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Development of Android-Based Learning Media in Computer and Basic Network Lessons Class X TKJ Cokroaminoto Vocational High School, Kotamobagu

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ABSTRACT

Cokroaminoto Kotamobagu Vocational School is an educational institution that aims to develop the potential of the nation's children so they can compete at the world level. To fulfill these objectives, educational institutions need to be equipped with adequate computer networks. This study aims to develop learning media based on Android (m-learning) on the subject of Applying IP Addressing to Computer Networks for class X SMK Cokroaminoto Kotamobagu. The research method used in this research is research and development (R&D). The steps taken are: Potential and Problems, Gathering Information, Product Design, Design Validation, Design Improvement, Product Trials, Revision of potentials and problems, data collection, product design, design validation, design revisions, product trials, and product revisions. After the product trials were carried out with two stages, namely small group trials carried out by twelve students, and wide trials carried out twice, the first stage was carried out by one teacher, and the second stage by thirty four participants educate. From the product trials, the results regarding the android-based m-learning application in the material Applying IP Addressing on Computer Networks obtained an assessment with very feasible criteria based on the teacher's assessment, and very interesting based on the student's assessment.

Keywords: design, learning media, network, NDLC, vocational high school

INTRODUCTION

The development of technology from year to year is very rapid, this can be seen from the increasing human need for technology. The quality of human resources determines a technological progress, while human resources depend on the quality of education. Education plays an important role in creating an intelligent and quality society. Therefore, in order to improve the quality of education of a nation it is very important to have an innovation in the field of education. Everything

that is used to convey information in learning activities is called learning media. This media is a tool that is used to accommodate the distribution of messages from teaching staff to students to carry out the learning process, (Tafonao, 2018).

So that students do not experience boredom and boredom during learning activities, it is necessary to combine several media such as audio and visual in making learning media. Interactive learning media is a learning media in the form of a combination or combination of several learning media such as text, audio, video and graphics (Rezeki & Ishafit, 2017). The problem in developing Android-based learning media for computer and basic network lessons in vocational high schools may include several factors such as: Lack of resources: Vocational high schools may not have sufficient resources to develop and implement Android-based learning media, such as lack of funding, hardware, software, and technical expertise (Batmetan, 2018). Technical challenges: Developing Android-based learning media requires technical knowledge and skills in programming and software development, which may not be available among teachers or staff in vocational high schools (Batmetan, 2019). Limited access to technology: Not all students may have access to smartphones or other mobile devices, which could limit the effectiveness of Android-based learning media in vocational high schools. Lack of training: Teachers may not have sufficient training or experience in using Android-based learning media for teaching computer and basic network lessons, which could limit their ability to effectively integrate technology into their teaching (Liando, 2022). Limited curriculum integration: Android-based learning media may not be fully integrated into the curriculum, which could limit the effectiveness of the media in teaching computer and basic network lessons.

The state of the art of developing Android-based learning media for computer and basic network lessons at vocational high schools includes several advancements that have been made in recent years, such as: Interactive multimedia: Android-based learning media can be designed to include interactive multimedia such as videos, animations, simulations, and games to enhance student engagement and learning (Sumual, 2019). Personalization: Android-based learning media can be personalized to suit individual student needs, preferences, and learning styles through features such as adaptive learning and intelligent tutoring systems. Collaborative learning: Android-based learning media can promote collaborative learning through social features such as discussion forums, messaging, and group projects. Mobile learning: Android-based learning media can be accessed anytime, anywhere using mobile devices, enabling students to learn at their own pace and convenience (Manggopa, 2022). Analytics and feedback: Android-based learning media can provide real-time feedback and analytics to teachers and students on student performance and progress, which can inform instructional decision-making and improve learning outcomes (Tulungen, 2021). Gamification: Android-based learning media can incorporate game elements such as points, badges, and leader boards to motivate and engage students in learning. Overall, the state of the art in developing Android-based learning media for computer and basic network lessons at vocational high schools is focused on creating interactive, personalized, and engaging learning experiences that can be accessed anytime, anywhere using mobile devices.

Based on this, in this study the focus was on developing Android-based learning media in the subject of Computers and Basic Networks in the material of Implementing IP Addressing in Computer Networks. The researcher chose to use an Android smartphone because generally students have it and it is easy to carry anywhere. This learning media was designed with the help of the Smart Apps Creator

3 application. The advantage possessed by this interactive learning media is that it can be easily accessed on an Android smartphone so that the media can be used anywhere and anytime according to the wishes of students without an internet connection. This learning media, in addition to the material in text and image formats, also contains supporting images and quizzes about the material to measure how far the material that has been presented can be understood by students. With the creation of this learning media, it is hoped that it will be able to support teachers in providing material and can provide an increase in the enthusiasm for learning of students.

Novelty of this study is developing Android-based learning media for computer and basic network lessons at vocational high schools lies in leveraging emerging technologies to create innovative and engaging learning experiences that are personalized, collaborative, and accessible from anywhere. The studi aims is the Development of Android-Based Learning Media in Class X Computer and Basic Network Lessons TKJ Vocational High School Cokroaminoto Kotamobagu.

METHOD

This research was conducted at SMK Cokroaminoto Kotamobagu as one of the samples for product needs analysis. The research will be carried out from September 2022 to November 2022. Product trials will be carried out at the Cokroaminoto Kotamobagu Vocational School in the odd semester of the 2022/2023 school year in class X TKJ. This research is a type of research and development (Research and Development / R&D). In this research developed android-based learning media (M-Learning). This Android-based learning media was developed for basic computer and network learning media in the material of Applying IP Addressing in Computer Networks. A product can be produced with research that is needs analysis, design validation by experts and assessment questionnaires, this is used to test the feasibility of products that have been produced by researchers so that they can be useful in the wider community, therefore a study is needed to test the feasibility of these products. See figure 1.

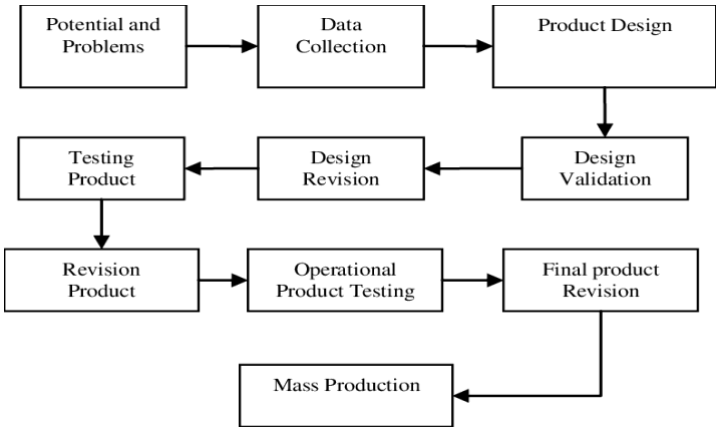

Figure 1. Steps in the R&D method

1. Potential and Problems

Potential is "Everything that when utilized will get added value". Based on pre-research conducted by the author, the potential that exists at SMK Cokroaminoto Kotamobagu is the availability of facilities and infrastructure that support technology-based learning processes, especially using Android smartphones. So that it is possible to develop Android-based learning media. The problem is "deviation between what is expected and what happens". The problem in this study is that Androidbased learning media has not yet been developed as a learning medium in computer subjects and basic network material for Applying IP Addressing in Computer Networks at SMK Cokroaminoto Kotamobagu.

2. Gathering Information

   After discovering the potentials and problems in this development research, the next step is to collect information that supports the potentials and problems. This information was collected by giving questionnaires in the form of statements to teachers and students regarding the subject of computers and basic networks at SMK cokroaminoto kotamobagu, especially on the subject of Applying IP Addressing to Computer Networks. The information that the authors get from the school is the availability of facilities and infrastructure in learning activities such as almost all students have Android smartphone devices, there is a library at school, and there is an internet network (wireless hotspot). The learning resources used by teachers and students are in the form of printed books and worksheets, but students are less interested in these learning resources.

3. Product Design

   Android-based learning media products are designed so that they can be utilized in the learning process, and can be one of the media that supports learning. Products that are attractive, practical, and easy to use anywhere and anytime.

4. Design Validation

   After the initial product has been made, the next step is design validation which is carried out with three tests, namely the material quality test, the language use test and the media test. Design validation was carried out by a team of experts consisting of material experts, linguists and media experts. The material expert examines the aspects of the presentation of the material in the form of suitability of the material for Applying IP Addressing on Computer Networks which is presented with the curriculum, correctness, adequacy and accuracy of the contents in accordance with the applicable curriculum. Linguists examine aspects of language use that are in accordance with the absorption abilities of students. Media experts examine the rules for image accuracy, and the appearance of Android-based learning media with the characteristics of the material and the suitability of the design with the material. The design test is carried out by each of two experts who are qualified in their field.

5. Design Improvements

   After conducting material quality analysis tests, language tests, and media tests, the next step is to consult the product that has been validated by experts to the supervisor and look for things that need to be improved so that they can be tested on the next step. At this stage, the initial product is ready to be tested.

6. Product trials
   Products that have been validated and declared appropriate by experts and have been consulted with supervisors, are then tested in learning activities. The trial was intended to obtain information on the feasibility of android-based m-learning as a learning medium. Product trials were carried out in two ways, namely small group trials and extensive trials.
7. Product Revision
   From the results of product trials, if the responses of teachers and students say that this product is good and feasible, it can be said that the Android-based learning media material for Applying IP Addressing on Computer Networks has been developed to produce the final product. If the product is not perfect, then the results of this trial are used as material for improvement and refinement of the learning media that are made, so that they can produce final products that are ready for use in schools.

RESULTS AND DISCUSSION

Results of Android-Based Product Development Research (m-learning)

1. Product Development Results

The Android-based mobile learning learning media developed in this study uses the research and development model proposed by Sugiyono which is modified with seven stages, namely: potentials and problems, data collection, product design, design validation, design revisions, product trials, and product revisions. The steps for research and development of Android-based m-learning are explained as follows:

a. Potential and problems

The results of observations and interviews conducted with TKJ teachers and giving a needs questionnaire to students in class X TKJ SMK Cokroaminoto Kotamobagu obtained the following data: (a) Basic network learning in class X TKJ SMK Cokroaminoto Kotamobagu used the 2013 curriculum, (b) Almost all students have technological devices such as android smartphones which are allowed to be brought to school, (c) Cokroaminoto Kotamobagu Vocational School provides a wifi network that can be used by students, (d) Learning media used by TKJ teachers is still very minimal and limited in use.

Even though modern technological advances have developed rapidly and almost all students have Android smartphone devices which are one of the advances in modern technology, the use and functioning of these devices in the field of education is still lacking. Students only use Android smartphones to find learning material that they still understand, and the rest of the students use Android smartphones more to play games and access social media. The lack of educational applications is also a factor in the lack of benefits of Android smarttrees in learning. Even though the existence of these modern technological devices can be used as an interesting and efficient learning tool by developing educational applications that support learning.

Based on the results of observations and interviews at SMK Cokroaminoto Kotamobagu, it can be concluded that learning media applications that can be operated using Android smartpone devices

are urgently needed as learning tools along with the progress of modern technology which is developing rapidly, this is also necessary so that the existence of Android smartphone devices can be put to good use and positive in order to support education towards a more modern and quality. From this it was found the potential for the development of Android-based m-learning as a learning medium.

b. Data collection

At this stage the researcher collects data or information needed in the process of product development and research. The researcher then plans the development of an androidbased m-learning application product on the material Applying IP Addressing in Computer Networks for class X TKJ Cokroaminoto Kotamobagu Vocational School, which is adjusted based on the 2013 curriculum. This planning is needed so that the application product development process can be carried out properly and systematically.

c. Product Design

After knowing the potential and problems in the field, and collecting data related to research, a general description of the development of Android-based m-learning applications is obtained. The next stage is to develop an Android-based mlearning application design on the material Implementing IP Addressing on the Network. Computer class X TKJ SMK Cokroaminoto Kotamobagu. This design development resulted in the initial product.

d. Design Validation

Design validation was carried out by several experts to assess the application of learning media that had been made by researchers. Design validation was carried out by several experts, including material experts, linguists, and media experts. Data from design validation results by experts are presented in the following data:

1) Data from Design Validation Results by Material Experts
   Design validation by material experts was carried out by 2 experts who were experts on aspects of the material content of of plant and animal tissues. Data from design validation results by material experts. See table 1.

Table 1. Results of Design Validation by First Phase Material Experts

Aspect	Total score Every Aspect	Score Maximum	Percentage (%)	Criteria
Content Aspect	44	80	55	Decent Enough

Data from the results of design validation by material experts in the first stage on the content aspect obtained the following assessment: a total score of 44, while the maximum total score is 80, then a percentage result of 55% is obtained. Referring to table 1, it can be concluded that the data from the

results of the design validation by the material expert is declared quite feasible, but revisions are needed according to expert advice, because the percentage of eligibility is still considered low. See table 2.

Table 2. Results of Design Validation by Material Experts After Revision

Aspect	Total score Every Aspect	Score Maximum	Percentage (%)	Criteria
Content Aspect	60	80	75	Worthy

Based on the data from the results of design validation by material experts after revision, the following assessments were obtained: the total score on the content aspect was 60, while the maximum total score was 80, so the percentage results obtained were 75%. Referring to Table 6, it can be concluded that the data from the results of design validation by material experts after the revision was declared feasible for testing.

2) Data from Design Validation Results by Language Experts
Design validation by linguists was carried out by 2 experts who are experts on aspects of language that are good for use in learning. Data from the results of design validation by linguists. See table 3.

Table 3. Results of Design Validation by Stage One Linguists

Aspect	Total score Every Aspect	Score Maximum	Percentage (%)	Criteria
Language Aspect	48	64	75	Worthy

Data from design validation by linguists in the first stage on the language aspect obtained the following assessment: the total score was 48, while the maximum score was 64, so the percentage obtained on the language aspect was 75%. Referring to Table 6, it can be concluded that the results of design validation by linguists were declared feasible for testing but revisions were needed according to expert advice, because the percentage of eligibility was still considered low.

Table 4. Results of Design Validation by Language Experts After Revision

Aspect	Total score Every Aspect	Score Maximum	Percentage (%)	Criteria
Language Aspect	53	64	82,81	Very Worthy

Based on table 4, the data from the results of design validation by linguists after the revision obtained the following assessment: a total score of 53, while the maximum score was 64, then a percentage of 82.81 was obtained. Referring to Table 6, it can be concluded that the results of design validation by linguists after the revision were declared very feasible to try out.

3) Data from Design Validation Results by Media Experts

Design validation by media experts was carried out by 2 experts who are experts on graphical aspects, effectiveness, and presentation of learning media. Data from design validation results by media. See table 5.

Table 5. Results of Design Validation by First Stage Media Experts

Aspect	Total score Every Aspect	Score Maximum	Percentage (%)	Criteria
Graphic Aspect	34	48	70,83	Worthy
Effectiveness Aspect	17	24	70,83	Worthy
Presentation Aspects	36	48	75	Worthy
Total number		87		
Max Score		120		
Percentage (%)		72.5		
Criteria		Worthy		

The results of design validation by media experts in the first stage obtained the following data: the number of ratings on the graphical aspect obtained a score of 34, while the maximum score was 48, so the percentage obtained was 70.83%. The number of assessments on the effectiveness aspect obtained a score of 17, while the maximum score was 24, so a percentage of 70.83 was obtained. Meanwhile, in the presentation aspect, a score of 36 is obtained, while the maximum score is 48, so the percentage obtained is 75%. The results of design validation by media experts in the first stage as a whole aspect obtained a total of 87, and a maximum score of 120, so a percentage of 72.5% was obtained. Referring to Table 6, it can be concluded that the results of the design validation by the first stage media experts were declared feasible for testing, but revision was needed with expert advice. See table 6.

Table 6. Results of Design Validation by Media Experts After Revision

Aspect				
Graphic Aspect	38	48	79,16	Worthy
Effectiven ess Aspect	20	24	83,33	Very Worthy
Presentation Aspects	40	48	83,33	Very Worthy
Total number		98		
Max Score		120		
Percentag e (%)		81.66		
Criteria		Very Worthy		

Based on table 6, the data from the results of design validation by media experts after revision, the following assessments were obtained: an assessment on the graphic aspect obtained a score of 38, while the maximum score was 48, then a percentage of 79.16 was obtained. Meanwhile, on the aspect of effectiveness, a score of 20 was obtained, with a maximum score of 24, a percentage of 83.33 was obtained. And in the presentation aspect, a score of 40 is obtained, with a maximum score of 48, a percentage of 83.33 is obtained. From the results of design validation by media experts after the overall revision, a total of 98 was obtained, the maximum score was 120, with a percentage of 81.66%. Referring to Table 6, it can be concluded that the results of the design validation by media experts after the revision were declared very feasible for testing.

e. Design Revision

After the android-based m-learning application on the material Applying IP Addressing on Computer Networks for class X TKJ Cokroaminoto Kotamobagu Vocational School was validated and has received an assessment, then this application was repaired according to the advice of expert lecturers. Suggestions from expert lecturers include : improving the content of the material and adding pictures, improving the application to make it more accessible, correcting errors in diction selection, correcting errors in the use of punctuation marks, and others.

f. Product Trials

1) Small Group Trial Results Data

Based on the results of the small group trial, 12 respondents obtained the results of an assessment of the Android-based m-learning application. As many as 9 out of 12 respondents gave an assessment that the android-based m-learning application was very interesting to use as a learning medium, while 3 out of 12 respondents gave an assessment that the android-based m-learning application was interesting to use as a learning medium. Based on the results of the small group trial as a whole getting

a total score of 448, with a maximum score of 528, the percentage of attractiveness of the Android-based m-learning application is 84.85%. Referring to Table 6, it can be concluded that the results table for the small group trial of the Android-based m-learning application is very interesting to use as a learning medium.

2) Extensive Trial Results Data

The results of the small group trial, we have a results of Extensive Testing of Android-Based M-Learning Applications by Teachers. See table 7.

Table 7. Results of Extensive Testing by Teachers

Aspect	Total score Every Aspect	Score Maximum	Percentage (%)	Criteria
Aspects of Formulation of Objectives	29	32	90.63	Very Worthy
Learning	11	12	91.67	Very Worthy
Effectiveness Aspect	16	16	100	Very Worthy
Total number		56		
Max Score		60		
Percentage (%)		93.33		
Criteria		Very Worthy		

g.

Product Revision

After conducting product trials including small group trials and wide trials, several suggestions were obtained from respondents, including: suggestions for increasing the scope of material for subsequent chapters, developing applications for iOS smartphone devices, and developing applications for offline access. This input cannot be used as revision material due to the limitations of researchers in developing products. However, this input is expected to be taken into consideration for future researchers who wish to develop similar applications.

The development of Android-based learning media can have significant potential benefits for learners in computer and basic network lessons classes. With the increasing use of mobile devices, the development of Android-based learning media can provide a more engaging and accessible learning experience for students. One of the advantages of using Android-based learning media is the portability and flexibility it provides. Learners can access the learning materials anytime and anywhere using their smartphones or tablets. This can increase the amount of time students spend on learning activities, as they are not limited by the availability of traditional classroom resources. Android-based learning media can also provide a more interactive and immersive learning experience. For example, multimedia

elements such as videos, animations, and simulations can be incorporated into the learning materials to enhance student engagement and understanding. Gamification elements can also be included to motivate students to learn and help them retain information better.

However, in general, the development of Android-based learning media in computer and basic network lessons class could potentially have various outcomes, depending on factors such as the design and implementation of the media, the target audience, and the learning objectives. Some possible outcomes could include increased engagement and motivation among learners, improved understanding and retention of course material, and enhanced digital literacy skills. However, the effectiveness of such learning media would ultimately depend on various factors, such as the quality of the content, the user interface, and the instructional design.

Another advantage of Android-based learning media is the ability to provide real-time feedback and assessment. Students can receive immediate feedback on their progress, which can help them identify areas where they need to focus their efforts. This can be especially useful for topics that require practice and repetition, such as basic network concepts. However, there are also potential challenges in the development of Android-based learning media. One issue is the need to ensure that the learning materials are designed and presented in a way that is appropriate for mobile devices. This requires careful consideration of factors such as screen size, navigation, and user interface design. Another challenge is ensuring that the learning materials are accessible to all learners, including those with visual or hearing impairments. Developers must consider the use of assistive technologies, such as screen readers or closed captioning, to ensure that the materials are accessible to all students.

In conclusion, the development of Android-based learning media in computer and basic network lessons classes has the potential to provide significant benefits to learners, including increased engagement and motivation, enhanced understanding and retention of course material, and improved digital literacy skills. However, developers must carefully consider the design and implementation of the learning materials to ensure that they are appropriate and accessible for all students.

CONCLUSION

The study concluded are the development of an android-based m-learning application on the material of Applying IP Addressing in Class X TKJ Computer Networks at Cokroaminoto Kotamobagu Vocational School has been successfully compiled using the research and development or R&D method with seven stages namely: potentials and problems, data collection, product design, design validation, design revision, product trial, and product revision. After going through validation by several experts, the developed Android-based m-learning application is complete. The quality of the android-based m-learning application developed according to the assessment of material experts, linguists and media experts is categorized as very feasible so that it is suitable for use in the learning process. After the product trials were carried out with two stages, namely small group trials carried out by twelve students, and wide trials carried out twice, the first stage was carried out by one teacher, and the second stage by thirty four participants educate. From the product trials, the results regarding the android-based m-learning application in the material Applying IP Addressing on Computer Networks

obtained an assessment with very feasible criteria based on the teacher's assessment, and very interesting based on the student's assessment.

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