Development of Learning Media Based on Articulate Storyline 3 to Improve Student‘sUnderstanding of Mathematical Concepts

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Abstract. This study was conducted to improve students' understanding of mathematical concepts through the development of learning materials.The development model used is ADDIE which includes 5 stages: Analysis, Design, Development, Implementation, and Evaluation.The research sample included 25 students of class VIII-A MTS Private Sholihin.The data collection techniques used were tests, questionnaires, interviews, and observations.The results show that the learning materials deployed by the project can be used as learning materials, especially for constructing flat space materials.Material validation showed a percentage of 88.6% in the very feasible category, including assessment of the content, language, and presentation of the material.Media validation also showed a percentage of 91.1% in the feasible category, including an assessment of the appearance and design, content, and ease of use of the media.The learning media carried out by the development was also considered practical by teachers with a percentage of 92.675% in the very practical category.The development of this media can improve student's understanding of concepts, as can be seen from the results of learning interest questionnaires and tests.The results of the questionnaire showed the medium category with a score of 0.52 using the n-gaintest, while the test results showed the medium category with a score of 0.57 using the n-gain test.Based on the results of this study, it can be concluded that the learning medium Articulate Storyline 3 can be used as a means for students to understand mathematical concepts.

Keywords: Articulate Storyline 3, Learning Media, Understanding Student Mathematical Concepts.

1 Introduction

Mathematics has a relationship with technological developments. This is because mathematics is a significant discipline in influencing the progress of science and technology. Mathematical

ICIESC 2023, October 24, Medan, Indonesia

DOI 10.4108/eai.24-10-2023.2342258

skills are needed for the progress of learning, science, and technology. Mathematics is a universal science[1]. Currently, technological developments in education affect the growth of mathematics education. There are three uses of technology in mathematics education technology as an alternative role Paper and pencil replacement equipment to carry out mathematics learning activities, Technology acts as a learning area for a certain level of mathematical expertise, and technology acts as an independent learning area to improve conceptual understanding of mathematics learning.

One of the characteristics of mathematics is abstrac[2]. Mathematics is a branch of science that deals with magnitude, spatial structure, and change. To achieve the goals of mathematics education which include the development of critical, logical, theoretical, rational, and everyday problem-solving skills with confidence, every student needs to study mathematics. However, many students are less interested in learning mathematics because they find it a difficult subject. Related to this matter, mathematics is considered a difficult and especially scary subject for students[3]. Based on the results of the International Student Assessment (PISA) program, it shows that the mathematics ability of students in Indonesia is low from 70 countries ranked 63rd, this is due to the ability of each student to be different in mathematics[4]. The importance of understanding concepts in learning is undeniable because, through a good understanding of concepts, students can overcome problems and apply them in real life. Because it is considered a complicated subject, students' learning interest in mathematics tends to be low[5]. This is evidenced when teaching practices in general, students are more interested in talking to their deskmates than watching the teacher explain the material in class. Interest is one of the factors that can affect success in teaching and learning activities. Low student interest in learning can lead to a low understanding of student concepts.[6] To improve learning ability and understanding of concepts, efforts are needed to increase interest in learning which is considered an important factor. Therefore, alternative learning is needed that changes the mindset of students so that learning mathematics does not feel difficult and fun.

At this time, one choice of learning method that can be used is learning that focuses on digital literacy. Innovative learning media is needed to improve students' mathematics skills, especially in the ability to understand concepts. The use of media in teaching and learning activities can provide support to teachers in delivering material to provide students assistance

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in understanding mathematical concepts. Media plays an important role in learning as equipment to facilitate the delivery of material and can clarify the meaning conveyed to master students. The lack of use of media in mathematics teaching and learning activities can cause a decrease in students' understanding of concepts.

In a preliminary study conducted by researchers of MTS Private Sholihin in class VIII, it was found that student's ability to understand concepts was very low.In the sample of 24 students, no student had a high level of conceptual understanding (0%), up to 4.2% of students had an average understanding of the concept, and up to 95.8% of students understood the concept.at a low level.From this result, it can be concluded that the ability of 8th-grade students ofSholihin MTS Private School to understand mathematical concepts is very low.Based on observations and interviews with mathematics teachers at MTS Private Sholihin, several obstacles were identified that contribute to students' poor understanding of mathematical concepts.One of these obstacles is the lack of diversity in learning methods, media, and resources used by teachers during the teaching process.The learning currently being applied is still traditional andemphasizes the lecture method.Teachers share definitions, principles, concepts, and example exercises about material from the material being taught.Furthermore, math teachers admitted that very few media were used in teaching and learning activities, only LKS, printed books, markers, and deaf charts.Math teachers also admit that students' understanding of math learning concepts is still very low.Judging from the problems that students encounter in the teaching and learning process, many students still do not fully understand the materials given by the teacher.The reason is that students lack concentration in understanding the lesson and some students have not mastered the basic knowledge of mathematics.This situation gives students the impression that math is a difficult and uninteresting subject.

Under these conditions, it is important to have learning materials capable of enhancing understanding of mathematical concepts.Therefore, the researchers wanted to develop a learning medium that had never been used by math teachers at MTS Private Sholihin.This use of learning support is new at Sholihin Private MTS.One of the software developed as a learning medium is Articulate Storyline 3.Articulate Storyline 3 is one of the multimedia development tools that can be used to create learning materials that combine text, images, graphics, sound, animation, and video.This app presents learning material through screens and slides combined with audio and video, to make learning activities more enjoyable.Articulate Storyline 3 differentiates itself from media based on PowerPoint, Adobe Flash, and Macromedia Flash.Publishing results from Articulate Storyline 3 can be done as web-based media (HTML5) or as application files that can run on a variety of devices such as laptops, tablets, tablets, etcsmartphones, and mobile phones.

2 Method

This study used research and development design or Research and Development (R&D) by applying the ADDIE model.The ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model is a guide for researchers in developing learning materials based on Articulate Storyline 3. Choosing this development model based on its systematic advantages, in which each step is always preceded by a modified previous step, creating an effective product.The research plan that the researcher carries out includes the following steps:

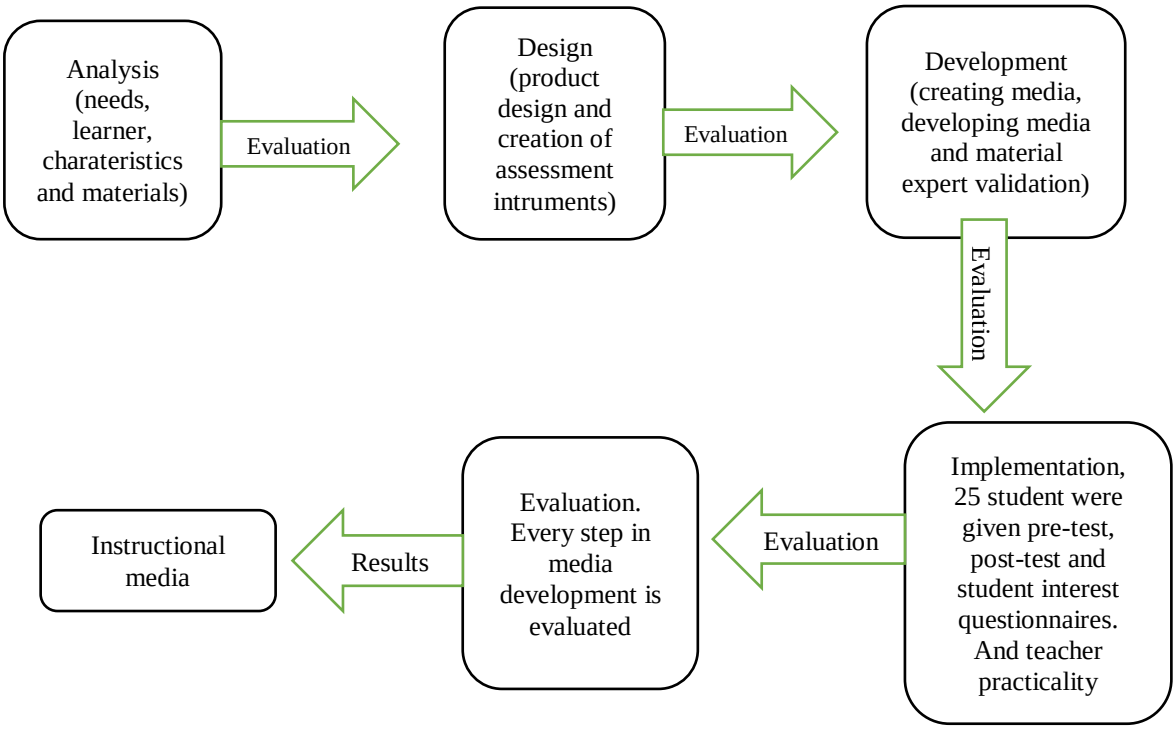

Figure 1. Step Of Research

This study was conducted at MTS Private Sholihin located on Jl.Sultan Serdang Pasar 6 G g. Madrasa, Telaga Sari village, Tanjung Morawa district.This study focuses on 25 students of class VIII-A in the even semester of the 2022/2023 school year.Data collection techniques used in this study included observation, interviews, questionnaires, and tests. The data collection process plays an important role in research because the main goal of research is to obtain relevant data[7]. In this study, the research tool used is a questionnaire or questionnaire with a Likert scale.This tool was used in the study as an evaluation questionnaire for materials experts, media experts, MTS math teachers, and students as research subjects.To determine the validity and practicality of this learning support activity based on Articulate Storyline 3, the research team used a questionnaire in the form of questions using a Likert scale to classify into 4 categories.

Table 1. Instrument grid media expert validation sheet

Aspects	Indicators
Display and design aspects	Compatibility of the background with the text and color combinations used
	Font size suitability and permanence
	Clarity of display
Content Aspect	Suitability of the description of the material and

[7] Sugiyono. (2013). Metode Penelitian Kuantitatif, kualitatif dan R&D. Bandung: Alfabeta, 298-311.

	grammar used
	The suitability of the use of animation in media
Ease of Use	The program is entirely easy to use and compact to use as teaching materials
	Attract students' attention

Calculate the results of analyzing the questionnaire for validation and practicality using the following formula:

$$V = \frac{\sum x}{N} \text{ X } 100\% \quad (1)$$

Keterangan

V = Persentage of Score , $\sum x = Sum\ of\ Score$*, N = Score Maximum*

Table 2. Validity Value Criteria

No	Score	Validity Criteria	Information
1	75 % < P ≤ 100%	Highly Valid	Very worth using
2	50 % < P ≤ 75%	Valid	Worth using
3	25 % < P ≤ 50%	Less valid	Worth using with revisions
4	0 % ≤ P ≤ 25%	Invalid	Not worth using

The effectiveness of learning media using *Articulate Storyline 3*, can be observed through increasing students' understanding of mathematical concepts and the completeness of student learning classically during teaching and learning activities with the application of these media in the classroom. Increased understanding of student concepts is measured through a comparison of pretest and posttest scores. To measure the increase, the N-Gain test method is used.

3 Result and Discussion

This study creates a multimedia learning product based on Articulate Storyline 3 to construct planar lateral space materials in odd semesters of Class VIII.This study was conducted at Sholihin Private MTS with 25 students as the research subjects.This research belongs to the type of development research according to the ADDIE development model which includes five stages, which are analysis, design, development, implementation, and evaluation.The following is an explanation of media development data using the ADDIE model:

3.1 Analysis Phase

In the first stage, specifically the analysis stage, analysis of problems that arise in practice is carried out as a basis for reflection.This phase includes several activities, namely needs analysis, student personality analysis, and document analysis.Based on initial observations and interviews with math teachers at MTS Private Sholihin, it was found that classroom math learning still uses a lecture method and is less student-oriented.Teachers have also not taken full advantage of digital learning media and still rely on whiteboards, markers, printed books, and LKS.Teachers also admit that students' ability to understand mathematical concepts is low.Based on the interview results, it was also found that one of the important needs to improve learning quality is the presentation of interesting materials.Therefore, there is a need for more learning materials, such as learning materials based on Articulate Storyline 3, which provide interesting, effective, and efficient learning materials.The media should improve their understanding of mathematical concepts, especially in the construction of flat space materials.Observations also showed that students have good skills in using digital tools such as laptops and mobile phones.

3.2 Design Phase

At this stage, two steps will be carried out by researchers, namely designing learning media products and compiling assessment instruments to be used. This product is carried out by compiling an outline of the material for building a flat side room, then preparing books as reference material, collecting pictures, making lesson plans, making explanation videos using GeoGebra editing using the InShot application, and making storyboards. Researchers designed learning media including the opening page, initial display, main menu, material menu, quiz menu display, info menu, reference page, and developer self-page. At this stage also carry out development to collect the data needed in this research. Instruments that have been prepared will be given to validators to carry out the validation of learning media.

3.3 Development Phase

At this stage, three steps will be carried out by researchers, namely media creation, validation by material experts and media experts, and validation of the practicality of learning media. Here are some descriptions of the media that have been developed. The opening page display on the Articulate Storyline 3 application contains an opening animation with the material title "Build a Flat Side Space". After that, it will automatically switch to the start menu section.

Figure 2. Main Menu Display

The main menu display in Articulate Storyline 3 contains a picture of the student's gender, on the top left there is a main menu button, the student's full name, school origin, material button, exercise button, info button, logout button, and menu display disable button. This question page consists of multiple-choice questions consisting of 10 questions and is displayed randomly and the choice options are also random. In other words, each student has a different appearance of the problem. After choosing an answer, students can click on the one on the left of the bar to proceed to the next question. When you finish answering the questions, you will automatically go to the quiz results page. The display of Quiz Results in Articulate Storyline 3 contains a review button to see the correct and incorrect answers that have been carried out by students, a print button to print the scores of the quiz results that have been carried out, and a back button to close the quiz. Your grade is displayed, the pass limit value, and if you pass will be given a congratulatory √, you pass if you have not passed will be given Tanya X sorry, you have not passed.

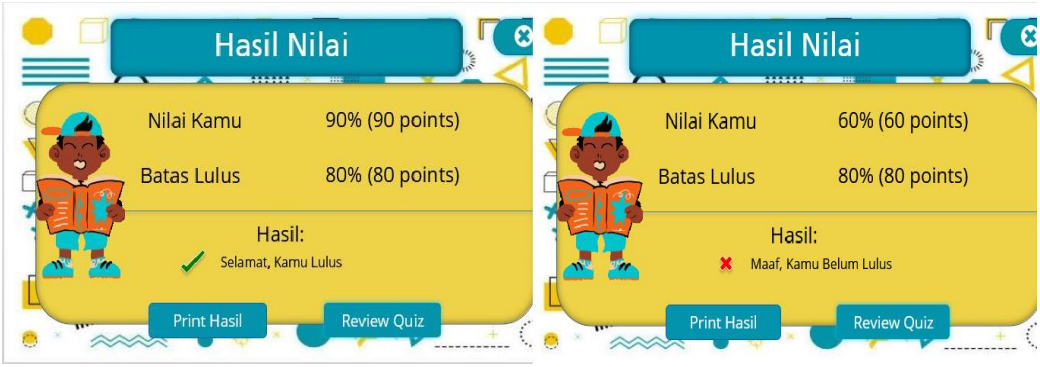

Figure 3. Quiz Page View

Learning media that have been developed by researchers are then tested for feasibility or validation by material experts and media experts. The following are the results of material expert validation.

Table 3. Material Expert Validation Results

Aspects	Vtotal
Content Eligibility	93,5 %
Language	83,3 %
Serving	88,9 %
Average	88,6 %
Criterion	Highly Valid

Table 4. Media Expert Validation Results

Aspects	Vtotal
Display and Design	90 %
Fill	91,7 %
User-Friendliness	91,7 %
Average	91,1 %

Criterion	Highly Valid

Based on the data collection results presented in Table 3, the feasibility aspect of the content reached an average value of 93.5%, indicating a very high level of validity.At the same time, the language aspect scored an average of 83.3%, also demonstrating a very high level of validity.Similarly, the presentation aspect scored an average of 88.9% also indicates a very high level of value.Overall, the appraisal results of materials experts showed an average score of 88.6% for the "Very Feasible" criterion.Therefore, the material contained in the Articulate Storyline 3-based study materials is considered valid and can be used in the live test.Experts also contribute to ensure that the media is of better quality.Based on the results of data collection from media experts shown in Table 4, aspects of form and design of learning materials achieved an average score of 90% with a very high level of value for students.Meanwhile, the content aspect of learning media scored an average of 91.7% with a very high level of validity.Furthermore, the ease of use aspect of the learning media also achieved an average score of 91.7% with a very high level of validity.Overall, the media experts' appraisal results showed an average score of 91.1% with the criterion "Very true".

3.4 Implementation Phase

After the learning media based on Articulate Storyline 3 has passed the validation process by media experts and material experts and undergone revisions, the next stage is implementation. At this stage, learning media will be tested for practice and effectiveness in learning activities. The implementation was carried out by distributing learning media to 25 grade VIII students and mathematics teachers at Sholihin Private MTS. The purpose of this implementation stage is to evaluate the practice and effectiveness of using learning media in learning.learning media is disseminated by researchers accompanied by mathematics subject teachers. This media is used by students in teaching and learning activities in as many as 5 meetings. Before entering the first meeting, researchers gave students pretest questions before using the media. After completion, researchers were provided with a class group by MTS Private mathematics teacher Sholihin to carry out the research. Researchers shared learning media through groups that had been provided and asked students to access learning media using each student's smartphone. In learning, students are asked to observe the entire content of the media. In the first meeting, the learning activity starts with the sub-chapter of cube material, in the second meeting the learning activity starts with the sub-chapter of block material, in the third meeting the learning activity starts with the sub-chapter of prism material, in the fourth meeting the learning activity starts with the sub-chapter of pyramid material. The last meeting was used to provide posttest questions along with questionnaires of students' learning interests after using learning media. The results of the post-test questions done by students are downloaded and sent back to the group provided. The practicality of this learning media can be seen from the value of student and teacher responses. The average response score given by the teacher was 94.2% with a very practical category, as well as the response given by students had an average of 91.15 with a very practical category. Then to see the effectiveness of this learning media, it can be seen that there is an increase in student learning outcomes with an average value of 0.57 with categories. The following table 5 shows data on improving students' concept understanding abilities.

Table 5. Improved Students' Concept Understanding Ability

No	N-gain score	Category	Frequency	Percentage
1	$g \geq 0.7$	Tall	4	**16%**
2	$0.3 \leq g < 0.7$	Keep	20	**80%**
3	$0 < g < 0.3$	Low	1	**4%**
	Sum		25	**100%**

3.5 Evaluation Phase

In the evaluation phase, the researchers evaluated the implementation of Articulate Storyline 3-based learning materials that had been implemented.When using these learning materials, students demonstrate enthusiasm and active participation.Sholihin, an MTS math teacher, found this study material very helpful and had no difficulty visualizing the materials needed to create a plane.

4. Conclusion

The development of learning materials based on Articulate Storyline 3 was carried out by applying the ADDIE development model consisting of five stages, which are analysis, design, development, implementation, and evaluation.Learning materials based on Articulate Storyline 3 are quality learning materials because they meet three main criteria: authenticity, practicality, and effectiveness in improving students' understanding of mathematical concepts.

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