Development of Android-based learning media using Smart Apps Creator on high school trigonometry material

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Received: 24 August 2023; Revised: 12 October 2023; Accepted: 13 October 2023

Abstract: This research is motivated by students’ low enthusiasm to participate in mathematics. Students are more interested in using technological developments in learning because they look attractive, simple, and practical. This research aims to produce learning media based on Android using a valid and practical Smart Apps Creator. This research type is often known as Research and Development (R&D) using the ADDIE development model (Analyze, Design, Development, Implementation, Evaluation). The participants in this study were XI IPA students at SMAN 1 X Koto in the Tanah Datar region. Validation questionnaires and practicality test questionnaires were the instruments utilized in this investigation. The percentage of the final assessment of the validity of learning media was 92.5%, with a very valid category based on the findings of the validator's assessment, which included media specialists and material experts. The teacher received a total score of 100% in the extremely practical area for the practicality rating. The pupils' ultimate practicality score fell into the very practical group with an 83.24% percentage. With a typical rate of 91.6%, using media is feasible. Based on the study’s findings, the Smart Apps Creator-based Android learning resources for class XI IPA SMAN 1 X Koto, Tanah Datar Regency have been deemed legitimate and workable for usage by instructors and students.

Keywords: ADDIE, Android-based learning media, Smart Apps Creator, Trigonometry


INTRODUCTION

The growth of information technology is accelerating in the current era of globalization, and its influence on the field of education cannot be avoided. The field of education must continually adapt to technological changes in order to improve educational quality. This includes modifying how information and communication technologies are used in education, particularly throughout the learning process (Fitri et al., 2021; Budiman, 2017; Napiah et al., 2022). One of the many technological developments owned and often used by students is a smartphone. According to Astuti et al., (2018) more and more students have and using a smartphone, the greater the opportunity to use technology in education World. The use of information and technology as a tool to enhance teaching and learning activities is one illustration of how technology in the field of education has been quickly adopted. The creation of multimedia is necessary in the field of education as a distinctive learning medium. (Permata & Rahmawati, 2018).

Generation Z or Gen Z (1995-2010) is the first generation to have been exposed to technology from an early age. The technology is in the form of computers or other electronic media such as cell phones, internet networks, and even social media applications. Born and raised along with advances in the digital world, this makes Gen Z different from previous
generations. A very striking difference from generation Z to other generations is the use of cell phones (Izzati et al., 2016; Khairunnisa & Heriyadi, 2023). Cellular phones (smartphones) have the potential to be used as a learning medium (Astuti et al., 2018). Learning media can boost the efficacy and efficiency of the teaching and learning process, encourage good relationships between teachers and students, and aid students in getting through boring lessons. At the time of the observation in class XI IPA SMAN 1 X Koto, Tanah Datar, the teacher was using textbooks as a learning medium rather than information and communication technology.

Based on observations and interviews that have been conducted, it was found that students have low enthusiasm in participating in mathematics learning and tend to prefer learning that uses technological developments because of its attractive appearance so that students do not get bored during the learning process. During the learning process, many students do not bring textbooks due to heavy reasons because mathematics textbooks are thick. Students want straightforward and useful learning tools. New learning resources are necessary, according to the observations and interviews that have been undertaken, so that students can quickly pick up the subject and understand it on their own. According to Melmharti et al., (2023) Mathematics learning results and student learning independence are impacted by IT (information technology)-based learning media. The creation of Android-based learning media using clever app creators is one solution that may be provided to help students and teachers in the learning process. To allow students to study freely without the teacher explaining it in front of the class, creators of Android-based learning media can include a video menu that describes the subject matter. Based on research conducted by Mahuda et al., (2021) the results obtained were that Android-based learning media using smart apps creators were effective in their use.

Software like Smart Apps Creator has a number of benefits, including the fact that anyone can use it effectively because it doesn't require programming knowledge. This application's output can be used on a variety of platforms, including Android, can include animation based on the developer's requirements and preferences, interaction, supports a variety of storage media formats and incorporates web services to make programs more functional (Budyastomo, 2020). Android-based smart apps creators also make it easy for students because after downloading the application on a smartphone students can easily access the media anywhere and anytime without having to be connected to the internet and are also equipped with practice questions according to the material they have learned, so that students can evaluate themselves from what they have learned. Smart apps creators also don't require a large storage space (Elviana & Julianto, 2022).

Research conducted by Maulia, (2022) with the title "Development of Interactive Learning Media Using Smart Apps Creator for Class XI SMA on Sequences and Series Material" shows that the products produced are valid and practical. The menus provided in the resulting product are basic competency menu, material menu, quiz menu and profile menu. For product updates that will be made from previous research, there is a guide menu that can make it easier for students to use the product and a video menu that displays video discussions of the material presented. Based on the background of this problem, the aim of this research is to produce Android-based learning media using smart apps creator on trigonometry material in class XI Science at SMAN 1 X Koto, Tanah Datar Regency that is valid and practical.

**METHOD**

Research and development, usually known as R&D, is the umbrella term for this study. According to Sugiyono (2019) research and development functions to verify and develop certain products (Oktaviani et al., 2023; Charissudin et al., 2021; Rismen et al., 2018). According to Feriatna, (2017), create and validate a product that will be used in education and learning, research and development activities are carried out. In other words, the goal of this research is to create a product and evaluate its viability and appeal. The ADDIE model was employed as the development model in this investigation. According to Hidayat & Nizar (2021)
The idea behind the five phases of the learning development process are listed below. Whether you want to deliver a learning product through an offline or online training program, coaching, a presentation, or an information pamphlet, the ADDIE training model offers a streamlined, structured framework that will help you do it.

The five stages of the ADDIE paradigm are: a. Analyze; b. Design; c. Development; d. Implementation; and e. Evaluation. The stages of the ADDIE Model are presented in Figure 1.

![ADDIE Model Stages](image-url)

**Figure 1. ADDIE Model Stages**

The steps of the ADDIE development model are shown in Figure 1. According to Sugiyono (2019), the steps involved in creating the ADDIE model are: (1) Analysis, Information that can be used to create products is gathered during the analysis step. At this point, information is gathered in the form of difficulties or barriers encountered during learning. (2) Design. The design stage for learning media is now being completed, which entails developing a media design and specific process needs. Storyboards are one of the tasks completed at this point. (3) Development, utilizing a smart apps creator and the previously described design, production of Android-based learning media. The learning media are then validated after that. (4) Implementation, Following the learning media's validation by the validator, a small group evaluation involving one instructor and six students was conducted during the learning media deployment stage. (5) Evaluation, at this point, an assessment of the implemented and tried-and-true learning media is done. If there are still flaws, corrections are made.

**Analyze Stage**

The analysis phase is carried out for the process of gathering information needed in developing learning media. Syllabus analysis is carried out with the aim of knowing whether the material taught is in accordance with competency standards, basic competencies, and competency achievement indicators. This analysis is carried out by filling in a checklist instrument that has been made previously based on the syllabus used in the learning process. Textbook analysis aims to see the suitability of the contents of the book with competency standards and basic competencies that must be achieved by students. Books that are suitable will be used as a reference for drafting concepts, self-training on the media to be developed. This analysis was carried out by filling in a checklist instrument that had been previously created based on the textbook used in the learning process.

Characteristic analysis looks at how well students can learn, as well as their prior knowledge, abilities, attitudes, and other relevant factors. The purpose of this investigation is to determine how students react when utilizing textbooks to learn mathematics. A questionnaire that was sent out to students was used in this investigation to gauge how they felt about using textbooks to learn. Interviews were conducted with the aim of finding out what problems or obstacles that occur and are encountered in schools related to learning mathematics. This interview stage was carried out in the early stages, namely at the time of observation using a questionnaire and direct interviews.
Development Stage

In this stage, the framework generated at the design stage is realized into a ready-to-use product using the Smart Apps Creator as an application development tool. In the development stage there are steps that must be carried out before proceeding to the next stage, namely expert review. The steps for creating Android-based learning media products using Smart Apps Creator according to the design that has been created are as follows: a. Developing the learning media framework design created in the previous stage, b. Developing material presentation, c. Product packaging, this learning media is packaged in the form of an application.

Implementation Stage

The development stage continues into this stage. The media has been developed at this point following revision. The Smart Apps Creator, which was created and implemented in a real environment, meaning the classroom, is used by Android-based learning media. However, at this point the researcher was only able to test the product in small groups (limited trial), which included subject instructor and student reactions to the created learning materials. The trial's goal is to evaluate the media's level of applicability. There was just one math teacher and six class XI IPA SMAN 1 X Koto, Tanah Datar pupils who had studied trigonometric material. The students ranged in ability from high to medium to low.

RESULTS AND DISCUSSION

Results

With the product created in the form of Android-based learning media using Smart Apps Creator on Trigonometry content, this research employs the Research and Development (R&D) kind of methodology. The steps of the ADDIE development model, which was used in this study, include analysis, design, development, implementation, and evaluation. The research and development activities resulted in the following research findings:

Analyze Stage

a. Syllabus Analysis

The review of the syllabus revealed that the content was in line with the competencies that were required of the students. The order in which the information is presented reflects the competences that must be attained. The material that will be created for Android-based learning media utilizing Smart Apps Creator is in agreement with the fundamental skills listed in the 2013 curriculum syllabus, according to the syllabus analysis.

b. Textbook Analysis

The review of the IPA mathematics textbook for class XI revealed that the content was in line with the core skills and fundamental competencies specified by the syllabus. The systematics and completeness of the material in the textbook are symmetrical and complete. The language and images in the textbook are easy to understand, but more examples in the book need to be added so that students better understand the material in the textbook.

An Android-based learning resource was created as a learning process companion based on the findings of the textbook analysis. As a result, trigonometry-related instructional resources for Android were created using Smart Apps Creator.

c. Analysis of student characteristics

The results of the analysis of student characteristics during observations showed that the students in class XI Science at SMAN 1 This can be seen from the learning facilities of students who already use Android as a learning medium. The academic achievement of class The learning styles of class XI Science students vary greatly, some of them like to study in groups, individually, audio-visually and others. This affects the level of intelligence of students which
also varies based on the delivery of knowledge. Class XI Science students hope that learning mathematics will be more interesting so that they can digest the knowledge provided more easily, so that they can get satisfactory grades.

d. Analysis of Student Responses to Mathematics Textbooks

Based on the student response questionnaire to textbooks, the results showed that students were less able to understand the lesson material using textbooks. Textbooks make students' attitudes in learning mathematics less good. Students cannot increase creativity in learning using textbooks. Apart from that, students' enthusiasm for learning mathematics decreases and students feel bored when studying because learning using textbooks does not attract students' interest in learning.

e. Teacher and Student Interview

The results of interviews with teachers obtained information that the learning media used by teachers in the learning process were textbooks and teaching aids. Teachers hope that learning media will be further developed in accordance with existing technological developments, so that students will be more innovative and can think creatively. From the results of interviews with several students regarding learning methods, it can be concluded that the way the teacher conveys the lesson material is quite good, but it is hampered by the learning media which seems boring because they still use textbooks and teaching aids. Not to mention that textbooks that are thick and have minimal illustrations can have the effect of lowering the quality of student literacy. During the interview, students also said that the most difficult sub-material was trigonometry because there were many formulas and angle comparisons that needed to be memorized. Students' hopes are that there will be an increase in the quality of learning media that is more practical and easily accessible according to technological developments.

Design Stage

The next stage is the design or planning of learning media using Smart Apps Creator on trigonometry material. Starting with designing the systematics and structure of learning media using Smart Apps Creator.

Development Stage

When developing learning media for Android using Smart Apps Creator, the design that was generated during the design phase is used as a reference. The finished product, which takes the shape of Android-based learning media, is validated by media professionals and subject matter experts to ascertain the veracity of the created learning media. The validation results can be seen in Table 1.

<table>
<thead>
<tr>
<th>Assessment Aspects</th>
<th>Media Validators (%)</th>
<th>Material Validators (%)</th>
<th>Final Score (%)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Eligibility</td>
<td>87,5</td>
<td>87,5</td>
<td></td>
<td>Very Valid</td>
</tr>
<tr>
<td>Presentation Eligibility</td>
<td>91,7</td>
<td>91,7</td>
<td></td>
<td>Very Valid</td>
</tr>
<tr>
<td>Language Eligibility</td>
<td>91, 7</td>
<td>100</td>
<td>95,8</td>
<td>Very Valid</td>
</tr>
<tr>
<td>View Eligibility</td>
<td>87,5</td>
<td>87,5</td>
<td></td>
<td>Very Valid</td>
</tr>
<tr>
<td>Ease Of Use</td>
<td>100</td>
<td></td>
<td>100</td>
<td>Very Valid</td>
</tr>
<tr>
<td>The Final Value Of Learning Media Validation</td>
<td></td>
<td></td>
<td>92,5</td>
<td>Very Valid</td>
</tr>
</tbody>
</table>

Table 1 shows that the material expert's validation value on the content feasibility aspect is 87.5% with a very valid category. The results of the validation show that the material presented in the learning media is in accordance with the competencies to be achieved. In the presentation aspect, a value of 91.7% is obtained with a very valid category. The results of the
validation illustrate that the material in the learning media has been presented in a systematic order. In the linguistic aspect, a value of 95.8% is obtained with a very valid category. The results of the validation illustrate that the developed media is in accordance with the rules of the Indonesian language. The display aspect is 87.5% with a very valid category. The validation results show that the appearance of the media is attractive. In the aspect of ease of use, a value of 100% is obtained with a very valid category. The results of the validation show that the developed media is easy to access and easy to use.

The validation value of all aspects of the validity of Android-based learning media using the Smart Apps Creator is 92.5%. This shows that Android-based learning media using the Smart Apps Creator is very valid. In line with what was stated by Arikunto & Suharsimi (2012) where the product is said to have high validity if the results match the criteria or high category. The media has been presented clearly, the content is in line with the skills to be attained, and the language used in the media complies with Indonesian language norms in a way that makes it simple to grasp. It has been intriguing in terms of appearance in the media. The media is also simple to utilize and readily available.

**Implementation Stage**

The media trial aims to see the practicality of Android-based learning media using Smart Apps Creator on trigonometry material that has been developed involving mathematics teachers and 6 class XI science students who have studied trigonometry. The results of practical trials by mathematics teachers and students on Android-based learning media using the Smart Apps Creator can be seen in Table 2.

<table>
<thead>
<tr>
<th>Assessment Aspects</th>
<th>Final Score (%)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease Of Use</td>
<td>100</td>
<td>Very Practical</td>
</tr>
<tr>
<td>Efficiency Of Learning Time</td>
<td>100</td>
<td>Very Practical</td>
</tr>
<tr>
<td>Benefits Gained</td>
<td>100</td>
<td>Very Practical</td>
</tr>
<tr>
<td>The Final Value of The Practicality of Learning Media</td>
<td>100</td>
<td>Very Practical</td>
</tr>
</tbody>
</table>

**Table 2. Results of the practicality of learning media by teachers**

**Table 3. Practicality of Learning Media Results by Students**

<table>
<thead>
<tr>
<th>Assessment Aspects</th>
<th>Final Score (%)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease Of Use</td>
<td>81.7</td>
<td>Very Practical</td>
</tr>
<tr>
<td>Efficiency Of Learning Time</td>
<td>83.3</td>
<td>Very Practical</td>
</tr>
<tr>
<td>Benefits Gained</td>
<td>84.7</td>
<td>Very Practical</td>
</tr>
<tr>
<td>The Final Value of The Practicality of Learning Media</td>
<td>83.2</td>
<td>Very Practical</td>
</tr>
</tbody>
</table>

Based on Table 2, it can be explained that the practicality value of Android-based learning media using Smart Apps Creator by teachers is 100% with very practical criteria. Meanwhile, Table 3 shows that the results of data analysis on the practicality of Android-based learning media using Smart Apps Creator by students have a final score of 83.2% which meets the very practical criteria.

Based on the practicality results by teachers and students, the average practicality score for learning media was 91.6% in the very practical category. This shows that Android-based learning media using Smart Apps Creator on practical trigonometry material is used for mathematics learning at SMAN 1 X Koto, Tanah Datar Regency.

**Evaluation Stage**

The evaluation stage is the last step in the creation of educational material. The assessment stage has two components, formative evaluation and summative evaluation, however only formative evaluation was conducted for this study because its goal is to assess the reliability...
and applicability of Android-based learning media created by smart app creators. When performing validation, formative evaluation is also conducted during the development stage.

**Discussion**

According to research done by (Nengsih et al., 2022), Android-based learning media that was helped create by Smart Apps Creator (SAC) met very valid standards, with material validity at 86.66% and media validity at 86.98%. Smart Apps Creator (SAC)-assisted Android-based learning media met very practical standards in terms of teacher and student responses, with 95.2% and 92.7%, respectively, on questionnaires that gauged practicality. In the meantime, this study created trigonometric learning materials for Android that are quite valid, with a rate of 92.5%, utilizing Smart Apps Creator. A 100% was given for practicality with teachers, and an 83.24% was given for practicality with pupils. Media use scores highly on the practicality scale among teachers and pupils, with a rate of 91.6%. This demonstrates the validity and applicability of Android-based learning media created with Smart Apps Creator.

**Analyze**

The analysis stage was carried out to gather the necessary data by keeping an eye on the creation of instructional media at SMAN 1 X Koto, Tanah Datar Regency. Trigonometry content is in compliance with the KI and KD in the 2013 curriculum, according on observations of the syllabus and textbook analysis results. The trigonometry subject has been systematically explained in the textbook, with comprehensive material that has been covered in order and complete examples of questions.

Based on the analysis of student characteristics and the results of teacher and student interviews, it can be seen that students have low enthusiasm and are less interested in the learning process, so teachers must be able to present material more creatively. In class XI Science at SMAN 1 In the learning process, the time provided by the school is also limited. The media used by teachers during face-to-face learning are textbooks and teaching aids. However, many students are reluctant to use these books on the grounds that they are not interesting and heavy to carry to school.

The results of student responses to the textbook show that students have difficulty understanding the mathematical concepts and formulas in the textbook. Apart from that, students think that textbooks cannot help them be more creative, therefore they are lazy to read them. Class XI IPA students at SMAN 1 According to students, Android-based learning media can increase their creativity and is also more practical, interesting and easy to use. Students say that if they study with Android, they don't have to worry if they forget the material because they can repeat it anytime and anywhere.

Based on the description given above, the researcher developed an Android-based learning resource using Smart Apps Creator, which simplifies learning for students because it can be quickly accessed via a smartphone when offline and offers a thorough summary of the subject matter. and unique. Additionally, anytime and at any time, Android-based educational media can be accessible through Smart Apps Creator.

**Design**

At this stage the researcher designed an Android-based learning media using the Smart Apps Creator on trigonometry material by making storyboards. The storyboard designed in this learning media includes an intro/front page, main page, instructions page, introductory page, material page, practice questions page and profile page. The material discussed in this media is "Trigonometry sub material Sum and Difference of Sine and Cosine". The following is an example of an initial design of Android-based learning media using a smart apps creator.
Development

Utilizing the Smart Apps Creator, the design created during the design phase is used as a model for the creation of learning material on the Android platform. The processes for using the Smart Apps Creator to create Android-based learning media products are as follows, in accordance with the design that has been created: a. Develop the learning media framework design that was created in the previous stage, b. Develop material presentation, c. Product packaging, this learning media is packaged in the form of an application.

Implementation

The media trial aims to see the practicality of Android-based learning media using Smart Apps Creator on trigonometry material which has been developed involving mathematics teachers and 6 class XI science students who have studied trigonometry material. The six students involved were taken based on the UH 1 trigonometry grades for classes XI IPA 1 and XI IPA 2 with one student each having high ability, one having medium ability and one having low ability. The implementation stage is carried out by teachers and students testing the
product developed by the researcher, then the teacher and students fill out the questionnaire instrument that has been provided by the researcher according to the product being tested.

Based on the results of teacher and student practicality, the average value for media practicality was 91.6% in the very practical category. This is in line with the statement expressed (Inayati et al., 2023) that learning media is said to be practical if student responses are in the positive category, namely more than 60%. According to how simple it is to utilize the generated learning media, it is simple to use because there are clear directions for doing so. In addition, the information supplied in learning media is simple to comprehend because the issues are real-world in nature and are frequently faced by students, making them suitable for independent study. According to the effectiveness of learning time, Smart Apps Creator-based Android learning media are regarded as being effective and efficient for assisting in the teaching and learning processes. The advantages of using learning media can assist students in assessing and determining their level of comprehension.

**Evaluation**

The last step in creating Android-based educational material with a smart apps maker is evaluation. At this point, the researcher merely conducts a formative evaluation in which the learning media are assessed based on recommendations from the validator during validation.

**CONCLUSION**

It can be concluded from the research and data analysis results that Smart Apps Creator-based trigonometric learning material for Android are trustworthy and beneficial. The trigonometric content is extremely valid with a percentage of 92.5%, according to the findings of research and data analysis done by Android-based learning media utilizing Smart Apps Creator. Practicality with teachers received a 100% rating and practicality with students received an 83.24% rating. Media use scores highly on the practicality scale among teachers and pupils, with a rate of 91.6%. This demonstrates the validity and applicability of Android-based learning media created with Smart Apps Creator.

**Declarations**

Author Contribution: DK: Conceptualization, Writing - Original Draft, Editing and Visualization; RR: Writing - Review & Editing, Formal analysis, and Methodology; MS: Writing - Review & Editing, Formal analysis, and Validation and Supervision.

Funding Statement: -

Conflict of Interest: The authors declare no conflict of interest.

Additional Information: Additional information is available for this paper.

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