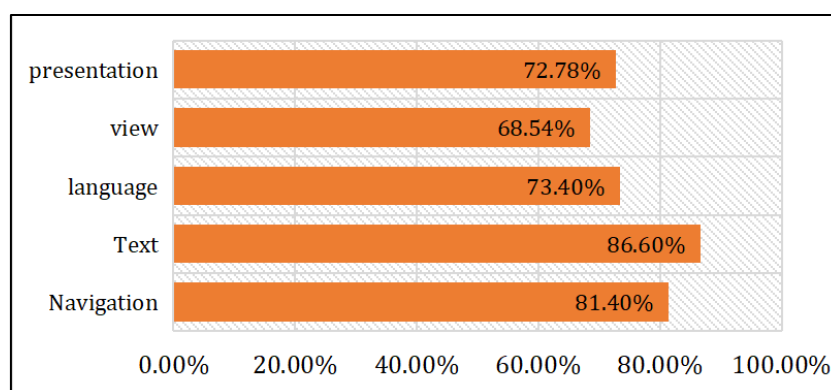
**Figure 5.** Display of material on edutainment media based on adobe flash

The third stage is the preparation of the design by developing flowcharts and storyboards so that they can be applied to Adobe Flash. The edutainment media was certified by three material specialists and two media experts after it was successfully created through a number of modifications.



**Figure 6.** Adobe Flash-based Edutainment Media Material Validation Results

The outcome of each aspect's validation by subject-matter experts is shown in Figure 6. With regard to the "Feasible" criteria, the content aspect received a score of 74.43%, and the "Very Feasible" criteria received a score of 83.45% for the display aspect. As a result, the overall score was 42, with a percentage of 78.7% including the "Feasible" criterion.



**Figure 7.** Adobe Flash-based Edutainment Media Validation Results

The outcome of each aspect's validation by media specialists is shown in Figure 7. The writing aspect received a score with a percentage included in the "Very Feasible" criteria of 81.60%, the language aspect received a score with a percentage included in the "Feasible" criteria of 73.40%, the display aspect received a score with a percentage included in the "Feasible" criteria of 68.54%, and the media presentation aspect received a score with a percentage included in the

"Very Feasible" criteria of 81.40%. Therefore, the aggregate score of 76.54% is considered to meet the "Feasible" requirement.

34 students tested the media after the validation was completed. The outcomes of this Adobe Flash-based educational media's validation are shown in the paragraphs that follow.

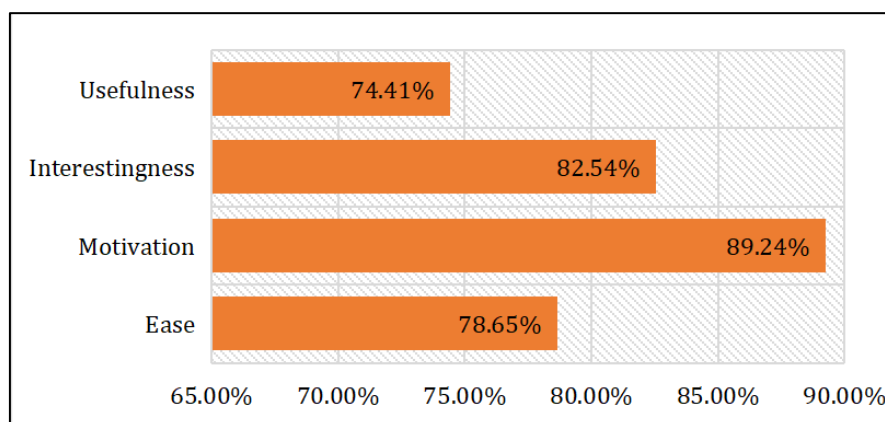


Figure 8. Student Response Results

Figure 8 is students' responses to this adobe flash-based edutainment media. The usefulness aspect has a score with a percentage of 74.41% with the category "Feasible". The attractiveness aspect scored 82.54% with the category "Very Feasible". While the aspects of motivation and convenience each obtained a percentage score of 89.24% with the criteria "Very Feasible" and 78.65% with the criteria "Feasible". Based on these results, it can be concluded overall that the adobe flash-based edutainment media scored a percentage of 81.21% with the category "Very Feasible".

## Discussion

Adobe Flash-based edutainment media can be said to be feasible in terms of the materials used because it offers high interactivity and attractive visualizations that can help students to more easily understand mathematical concepts (Susilawat et al., 2018). In addition, Adobe Flash also allows the development of feature-rich edutainment media such as simulations, games and videos that can be used to increase student engagement in learning (Ahmadi, 2020).

Adobe Flash-based learning materials have been proved in numerous studies to enhance students' math learning outcomes. Visual learning theory is one of the theories that bolsters the viability of content on Adobe Flash-based math learning medium. According to this notion, pupils will comprehend mathematical concepts more quickly and easily if the information is presented visually (Tiller, 2001). Mathematical content can be presented in engaging visual formats including graphics, animation, and simulations using Adobe Flash-based learning materials, which can improve students' conceptual understanding (Farida et al., 2021).

Additionally, studies demonstrate that learning materials based on Adobe Flash can boost students' interest in their studies. In a study conducted by Susilawat et al., (2018), it was found that students who studied using Adobe Flash-based learning media obtained better results than students who studied using traditional learning media. This is supported by the theory of student involvement which states that students who are more involved in learning will be better able to absorb the material taught (Munawaroh, 2017).

In conclusion, Adobe Flash-based mathematics learning media can be said to be feasible in terms of the material used because of its ability to present mathematical material in an attractive visual form and increase student involvement in learning. Visual learning theory and student engagement provide strong theoretical support for the use of Adobe Flash-based math learning media in the learning process (Imam et al., 2018).

Adobe Flash-based edutainment media can be said to be feasible in terms of the media used because it offers flexibility in its use. Adobe Flash can be run on various platforms such as

computers, laptops, tablets, and mobile phones, so students can learn anywhere and anytime (Andriani et al., 2021). In addition, Adobe Flash also allows the development of edutainment media that is rich in interactive features such as simulations, games, and videos that can be used to increase student engagement in learning. Adobe Flash also allows the development of edutainment media that can be tailored to individual student learning needs (Febriati et al., 2022). This can be done through the creation of learning scenarios that can be adapted according to the level of difficulty of students. This is very important in learning mathematics because each student has a different level of understanding.

In conclusion, Adobe Flash-based edutainment media in mathematics learning can be said to be feasible in terms of the media used because of its ability to offer flexibility in its use, increase student involvement in learning, and can be adapted to the individual learning needs of students. According to experts, Adobe Flash-based edutainment media has good validity in the teaching-learning process. Adobe Flash is a software used to create animations, games, and interactive applications. This allows Adobe Flash-based edutainment media to present subject matter in a fun and interactive form, so that students can more easily absorb information (Putra et al., 2020). In addition, Adobe Flash also makes it possible to create edutainment media that can be accessed through various devices such as computers, tablets, and smartphones (Harsa & Napitupulu, 2019). This makes Adobe Flash-based edutainment media can be used in various learning contexts such as at school, at home, or anywhere possible (Aulia, 2020). To make sure that the media is successful in enhancing student learning outcomes, several experts, however, also assert that the usage of Adobe Flash-based edutainment media must be supported with thorough evaluation and adequate criteria.

Students also tend to prefer learning through media that is fun and presents material in an interesting form for them, such as in Adobe Flash-based edutainment media. This media can also help students to learn in a more fun and effective way, which can increase students' interest and motivation to learn (Yanuari, et al., 2019). Several theories and studies have shown the advantages of edutainment media in the learning process. One of the theories that support the advantages of edutainment media is the theory of constructivism, which states that students will learn more effectively if they can construct their own knowledge through interaction with the environment (Mogashoa, 2014). Edutainment media can provide an interactive and fun environment for students to learn, which can help them to construct knowledge more effectively.

Research also shows that edutainment media can increase students' engagement in learning. In a study conducted by (Barkley, Cross, & Major, 2014), it was found that students who learned using edutainment media obtained better results compared to students who learned using traditional learning media (Zin et al., 2022). This is supported by the theory of student engagement which states that students who are more involved in learning will be better able to absorb the material taught (Hiver et al., 2021). Edutainment media can also help students in developing 21st century skills such as collaboration, communication, creativity and critical thinking (Chiruguru, 2020). Edutainment media that can be accessed online can also help students to learn independently and improve information technology skills (Surjono, 2020).

According to experts, edutainment media has several advantages in the teaching and learning process. One of the advantages is being able to present fun and interesting subject matter so that it is more easily accepted by students. This is because edutainment media combines elements of education and entertainment, so that students do not feel bored or saturated while learning (Nurfitrasari & Sumarni, 2014). In addition, edutainment media also helps increase student motivation to learn, because students feel happy and interested in learning because the material presented is fun (Febriati et al., 2022). Another advantage is that edutainment media can make the learning process more interactive and fun, so that students find it easier to remember and absorb information.

In conclusion, the theories of constructivism and student engagement provide strong theoretical support for the use of edutainment media in the learning process. The research also shows that edutainment media can improve students' learning outcomes and can assist students in developing 21st century skills.



## CONCLUSION

Based on the percentage of media validation assessment scores obtained a score of 76.54% with the criteria "Feasible", the percentage of material validation assessment scores that obtained a score of 78.7% with the criteria "Feasible", and the percentage of student response scores with a value of 81.21% with the category "Very Feasible" It can be said that Adobe Flash-based educational media satisfies the criteria for viability in terms of media, content, and student reactions. These results can provide benefits for mathematics education to be used in the process of improving student learning outcomes.

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