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Development of Android-Based Learning Application Using Articulate Storyline 3

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Abstract

This research aims to create an Android-based learning application assisted by Articulate Storyline 3 software for class VIII students of SMP Negeri 13 Kupang that is valid, practical, and effective. The method used is Research and Development (R&D) with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. Data collection techniques and instruments include interviews, questionnaires, and tests. The data analysis technique uses qualitative and quantitative descriptive analysis techniques. This research produces an Android-based application product named "Relations and Functions" and has met the criteria for validity, practicality, and effectiveness. For media validity, the average assessment by 3 material experts was 4.37, and the average assessment by 3 media experts was 4.38, so it has the "valid" category. For the practicality of the media in small-scale trials, the student response was 4.72, and the effectiveness of the media through the percentage of learning completion was 100%. Meanwhile, in the large-scale trial, the subject teacher's assessment response was 4.5 and the student response was 4.63, so it was in the "practical" category. For media effectiveness, the learning completion percentage was 83.33% and was categorized as "very effective". Thus, the learning application developed is valid, practical, effective, and suitable for use in learning activities.

***Keywords**: addie development, android-based learning media, relation and functions*

INTRODUCTION

In the midst of this modern era, humans are increasingly inseparable from technological advances. The rapid advancement of technology today shows that the world has entered the era of globalization. This means that human activities always depend on technology. The use of technology makes it easier for humans in the fields of information, communication, transactions, entertainment, and personal needs. Technological developments also affect the world of education. According to Tondeur et al. (Lestari,

2018, p. 95), digital technology that is currently developing is starting to be used in the field of education as a means and infrastructure to support learning.

Data from the Newzo report (2021) shows that Indonesia is in the fourth position with 170.4 million smartphone users, the largest after China, which is in the first position, followed by India and the United States. Newzo (2020) reports that it is estimated that the smartphone-using population in Indonesia will reach 89.2% by 2025. However, the increasing use of smartphones, especially among students, is mostly used to access social media such as WhatsApp, Facebook, Instagram, and YouTube, according to the current trend, TikTok, and also to play games. To overcome this as an educator, of course, a new breakthrough is needed in creating innovative learning media. Sudjana & Rivai (2001) mention the benefits of learning media, including: (1) it can attract students' attention so that it can increase student learning motivation; (2) it can make learning more meaningful so that students understand the material better; (3) it can vary teaching methods so as not to make students feel bored; and (4) it can make learning activities more active.

Mathematics contains abstract concepts and objects, so it is not surprising that most students consider mathematics a troublesome subject (Khusanah et al., 2020). Relations and functions are two of the materials in mathematics that can be connected in everyday life. There are many examples of daily activities that have a relationship with relationships and functions but are not realized by students. In fact, there are still many students who have difficulty understanding the concepts of relations and functions, so students' ability to solve mathematical problems in this material is still low. The emergence of the COVID-19 pandemic has made it more difficult for students to understand this material because they have to learn independently without direct explanation from the teacher.

Based on observations and interviews with VIII grade teachers at SMP Negeri 13 Kupang, during online learning, teachers only provide teaching materials and Learner Worksheets for each meeting to students sent in PDF or Word form via WhatsApp and Google Classroom. The Learner Worksheet given is then done by students by only looking at teaching materials and student handbooks. In addition, there are some teachers who send learning videos via YouTube links to students with the hope that students can understand the teaching material. However, students are often tempted by other YouTube channels and tend to get bored with videos that are more than five minutes long. This

makes students not focus on the teaching material provided by the teacher. On the other hand, some students who do not have an internet quota cannot access the YouTube link or teaching materials and Learner Worksheets provided by the teacher, so they are forced not to participate in learning activities and not do assignments. So Learner Worksheets from the above problems, the solution offered by researchers is to implement learning applications that can be accessed offline or online without being limited by space and time both in class and at home and do not have to be connected to the internet network. The learning medium that is usually used to help students learn mathematics at SMP Negeri 13 Kupang is PowerPoint, which only displays material and images.

Android is an application that is very popular with everyone (Savitri, Karim, & Hasbullah, 2020). Android is an operating system that has open-source properties for developers who are free to create applications (Anggreani & Kustijono, 2013). Android-based learning that utilizes smartphone technology can make learning activities that were previously only monotonous in text more interesting and interactive with audiovisual elements and animated videos. So that students can more easily understand the learning material, learning objectives can be optimally achieved (Dwiranata, Pramita, & Syahruddin, 2017).

Learning media development requires software that can be published into Android-based applications. The software that can be used is Articulate Storyline 3. Articulate storylines are still unfamiliar to the public. In fact, the use and appearance of the menu in this software are almost similar to those in Microsoft PowerPoint, but Articulate Storyline 3 has several advantages, including its relatively simple use and the support of features to create quizzes with various options such as drag and drop, pick one, pick many, text entry, and so on. In addition, this software also contains features that can create questions with various forms of questions (true and false, match, multiple choice, fill-in, and others), create simple games, and create quizzes. Learning media published using articulate storyline 3 produces output in the form of HTML5 Web links, application files, personal pages, CDs, LMS, and Word (Putri, Heleni, & Murni, 2022).

Based on the description of the problem above, the researcher is interested in making an android-based learning application that aims to develop android-based mathematics learning media using Articulate Storyline 3 on relation and function material for class VIII students of SMP Negeri 13 Kupang that is valid, practical, and effective.

METHODS

This research uses a type of research and development (R&D) research with the ADDIE model, which consists of stages: 1) analysis, 2) design, 3) development, 4) implementation, and 5) evaluation, with the procedure shown in Figure 1.

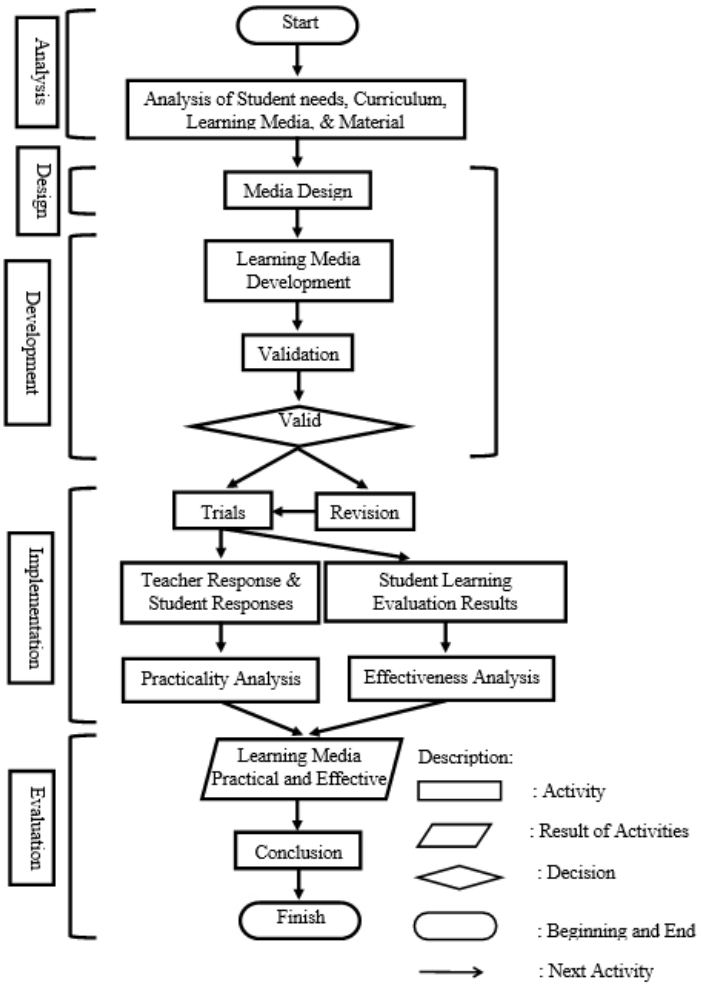

Figure 1. Research Procedure

This research and development was conducted at SMP Negeri 13 Kupang and took place during the 2022–2023 academic year, starting from the interview stage, analysis, application development, validation, and application testing. The research subjects consisted of 2 stages, namely 6 students of class VIII of Rosa Mystica Junior High School in the small-scale trial and 1 math teacher and 30 students of class VIIID of SMP Negeri 13 Kupang in the large-scale trial. Data collection techniques and instruments included interviews, questionnaires, and tests. Data analysis techniques used qualitative and quantitative descriptive analysis consisting of analysis of the level of validity, practicality, and effectiveness of the media.

The validity level is obtained through the filling out of a questionnaire by three material experts and three media experts. The results of filling out the questionnaire were then analyzed to determine the level of validity of the learning media that had been developed. Each score on each aspect is calculated using the formula and table of validity criteria that have been determined as follows.

$$RTV = \frac{\sum_{i=1}^{n} A_i}{m}$$

Description:

$RTV =$ average total validity of learning media
$A_i =$ the average of the i-th aspect
$i =$ aspect,
$n =$ many aspects

Table 1. Criteria for validity

RTV	Criteria
$4 \leq RTV \leq 5$	Valid
$3 \leq RTV \leq 4$	Valid Enough
$2 \leq RTV \leq 3$	Less Valid
$1 \leq RTV \leq 2$	Invalid

The results of the analysis by the three experts on the material and media aspects were then averaged to determine the validity level of the learning media.

The level of practicality is obtained by filling out the response questionnaires of subject teachers and students after using the application in class. The results of filling out the questionnaire were then analyzed to see the level of practicality of the learning media that had been developed. Each score on each aspect is calculated using the formula and table of practicality criteria that have been determined as follows.

$$RTP = \frac{\sum_{i=1}^{n} A_i}{m}$$

Description:

RTP average total practicality of learning media
$A_i =$ the average of the i-th aspect
$i =$ aspect,
$m =$ many aspects

Table 2. Practicality Criteria

RTV	Criteria
$4 \leq RTP \leq 5$	Practical
$3 \leq RTP \leq 4$	Practical Enough
$2 \leq RTP \leq 3$	Less Practical
$1 \leq RTP \leq 2$	Not Practical

The effectiveness of the media is obtained through test results given to students after using Android-based learning applications in learning activities. The test questions are in the form of multiple-choice questions totaling 10 numbers. The test results were then analyzed to determine the level of effectiveness of the media that had been developed. The effectiveness of learning media can be fulfilled well if the results of the assessment of students meet the percentage of the Minimum Completeness Criteria (MCC), which is formulated as follows.

$$P = \frac{L}{n} \times 100\%$$

Description:

P = Percentage of students who pass classically

L = number of students who pass the MCC

$n =$ number of students

Table 3. Effectiveness Assessment Criteria

Percentage of Completeness	Criteria
$P > 80$	Very Effective
$60 < P \leq 80$	Effective
$40 < P \leq 60$	Effective Enough
$20 < P \leq 40$	Less Effective

RESULTS AND DISCUSSION

This research produces a product in the form of learning media based on Android applications on relationship and function material for class VIII students. Research and development with the ADDIE model produces applications that can be installed on smartphone devices with the Android operating system. The results of the stages with the development model.

Analysis

The analysis stage aims to obtain information about: 1) student needs; 2) curriculum; 3) learning media; and 4) materials by conducting interviews and preliminary observations. The information obtained will be used as a reference and benchmark in designing and developing media. The following are the results of the analysis.

First, a student needs analysis was conducted to obtain information related to the obstacles experienced by students during the learning process as well as information about the learning media needed by students at this time. Based on the results of

interviews with mathematics teachers at SMP Negeri 13 Kupang, information was obtained that in mathematics learning activities, especially the material of relations and functions, there is no learning medium either online or offline. The only learning media owned by the school is offline-based learning media on the material of building space and flat shapes. So that students are less motivated and less eager to learn.

Second, curriculum analysis is carried out to determine the content of the material that must be included in the media. This is because the curriculum used in each class is different. Based on the results of the interview, the curriculum used at SMP Negeri 13 is the independent curriculum for grade VII students, while grade VIII and IX students still use the 2013 curriculum.

Third, there is a need for analysis of technology and learning media. From the interviews, it was found that mathematics learning at SMP Negeri 13 Kupang has no technology-based learning media. Some teachers still use student and teacher handbooks, teaching modules from last year, student worksheets, and teaching aids that are only limited to the material of building space and flat shapes. However, it has been rarely used since the COVID-19 pandemic because learning activities at school must be carried out online. So teachers and students need a technology-based learning medium to support learning both online and offline. The learning medium used by teachers is PowerPoint. However, the material included in the PowerPoint does not make students motivated and excited to learn because the display of material on the PowerPoint is less interesting and only monotonous with text. In limited face-to-face learning, teachers cannot use PowerPoint slideshows because the time given is very limited, so teachers only teach the core material and give assignments to students.

Fifth, material analysis is related to the content of the learning media to be designed, namely material that is relevant to what is taught at school and in accordance with the selected basic competencies. Based on the interview results, students tend to find it difficult to understand the material because they have not mastered the basic or prerequisite material, so they have difficulty exploring their abilities. From the interview results, students more quickly understood the material related to everyday life.

Design

The design stage is the stage of making flowcharts and sketches of learning media with several activities, including compiling flowcharts, designing storyboards, and

collecting media materials.

A flowchart serves as a diagram or flowchart that describes the structure and steps of delivering the content of the learning medium. This flowchart will be used as a foundation for designing storyboards in accordance with the structure of the media created. The flowchart display of this learning medium is described as follows.

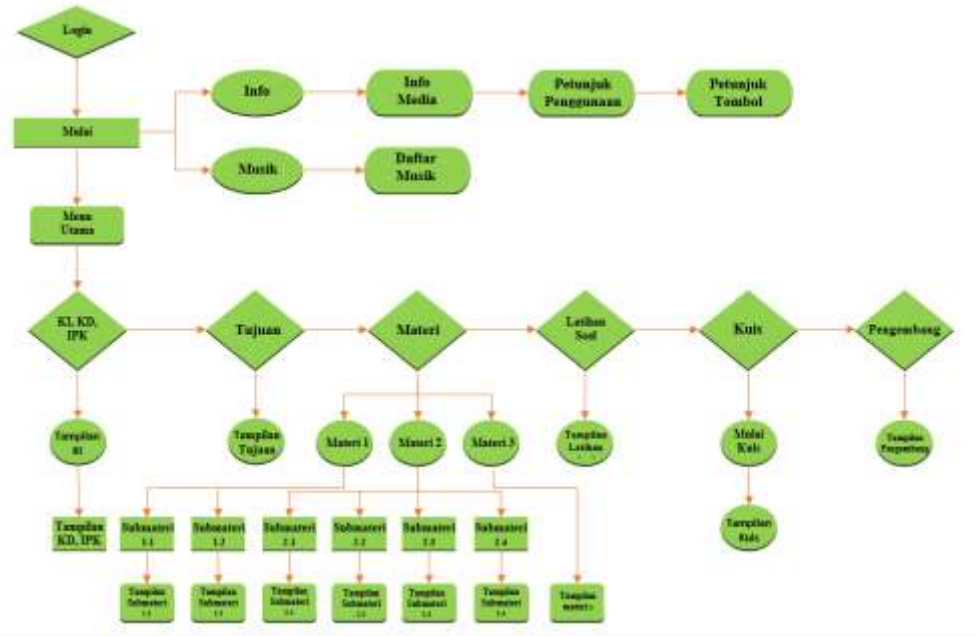

Figure 2. *Flowchart*

A storyboard is a sketch that describes the raw design of the learning medium to be developed. In this case, the storyboard created will display the position or layout of the material, content, images, logos, icons, buttons, and others. In the storyboard design stage, the developer uses the Canva application to create a storyboard display. The collection of media materials in the form of backgrounds, navigation buttons, gifts, images, and music is downloaded via freepik.com, Pinterest, and Google. The reference material taught in the media uses the SMP/MTs Class VIII Student Handbook Revised Edition 2017 Semester 1 (Mts, 2017).

Development

The results of the analysis of the flowchart and storyboard design that have been made are then implemented into the actual display so that the media becomes more attractive and easy to apply. Then, in the process of working, developers include backgrounds, frames, navigation buttons, music, animations, triggers, and images in gift, jpg, and PNG formats. As for the content of the material, quizzes, and practice questions,

the developer looks for ideas from several sources and articles to create innovative, creative, and interactive learning media. The learning media is developed using Articulate Storyline 3 and some supporting software such as Web2 APK Builder, Adobe Illustrator, and Microsoft PowerPoint. The appearance of the application page that has been made by the developer can be seen in the picture below.

Figure 3. View of the application page developed with Articulate Storyline 3

The learning media that has been developed and installed on an Android smartphone is then tested for validity by three material experts as well as media experts by giving a questionnaire that has been prepared previously to be assessed according to the results of observations of the learning media that has been developed. Learning media is said to be valid if it meets the validity criteria set based on the aspects of the assessment in the questionnaire. The results of the assessment in the questionnaire are then calculated using the specified formula. The results of learning media validation from each validator are as follows.

Table 4. The results of the validation analysis by the three material experts

Material Expert	Aspect Assessment	Total Score	Average Aspect	RTV
1	Curriculum	15	5	**4.38**
	Material	45	4.5	
	Evaluation	12	4	
	Language	8	4	
2	Curriculum	15	5	**4.35**
	Material	44	4.4	
	Evaluation	12	4	
	Language	8	4	
3	Curriculum	14	4.67	**4.39**
	Material	44	4.4	
	Evaluation	12	4	
	Language	9	4.5	
Average				**4.37**
Category				**Valid**

Based on Table 4, the total average validity of learning media obtained from the assessment by 3 material experts is 4.37 and is in the range of $4 \leq RTV \leq 5$, so according to the media validity criteria table, it is categorized as valid.

Table 5. Results of a validation analysis by three media experts

Media Expert	Aspect Assessment	Total Score	Average Aspect	RTV
1	Software Engineering	19	4.75	**4.47**
	Audiovisual Display	42	4.67	
	Language	8	4	
2	Software Engineering	18	4.5	**4.24**
	Audiovisual Display	38	4.22	
	Language	8	4	
3	Software Engineering	17	4.25	**4.44**
	Audiovisual Display	41	4.56	
	Language	9	4.5	
Average				**4.38**
Category				**Valid**

Based on Table 5, the total average validity of learning media for assessment by 3 media experts is 4.38 and is in the range $4 \leq \text{RTV} \leq 5$, so according to the media validity criteria table, it is categorized as valid.

Implementation

At this stage, the media that has been validated and declared feasible to use according to suggestions and comments from experts is then improved by researchers. After that, the valid media was tested in the field. The trial consisted of two stages, namely small-scale trials and large-scale trials.

Figure 3. Small-scale trial and large-scale trial

At the small-scale trial stage, the researcher involved six eighth-grade students at Rosa Mistyca Junior High School. In the testing process at this stage, the researchers introduced themselves as well as conveyed the purpose and objectives of this research. After that, the application file that has been uploaded to Google Drive is shared with students via WhatsApp so that they can download and install the application on their respective smartphones. Next, the researcher introduces and demonstrates the application briefly, explaining what is in it and how to use it. The goal is that students are easier and more interested in using the learning media. After that, students study the material on the learning medium independently. Learners who do not understand both the material and how to operate the application are given the opportunity to ask, and the researcher will explain things that have not been understood. After students use the learning media, researchers give test questions and student response questionnaires to determine the level of effectiveness and practicality of the learning media. The results of the analysis show that the average practicality of the media is 4.72, so it is categorized as "practical" and the percentage of completeness of student learning outcomes is 100%, so it is included in the criteria "very effective".

In the large-scale trial stage, the implementation of learning media is carried out offline. This trial was conducted as part of learning activities in class VIIID, consisting of 30 students. Learning activities were carried out in as many as five meetings with the teacher as the lecturer. In the first meeting, students were directed to download and install the application on their respective smartphones. The teacher then delivered the learning material, which began with a game to help students understand the concepts of relations and functions. Then the teacher explained the material from the game played. At the end of learning, students complete the quiz in the application. The teacher also provides additional assignments in the application to be done at home. At the last meeting, researchers distributed test questions and teacher and learner response questionnaires to see the effectiveness and practicality of the media. The results of the analysis showed that the average practicality of the media in the subject teacher's response was 4.5, so it was included in the "practical" category, and the average practicality of the media in student responses was 4.63 in the "practical" category. Meanwhile, the results of the effectiveness of learning media with the Minimum Completeness Criteria (MCC) are ≥70, and the maximum score of 100 obtained a percentage of completeness of 83.33%, including 25 students who passed and 5 students who did not pass. Thus, the media is included in the "very effective" category.

Evaluation

Evaluation is the final stage of research with the ADDIE model. However, this stage also needs to be done at every stage of the development model to find out what deficiencies in the learning media need to be corrected, review the development program, and make an assessment.

The final product produced in this research is an android-based learning application on relational and functional material for junior high school class VIII. This application is named "Relation and Function". In the development process, researchers used the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation. The developed learning medium has met the eligibility criteria, namely valid, practical, and effective.

The results of the data analysis of the validity of learning media based on Android applications on relation and function material are in line with research conducted by Supratman, Jubaerudin, and Santika (2021), who expect further research by paying

attention to weaknesses, namely increasing the variety of forms of questions and practice questions linked to Google Forms. From these weaknesses, researchers have made questions with various forms of questions, namely multiple choice, true false, matching, and short form.

The results of the data analysis of the practicality of learning media based on Android applications on relation and function material are in line with research conducted by Syam & Izzati (2020), where the learning media developed is very practical and gets a good response from students after using the application simultaneously in class.

The results of the data analysis of the effectiveness of learning media based on Android applications on relational and function material are in line with research conducted by Demon, Nubatonis, and Dominikus (2021), where the learning media used is very effective and feasible to use as an evaluation tool that supports learning activities. However, there are still students who open other applications during the learning process, so it requires extra supervision of the use of the application.

Based on the relevant research above, this Android-based application has several advantages and disadvantages as a technology-based learning tool. The advantages of this application include: 1) The "Relation and Function" application is an android-based math learning application on relation and function material that is practical and effective for use in learning activities. 2) The application presents material in the form of games, quizzes, and animations, as well as learning videos, to assist students in learning the material of relations and functions. 3) The application is not limited by space and time, so students can learn the material of relations and functions independently anywhere and anytime. 4) This application also presents material, games, practice questions, learning videos, and quizzes that will be rewarded in the form of certificates if students are able to complete quizzes if they meet the Minimum Completeness Criteria (MCC) so that they can increase learning motivation, interest in learning, and student understanding of the material of relations and functions. While the disadvantages of this application include: 1) There are several features that require internet access when sending answers to practice questions and watching learning videos. 2) It requires fairly large RAM and internal memory because this application is about 66 MB.

CONCLUSION

Based on the results of the development and research results above, it can be concluded that math learning media based on android applications using Articulate Storyline 3 on relation and function material for Class VIII students of SMP Negeri 13 Kupang is declared valid, practical, effective, and feasible to use in learning activities.

Based on the above conclusions, as for suggestions from researchers for further research, it is hoped that it can make more creative and interesting media and can make learning applications with other materials that are tailored to the curriculum at school so that the learning media developed are not only limited to Relation and Function materials. In addition, the developed application can be uploaded to the Play Store and used on other devices besides Android.

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