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Android-Based Media Development in Mathematics Lessons

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a b s t r a c t

This study aims to develop Android-based media for learning the orm applications by developing designs to attract students to learn independently. The application used in this study is the Smart Apps Creator (SAC). This media development uses the research and development (R&D) method according to Sugiyono by using the Potential and Problem steps, Gathering Information, Product Design, Design Validation, Design Improvement, Product Testing, Product Revision, and Usage Trials. The validation results by the media expert were 0.84 with the criteria "Very Appropriate." The validation results by the material experts were 0.80 with the criteria "Very Suitable." Based on the results of expert validation, the application is declared valid and feasible to be tested on a limited and broad basis. Based on the limited trial results and broadly obtained from the results of the questionnaire for each item number> 50%. To sum up, that this android-based mathematics application media is suitable for independent learning wherever and whenever.

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K e y w o r d s :
Android, Development, Learning

INTRODUCTION

Education is a process of learning knowledge, skill, and habits of a group of people who have been passed down from generation to generation through teaching, training, and research. In education there must be development of potential and abilities so that it can be useful for the interests of his life as an individual and a citizen of the community in the future.

According to (Suryono & Hariyanto, 2016) Learning is an activity or a process to acquire knowledge, improve skills, improve behavior, attitudes and strengthen personality.

Teaching is a complex process. Not just conveying information from the teacher to students, but an activity or action that must be taken so that the desired learning outcomes can be achieved maximally.

However, in education, there is often an obstacle to creating good quality education. For example, the weakening of the learning process, where many students do not understand when the teacher provides a stimulus and students are less active or embarrassed to ask questions in the learning process. Because in learning, students are required to be active and develop thinking skills.

Learning and teaching is a word that must be understood by every teacher so that the teacher does not only provide knowledge but can provide skills, knowledge, attitude knowledge and so on. This means that the success or failure of an education can be seen from the teaching and learning process designed and carried out professionally by both the teacher and the students themselves.

Based on the PISA results (Program for International Student Assessment) survey of 15-year-olds in 2015, it was stated that the math ability of Indonesian students was ranked 63rd out of 72 countries. But in 2018, the quality of education performance in Indonesia decreased somewhat from 2015 in terms of reading skills, math skills, and science performance abilities. This is unfortunate, seeing that researchers want to try to use android applications to improve the quality of education and abilities in the field of mathematics. In fact, after seeing from the student's side and interviews from the math teacher, that motivation is still lacking.

So that in offsetting this statement, it is necessary to add a learning model and learning media so that students can develop their potential to the fullest because these additions have an effect on student success in understanding learning both in material and skills. To expedite the teaching and learning process, learning media is needed which is expected to increase students' learning motivation.

But, in the learning process, there are still many who have not used media and only use supporting tools such as Student Worksheets to feel bored and have difficulty understanding in learning. This situation of course, affects student motivation and activity in education.

As in other facts, in Mathematics learning, teachers are less creative in utilizing media and tools for delivering material. Conditions like this make students less active or lack the motivation to learn so that student learning outcomes are not optimal and the results are unsatisfactory. So learning mathematics in the eyes of students is very boring and difficult to understand. The learning process is very influential on students' success in understanding the material, so there is a need for media to increase student motivation and learning outcomes.

In learning Mathematics, of course, the position of the media will make learning run more unpleasant. This because the use of media is used and directed to make it easier for students to learn to understand the subject matter. Many ways are developed in learning that involve active students through the Android application, one of which is using theprogram *Smart Apps Creator*. This program is expected to increase learning motivation and make students more active in participating in Mathematics learning.

Previous related research suggested that the *appypie mobile learning media* Android-based on conceptual understanding was feasible (Handoko, 2018). (Dewi Purnama Sari, 1997) states that-based mathematics learning media *mobile learning* in the form of a drawer educational game received an exciting and effective response in field tests. Liza Ainul Mila (2019) states that android-based media is categorized as effective and practical. Annas Ribab Sibilana (2016) states that Android-based learning media gets a good response and is feasible. This study aims to develop android-based media by producing a learning application product that is feasible to help student learning wherever and whenever the application is used.

LITERATURE REVIEW/ THEORETICAL FRAMEWORKS (IF APPLICABLE)

1. Learning Media

The word media comes from Latin *medius,* which means "middle," "intermediary", or "introduction". In Arabic, the media is an intermediary "wa saa il" or an introduction to messages from the sender to the recipient of the message (Arsyad, 2011, p. 3). Umar (Umar, 2013), said that learning media are tools, methodical, and techniques used as an intermediary for communication between a teacher and a student to make communication and interaction between teachers and students more effective in the process of teaching education in schools. Based on definitions above, it can be concluded that learning media are all objects that can transmit messages or lesson content so that they can stimulate students to learn and satisfying learning outcomes with learning objectives can be facilitated in achieving it.

2. Android

Android is an operating system for linux-based mobile devices, including operating systems, *middleware,* and applications. Android is an operating system for Linux-based mobile phones. Android provides a *platform* open for developers to create their applications themselves (Ichwan & Hakiky, 2011). Meanwhile, according to (Multiwiyati & Lauren, 2013) android is an operating system for linux-based mobile devices, including an operating system, *middleware,* and applications. According to (Dwi & Astuti 2016, pp. 4-5) The benefits of using Android-based learning media are as follows:

1. It can be used as an effective and efficient learning media because it is practical carried everywhere.
2. Make it easier for students to find references.
3. It attracts students because the contents of the android application can be various, such as materials, pictures, videos, and interactive quizzes.
4. Train students' abilities or knowledge of the material through interactive quizzes contained in the Android application.

In concluded, that Android is an operating system that is in a cellphone that can be used as an effective and efficient learning medium that can be used anywhere and anytime.

3. Matrix

Matrix is an arrangement of real numbers or complex numbers that form a square rectangle arranged according to rows and columns. The performance of these elements

is enclosed in brackets (), or brackets []. The elements or entries can be numbers or letters.

4. Math Logic

According to Imamul Muttakhidah in (Bofandra, 2015) Symbolic Logic is the science of valid inference (valid), especially those developed with the use of mathematical methods and with the help of special symbols so that someone can avoid multiple meanings from everyday language. This symbolic logic is known as mathematical logic.

METHODS

The method in this research is research and development (R & D) by using the steps for developing media *mobile learning Smart Apps Creator* Android to get a learning application referring to the development model proposed by Sugiyono. This model contains ten stages that are used in the development process. The steps will start from collecting information that will be used as development materials, product design, testing, and repetitive product improvements until a product that fits the criteria is obtained.

This development will be carried out according to the procedures developed by Sugiyono (2018). The ten steps are: Potentials and Problems, Collecting Information, Product Design, Design Validation, Design Refinement, Product Testing, Product Revision, Usage Trial, Product Revision, Mass Product Manufacturing. However, due to conditions that made it impossible with mass production, the researchers only took 8 steps until the trial use. Data collection techniques in this study were expert testing, filling out student questionnaires using the My Mathematical application. Exprt test to obtain valid teaching materials based on assessment by experts (*CVR*). Questionnaires are used to obtain student response data to use the My Mathematics application, whether it is suitable for use or not for learning.

Sources of data in this study were students of SMK Negeri 1 Kawali, class XI RPL 1 as a limited test conducted by 20 students, and extensive testing conducted in class XI TKJ 1 and XI TKJ 3 with 40 students. The questionnaire of assessment sheets from media experts and material experts is analyzed based on the percentage score of each validator calculated by:

Tabel 1
Evaluation Validator Responses

Criteria for	**Skor**
Yes	1
No	0

The CVR, the following equation is used :

$$\text{CVR} = \frac{n_e - \frac{N}{2}}{\frac{N}{2}}$$

Description:
CVR : the validity value of the contents of the question
n_e : the number of respondents who said yes
N : total respondents

Provisions:

1. When less than ½ the respondent stated Yes then the CVR value = negative.
2. When less than ½ the respondent stated Yes then the value of CVR = 0
3. When all respondents say Yes, the value of CVR = 1 (this is regulated or adjusted to the number of respondents).

4. When the number of respondents who say Yes is more than ½ of the total respondents, the CVR value = 0 - 0.99.

From the CVR results, it can be determined that the items were revised or not. The questionnaire instrument is valid if each question has a CVR ≥ 0.99, this is in accordance with Lawshe's critical CVR table, if you use a validator that is less than 7 then the minimum CVR value is 0, 99.

After identifying each sub on the questionnaire instrument using CVR , *the Content Validate Index (CVI) is used to calculate the total number of*sub-questions. Briefly, in (Sugiharni, 2018), CVI calculates items that are considered relevant or yes to take the average of the CVR value then. The equation obtains CVI:

$$\text{CVI} = \frac{\sum \text{CVR}}{Jumlah\ Soal}$$

CVR and CVI calculation results are in the form of a ratio of numbers 0-1. This figure can be categorized as follows.

Table 2

Calculation Results Table CVI

Value	Category
0 to 0.33	Unsuitable
0.34 to 0.67	Appropriate
0.68 to 1	Very Appropriate

Questionnaire instrument can be used in the study, if the minimum questionnaires have valid criteria. Even though the questionnaire meets the valid criteriarevisions still need to be made to the application section according to the revision suggestions provided by the validator. If the questionnaire instrument meets the criteria under the valid criteria, it is necessary to revise it according to the suggestions given by the validator.

Data Collection and Analysis

The data collection technique in this research is by using a questionnaire technique and documentation. Questionnaire and documentation techniques were used to determine the needs and responses to media development *mobile learning Smart Apps Creator* based on motivation and student learning outcomes in mathematics subjects.

1. Questionnaire

The questionnaire as an assessment tool is used to find out opinions, aspirations, desires, beliefs, etc. as a result of student learning. According to (Sudjana N., 2008, p. 167) a questionnaire is a number of written questions that are used to obtain information from respondents in the sense of reports about their personalities or other things they know. According to (Sugiyono, 2018, p. 199), a questionnaire is a set of questions or written statements used to collect data given to respondents to be answered. The questionnaire in this study was used to collect initial data on the needs of media products *mobile learning Smart Apps Creator* android based on conceptual understanding in mathematics subjects. It is also used in knowing the product feasibility responses given to product validators, students, and teachers. A quantitative questionnaire is presented using a Likert scale as a measurement scale.

2. Validation Questionnaire for Media Experts and Material Experts

Validation questionnaires are given to material experts, and media experts as validators. Media aspects will be assessed by media experts who see the design and appearance of the

product being developed. Material aspects will be assessed by material experts who will assess the suitability of the product content with the 2013 curriculum. Language aspects that linguists will assess will assess the suitability of the language used with the rules for using good and correct language. The validation sheet will be written in the order of the title, the identity of the researcher, the validator's identity, time, instructions, assessment criteria, assessment items, suggestions and responses, and the validator's signature.

3. Student Response Questionnaire

Student response questionnaires are given as a way to obtain responses and assessments after testing media products *mobile learning Smart Apps Creator* android on math subjects. This response questionnaire was made with the arrangement of the title, the researcher's identity, the respondent's identity, the filling instructions, the assessment criteria, and the statement items.

4. Documentation

The documentation in this study is in the form of data such as a list of teachers, a list of students, photos of research and others related to research. Documentation is also in the form of photos or videos during product testing.

RESULT AND DISCUSSION

This research produces a mathematics learning application for class XI with Matrix and Mathematical Logic materials. This Android-based application was developed with Sugiyono development steps, steps are Potential and Problem Stage, Information Gathering Stage, Product Design Stage, Design Validation Stage, Design Improvement Stage, Product Trial Stage, Product Revision Stage, and Test Stage Try Usage.

Potential and Problems Stage, this research begins with seeing the potential of students as a creative, innovative generation and able to apply a

Product during learning or in everyday life. However, in reality the mastery of the material in mathematics is still lacking. For this reason, it is necessary to investigate these problems further so that the existing potential can be utilized.

Stage of Gathering Information, collecting this information by interviewing two teachers to determine the material to be discussed in the application. The material is mathematical logic and matrices, and both materials are used to support learning in the Department of Network Computer Engineering (TKJ) and Software Engineering. (RPL), because the material is interrelated with their majors. Furthermore, looking for material with various books that can support the material to be conveyed.

Collecting this information is not only with the teacher but with students. Information obtained from interviews, namely on mathematics learning material mastery and understanding of concepts, still needs improvement because students find it difficult when the material presented cannot be understood. Therefore the learning process must not stop until the results are considered optimal.

Product Design Stage, Based on the results of data collection and information, the next stage is making product designs for Android-based learning media. The product design to be developed is in the core competency and basic competency sections, the material to be used, practice questions, quizzes, bibliography, and developer profiles.

Design Validation Stage, Media validation is carried out to identify and systematically evaluate media products that will be developed in accordance with the objectives. Media experts assess the appearance and design aspects of the learning application and media feasibility questionnaires. Based on the validation of 2 media experts, the first is a

mathematics lecturer at IAIN Syekh Nurjati Cirebon and the second is a Software Engineering teacher (RPL) SMKN 1 Kawali obtained an overall score with the revision. and the average value is 0, 84. So it can be seen in the eligibility criteria table, which means it is very suitable. The results of the validation from media experts used 2 validators, the first was a mathematics teacher at IAIN Syekh Nurjati Cirebon, the second was a mathematics teacher at SMKN 1 Kawali with an average score of 0.80 which means that it is included in the very appropriate criteria, so that the application can be used. with revised terms.

Design Improvement Stage, this stage is the design improvement of each validator. The improvements are as follows.

a. Only one font is used. Here initially using a variety of fonts, after the revision only one font.For citation sources, use the following writing format:

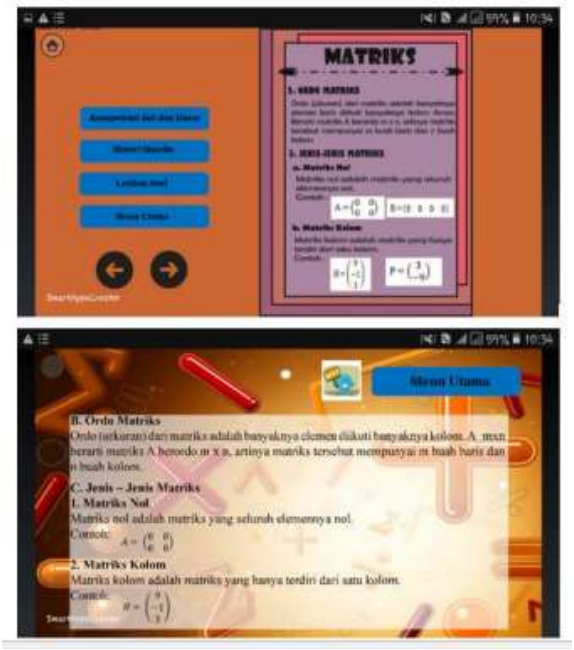

Figure 0.1
Changes in Fonts

Explanation:

In the picture, too many fonts are used, while after going through revisions, it shows that only one font is "Times New Roman".

a. Images that are too busy are revised using images that are relevant to mathematics.

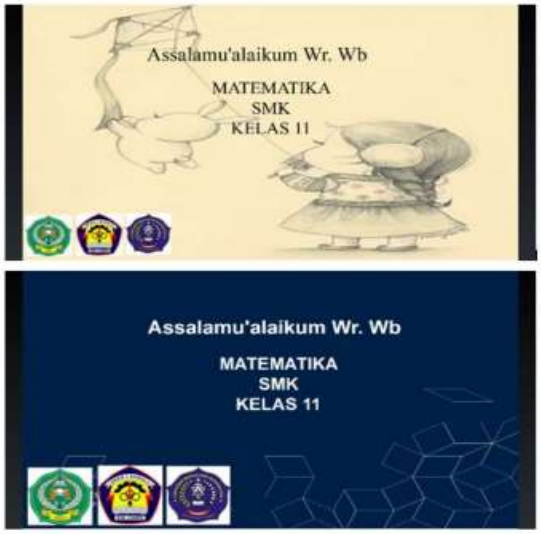

Figure 0.2

Changes in drawings that are relevant to mathematics

Explanation:

In this picture, we can see changes in the picture above, which shows a picture of a small child, while after the revision is used a picture relevant to mathematics.

a. The use of the following and back icons is less clear, so the icon image is enlarged.

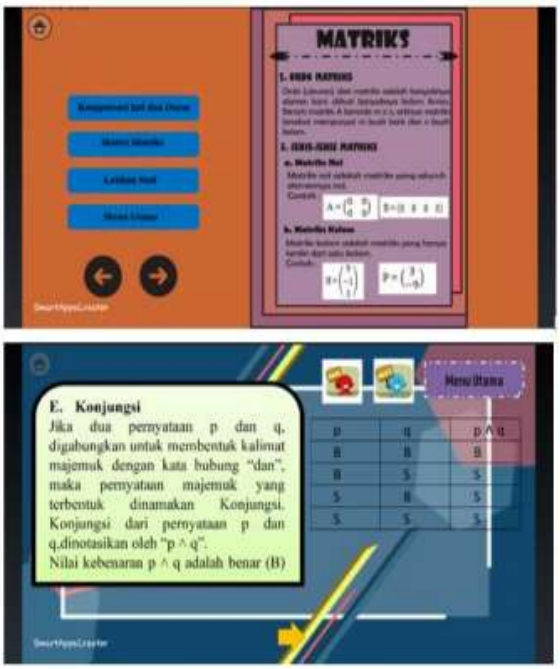

Figure 0.3

Change Icon Next and Back

Explanation:

The picture visible difference icon next and back, looks after the revision icon next and back have an inscription, making it easier to read.

a. The videos to make it clearer, there is no video because the capacity is too large.

b. The presentation of material is too full. The material is shortened again to be shorter.

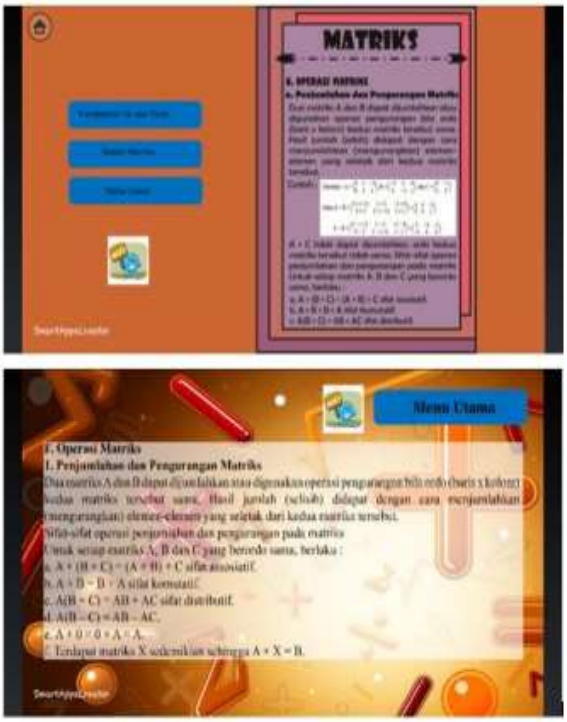

Figure 0.4

Abbreviating the material

Explanation:

In the figure, the differences can be seen before the revision, the material is too full and the font size is too small, while the material becomes shorter after revision.

a. Equation with screenshot. Use the equation by matching the color of the material text to make it more unified.

Figure 0.5

Changes in Equation

Explanation:

In the picture, it can be seen that before the equation changes, it still uses a screenshot. Meanwhile, after a revision, the equation equates with the text of the material to make it more unified.

Product Trial Phase, After validation by two experts, namely media experts and material experts, and having gone through the design improvement stage, then limited product testing with 20 students of SMK Negeri 1 Kawali, especially class XI RPL 2. This trial was used to find out how worthy this app is for learning. From the results of limited trials, it was found that the overall application can be used for learning, but there is one item that must be improved, namely the 18th item students are still confused in operating the application.

Product Revision Stage, at this stage, is carried out in the 18th item that "there is still confusion in operating the application". Revision atstage thisis carried out by making a video about using the application so that students can operate the application.

Usage Trial Stage, At this stage, a trial of use was carried out extensively after the revision was carried out. This extensive trial was conducted with 40 students of SMK Negeri 1 Kawali, especially class XI TKJ 1 and XI TKJ 3. From the trial results, it was widely obtained that the application provides benefits to students, because overall the application can be used anywhere and anytime offline, and the product is suitable for use for learning mathematics.

CONCLUSION AND IMPLICATION

a. Conclusion

The Android-based Media Development was developed using the research and development (R&D) method using development steps by Sugiyono with 8 stages (Potentials and Problems, Collecting Information, Product Design, Design Validation, Design Improvement, Product Testing, Product Revision, Testing Try Usage, Product Revision, Mass Product Creation). The results of the validation of the media expert were 0, 84 and the material expert was 0.80 so that the teaching materials were said to be "Very Appropriate". The results of student responses after being tried out were limited to 20 students, it can be concluded that the overall application can be used for learning, but there is one item that must be improved, namely the 18th item students are still confused in operating the application. After the revision continued with extensive trials with 40 students, it can be concluded that the application provides benefits for students because overall the application can be used anywhere and anytime offline. The product is suitable for learning mathematics.

b. Implication

Some suggestions given by researchers for the development of android-based media for learning are as follows. Learning media should be added with more Hots questions so that the level of difficulty is higher. Learning media should be developed again, because there are still many deficiencies in content, appearance, and material. This android-based media development must be even better so that student's interest in learning independently wherever and whenever can get maximum results, learning media can be developed again through 10 stages of Sugiyono's development model.

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