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Development of Android-Based Offline Test Model in Physics Subjects

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Abstract: The need to integrate technology into the education system to improve the quality of human resources. The author specifically focuses on adopting technology in learning and assessment methods and expresses the desire to design an Android-based offline test system. The Android-based offline test model is a test model that utilizes Android during the exam process but is not connected to the internet network. The compiled questions will be converted to Android**.** This study aims to produce a valid, practical, and effective Android-based offline test model. The method used is the ADDIE model research and development method. Data was collected using validity, practicality, and effective instruments to determine which Android-based offline test models were valid, practical, and effective. Based on the research results, it was obtained that the validity test percentage was 95.71% by media experts and 100% by material experts. The rate of practicality tests was 92.00% by teachers and 90.50% by students. The percentage of effectiveness test is 90% based on test activity. It was concluded that the resulting Android-based offline test model was valid, practical, and effective for the test process.

Keywords: test model, offline test, Android

INTRODUCTION

Along with the development of science and technology, physics as part of science and technology also develops. Indeed, the increasingly rapid development of technology must be in line with improving the quality of human resources (HR) so that the direction of development of science and technology can reach the right target. The demand to prioritize improving human resources through education is necessary (Khalik et al., 2020). Improving the quality of human resources, especially when looking at problems and results in the student learning process and teaching materials, must be a teacher's main concern.

The learning process and assessment model teachers use is better by technological developments. Improved learning outcomes through technology-based learning (Putinatr & Kiattikomol, 2022), (Mustafa, 2022), e-learning (Lao et al., 2021), blended project-based learning (Mursid et al., 2022), and blended web mobile learning (Hariadi et al., 2021). The assessment takes place effectively using technology (Elmahdi et al., 2018, Grier et al., 2021), such as assessment using computer-based tests (Dwiyono et al., 2021, Yilmaz, 2021, Herrmann-Abell et al., 2018), and Android-based test (Nurhikmah et al., 2021).

Based on the author's observations at SMAN 7 Lhokseumawe, the assessment or exam model teachers apply is still conventional. The examination system conducted by teachers is still paper based. The author has applied for an Android-based test, although only alone. The Android-based test system that the author uses is still online. The author has a dream for the development of an Android-based exam system, but it is offline.

The need to integrate technology into the education system to improve the quality of human resources. The author specifically focuses on adopting technology in learning and assessment methods and expresses the desire to design an Android-based offline test system. The Android-based offline test model is a test model that utilizes Android during the exam process but is not connected to the internet network. The compiled questions will be converted to Android. To support these needs, the author utilizes iSpring software. The advantage of this software lies in its ease that it can be integrated with Microsoft PowerPoint. Thus, teachers do not need special skills in designing exam questions.

The use of Android-based offline test models is one of the answers to the trend of implementing computer-based exams. The use of Android in its implementation is an effort to motivate students to do exam questions. This follows the facts in the field where almost all high school students have Android. This opportunity needs to be exploited in education. It serves as a reference in developing technology-based media,

particularly Android-based ones (Hediansah & Surjono, 2019). One of them is through the application of Android-based tests.

Several relevant studies show positive trends in developing and using computers and Android for learning and testing purposes. When distributing questions and answers, checking results, and reducing paper usage, computer-based tests offer more advantages than paper-based tests (Handoko et al., 2019, Khoshsima et al., 2017). The use of mobile apps enhances academic performance (Kocakoyun et al., 2017).

Generally, research related to the use of Android focuses on the development or application of Android to support the learning process, such as learning media. Such as research conducted by (Mahuda et al., 2022) which investigated student responses to the use of Android-based media assisted by Smart Apps Creator for mathematics learning, (Aminatun et al., 2022) the use of Android-based e-modules, and (Zulfiani et al., 2021) develop an Android version of the science education adaptive learning system (ScEd-ALS) as a science learning medium to accommodate various learning styles.

Therefore, this research intends to develop an Android-based offline test model. This study aims to find a valid, practical, and effective Android-based offline test model. Developing an Android-based offline test model in High School Physics subjects is expected to be successful and can be applied to other subjects.

METHOD

Research design

This research is a research and development (R&D) using the ADDIE model developed by Dick and Carey (Dick et al., 2005), as shown in Figure 1. This model consists of 5 (five) stages, namely: 1) Analysis; 2) Design; 3) Development; 4) Implementation, and 5) Evaluation.

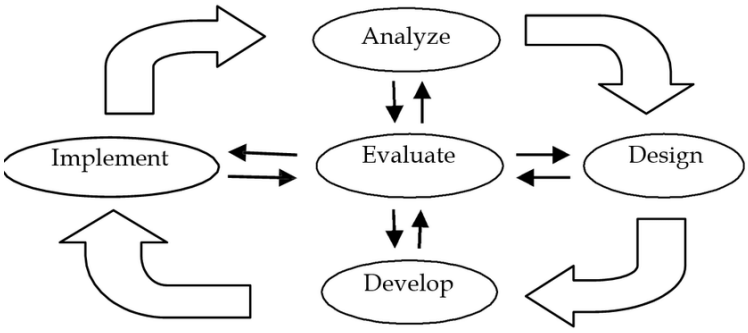

Figure 1. ADDIE model (Dick et al., 2005)

Population, Sample, Sampling

This research was carried out at SMAN 7 Lhokseumawe during the odd semester of the 2022/2023 academic year. The population of this study is all students of grade XII IPA SMAN 7 Lhokseumawe for the 2022/2023 academic year, totaling 45 people. Sampling in this study used nonprobability sampling techniques. As stated by Sugiyono (2010), nonprobability sampling is a method that does not offer equal opportunities for every element or member of the population to be selected as a sample. One nonprobability sampling technique is purposive sampling. This technique is deliberately selected based on certain criteria or considerations, through a selection process used in random sampling. The author chose class XII IPA.1 students totaling 23 people from the population above as the research sample. The criterion for selecting this sample is that class XII science students are accustomed to taking online-based learning and exams. In addition, the position of KD in this research is in class XII. Table 1 illustrates the distribution of research samples.

Table 1. Distribution of the Number of Research Samples

School Name	Academic Year	Class XII IPA.1	Total Amount
SMAN 7 Lhokseumawe	2022/2023	23	23
Sum		**23**	**23**

Intervention Procedure

This research was conducted once using an Android-based offline test model in class XII IPA.1. It is then compared with the conventional test model, a paper-based test of the same class. This paper-based test is commonplace.

Instrument

The instruments used in this study are (1) validity instruments to measure whether Android-based offline test models are valid or not; (2) practicality questionnaire to measure the practicality of Android-based offline test models; and (3) student activity observation sheets to measure the effectiveness of Android-based offline test models.

RESULTS AND DISCUSSION

Analysis

As a first step, the author analyzed the purpose of developing an Android-based offline test model in the Physics subject of SMAN 7 Lhokseumawe. The goal of creating this test model is to obtain an ideal test model used at SMAN 7 Lhokseumawe. This test model must be valid, practical, and effective. This test model is expected to be able to replace the conventional test model that has been applied at SMAN 7 Lhokseumawe.

After analyzing the purpose of developing this test model, researchers also analyzed the curriculum and physics materials using the SKL, KI, KD, and learning material analysis formats. Based on the analysis results, it was obtained that the learning materials used in this test model were Dynamic Electricity and Static Electricity. Following the analysis, the position of this material is at the beginning of the odd semester in class XII.

The next step is for researchers to analyze the level of ability and characteristics of target users, in this case, students of class XII IPA SMAN 7 Lhokseumawe. Data were obtained from the analysis that around 98% of class XII IPA SMAN 7 Lhokseumawe students have Android. In addition, students are also proficient in using Android. This advantage researchers use to develop Android-based test models that can be accessed through Android students.

Design

The author designed in advance the grid of questions. After creating the question grid, the author prepares the question items used in the Android-based test model. The question items are then transferred by the author in iSpring.

In addition to transferring the question items to the iSpring software, the author collected the materials needed to develop this exam model. These materials are complementary to the development of Android-based exam models.

The design of this exam model includes questions and answer choices that can be randomized automatically so that each participant gets a different order of questions and answer choices. The question items displayed in this test model are about electric current strength, Ohm's law, capacitor capacity, electric force, and electric field.

Development

The author developed this research by creating an iSpring-based script. This script serves to run tests so that they can take place offline using a router. This script is run using the xampp application. The developed script allows test results to be captured on the server.

Test results are recapitulated in Excell format, including analysis results per question. While the problems have been integrated into iSpring, settings are made so that they can be run using the developed script. Then it was published. The results of this publication are included in the script that has been created. Server settings are also done so that they can be run offline.

Implementation

At this stage, the implementation of an Android-based offline test model is carried out on students. Before that, the model that has been developed must be tested for validity, practicality, and effectiveness. Media experts and material experts test validity.

Validity

The presentation of the research results on the development of Android-based offline test models starts from the effects of expert validation of the feasibility of the developed model. The validation results are carried out by experts who have mastered the field of Android-based offline test model development.

The results of expert validation of the development of Android-based offline test models show that the test model has been developed based on learning assessment theories and media development. Experts respond very well to all indicators. The percentage of product validity is 95.71%. Experts only suggest making the image more colorful to look more attractive. Against these recommendations, researchers did not implement considering that the display of circuit images in black and white form was also very adequate.

The expert further stated that the navigation menu used in the Android-based test model makes it easier for users to use the model. Ease of navigation is very important, considering that the Android-based test model's maximum results depend on the navigation menu used.

The ease of reading the questions and answer choices and the images' clarity also greatly affected the results achieved. Against this indicator, the expert states that the questions are very easy to read, including answer choices, along with the image's clarity. Although experts recommend making the image more colourful, the existing idea is already excellent.

Based on the description of the validity data of the Android-based offline test model, it is known that the test model developed is valid because it meets the criteria and requirements for creating a good test model. By construction, this test model is declared right by validators. Validation leads to systematic and analysis of the curriculum.

Validation is technically valid, which concerns the appearance of the Android-based test model developed. As the test's focus, the questions must be packed with interesting illustrations. The navigation used must also be able to make it easier for users to do test questions.

The validation results above show that the Android-based test model for the resulting Physics subject has been tested and declared valid by validators. Thus, this Android-based test model is feasible for making Android-based student tests.

Based on aspects of Physics learning materials, the material tested with the Android-based offline test model is relevant to the KD taught in class XII. Even this material is very much following the revised 2013 Curriculum. Compliance with KD is crucial so that this research follows the current curriculum. In addition, implementing the study does not interfere with the learning process.

The Language that complies with the General Guidelines for Indonesian Spelling (GGIS) is also very important. This is so that the sentences used are not ambiguous and chaotic. The standard sentences used in the questions make it easier for users to understand the questions and quickly determine the answer. In addition, sentences following GGIS are one of the rules that must be followed when writing test questions. The expert concluded that the questions written were following GGIS guidelines.

In general, experts argue that the Android-based offline test model developed is feasible to use. This feasibility is crucial for researchers to produce conclusions from valid research results.

In addition to validating the product, experts are also required to validate based on the material used in this test model. There are 3 (three) main aspects assessed, namely: 1) linguistic aspects, 2) aspects of material suitability, and 3) illustrative aspects. Experts give perfect scores for all three aspects. The percentage of material validity by material experts is 100%.

Experts argue that the test model developed from the aspect of Language is already very good. The sentences used are easy to understand. In addition, the Language used is also very communicative. Experts give perfect marks for this aspect. This shows that the model developed from the element of Language is very good and helpful for users in answering questions.

The aspect of material suitability also gets attention in material validation. Experts argue that the questions presented in the model are already contextual. The questions tested are also following KD in the revised 2013 curriculum. The questions written contain concepts that follow the facts. The point is that the data displayed in the problem follows the facts. The questions written also follow the material in the revised 2013 curriculum syllabus and the subject matter taught.

The illustration aspect shows the quality of the test model in line with expectations. Experts argue that the placement of images is following the problem material. In addition, the questions and pictures presented

are systematic and easy to understand. The images used in the questions also strongly support the completeness of the questions.

The results of expert validation in terms of material show that this test model is very in accordance with the material taught. This indicates that the test model used is very feasible to use. This feasibility is very important in research implementation to obtain valid results. This is following research Nugroho (2018)which states that the development of Android-based tests using the Google Form application has been following predetermined criteria so that the developed media is included in the valid criteria.

Practicality

At the practicality stage, trials were carried out using this model on students. The goal is to make the wearability of this model right on target. The results of the practicality analysis of the Android-based test model amounted to 92.00% with a very practical category. This shows that this test model is very practical for teachers to use in the learning outcome assessment system. This condition can be seen based on implementation, use, and benefits. Teachers can use this Android-based test model without experiencing any significant difficulties. This test model can help learners take tests well without using paper. In other words, this test model is very good for schools that apply the paperless school model.

Based on the practicality questionnaire distributed to students, the results of the practicality analysis were obtained by 90.50%. This figure shows that the Android-based offline test model developed is very practical for students. Students are happy to take the test using an Android-based test model. According to students, the navigation menu used in the Android-based test model makes it easy for them to do test questions. The pictures and illustrations used in the test are also very helpful for them in doing the test questions.

Analysis of the questionnaire found that the Android-based test model is very practical. This can be seen in terms of implementation, use, and benefits. Any teacher can easily use the Android-based test model without any significant difficulty.

Based on the results of practical analysis, teachers concluded that using this Android-based test model is very practical. This Android-based test model can replace paper-based tests. This Android-based test model is very easy for students to use. This is following (Azhari, 2016) research, that the Android-based National Exam practice application is included in the very practical criteria.

Effectiveness

At this stage, the effectiveness of the Android-based offline test model was tested through analysis of test results. Test results are analyzed to determine how effectively this test model can be applied. The percentage of learners who pass the Android-based test is calculated using a percentage formula. Furthermore, it is compared with last year's midterm test results, which still use a conventional test model.

Based on the results of the analysis, it was found that about 80% of test takers passed using the developed Android-based test model. Student test results are automatically recapitulated on a server embedded with an iSpring-based script. The recapitulated test results after analysis found that 80% of participants passed the test. The passing grade used is 70 according to the minimum completeness criteria at SMAN 7 Lhokseumawe.

While in the previous year, when students took the paper-based midterm test, data was obtained that only 65% of students passed. Thus, students must be given treatment in the form of remedial teaching. This condition shows that Android-based offline test models are more effective than conventional ones. A comparative overview of the effectiveness of Android-based test models with conventional test models is illustrated in Figure 1.

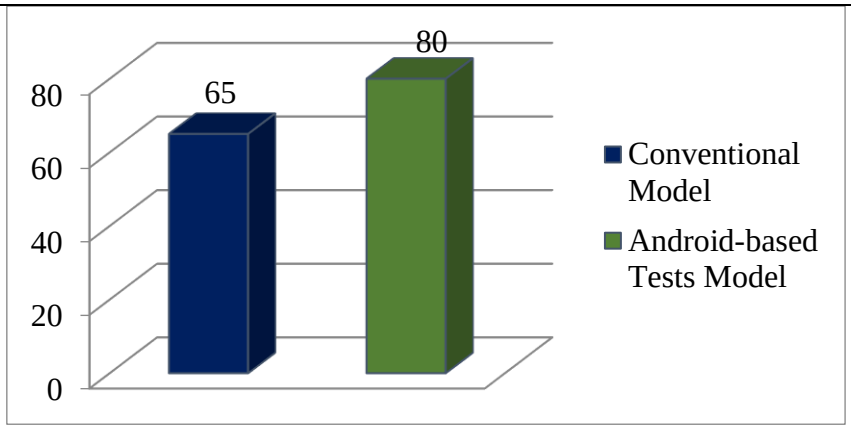

Figure 1 Comparison graph between Android-based test model and conventional model

The Android-based offline test model is effective, practical, and efficient. This is because it does not require the paper to write questions and answer sheets. The Android-based test model can also display images in very good quality and color to make it more attractive to students. The Android-based test model is also capable of displaying sound or video, adding to test takers' interest in working on the questions.

Based on the distribution of test activity questionnaires filled out by observers, data was obtained that the Android-based offline test model is very effective for an alternative test model. 90% of test activities are effective. Learners answer the test by clicking on the correct answer choice. The timing made by the researcher made the test taker not have time to cheat. Examinations take place with more integrity.

Based on the results of the analysis of the effectiveness of using Android-based test models show that this test model is very effective to use. The percentage of student graduation is increasing compared to conventional models. Thus this Android-based test model has increased the pass percentage of learners.

The effectiveness of using this Android-based test model is in line with research conducted by Hendikawati (Hendikawati et al., 2019), the Android-based Computer Assisted Instruction (CAI) is valid for use as a learning resource, is flexible, and supports self-regulated learning by students.

Evaluation

At this stage, the author evaluates the use of Android-based offline test models. For this purpose, the author conducted dissemination at the Physics Teacher Deliberation Forum (PTDF) of SMA / MA Lhokseumawe City. The dissemination took place on Tuesday, November 8, 2022. Based on the dissemination results, it was concluded that the Android-based offline test model is very good to use. Physics teachers in Lhokseumawe City appreciate this test model. The use of test models is very practical and effective both during the test and when processing results automatically recapitulated via teacher email. Dissemination activities of writing results in the SMA / MA Physics PTDF forum, as shown in the picture below. This is in accordance with (Yulianti, 2018) research, that media in the form of Android-Based Mobile Applications have excellent feasibility in terms of learning design aspects, software engineering aspects and visual display aspects.

The enthusiasm of Lhokseumawe City SMA / MA Physics teachers in participating in the dissemination was marked by the teacher's request to learn to make Android-based tests. This condition is shown by their desire to ask the Head of the Physics PTDF of SMA / MA Lhokseumawe City to schedule training in making Android-based test models. They realize that it is very difficult to stem the progress of Android technology. Therefore they want to utilize Android technology in learning. This includes the use of Android technology for test purposes.

CONCLUSION

Based on the research and development results, it can be concluded that the Android-based test model developed is very valid according to validators, practical to use, and effective in increasing student graduation from the test. This is shown by the percentage of validity tests of 95.71% by media experts and 100% by material experts, practicality tests of 92.00% by teachers and 90.50% by students, and effectiveness tests of 90.00% based on test activities. The author suggests that this test model can be further developed to produce

an Android-based offline test model following the times. Given that this test model is very valid, practical, and effective, schools should be able to use this test model in planning tests in schools.

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