

Innovation of Cooling System Learning Media Android-Based Air Using Smart Apps Creator for Vocational High School Students

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ABSTRACT

This study aims to develop Android-based cooling system maintenance learning media using Smart Apps Creator, determine the feasibility and effectiveness of the media, and determine students' responses after using the learning media that has been developed. This research is a type of research and development developed using the ADDIE development model. The resulting product is an Android application made using Smart Apps Creator. Product trials were carried out using a one-group pretest-posttest design, while the instruments used were questionnaires and test instruments. The results of this study are that this learning media gets "Very Feasible" results based on the assessment results from material experts and media experts, with an average percentage of 93.13% feasibility from material experts and 87.73% from media experts. Learning media is effective for use in the learning process. This is based on the t-test results, which get a value of t-score. 11.65, or it can be concluded that there is a significant increase in learning outcomes after using learning media. Students also responded excellently to using learning media, with a percentage of 86.71%.

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Introduction

Advances in science and technology today, such as in the field of information and communication technology, have a positive impact on the progress of education. Education that takes place both

formally and non-formally can utilize technological facilities both from simple to the most sophisticated today. Therefore, as an educator, we are expected to be able to implement good learning strategies and improve the quality of learning, which of course cannot be separated from technological developments. Because technology has an important role in conveying information to students and has a significant influence on the teaching methods provided by educators ((Ahmadi, 2018). Based on data from the Ministry of Communication and Information from (Hanum, 2021) states that the use of smartphones in Indonesia has reached a very high number, reaching 167 million people or 89% of Indonesia's population, and is expected to increase every year. However, in the world of education in Indonesia, there are still several obstacles that are often experienced in the learning process, such as the low optimization of the use of smartphones, the appearance of learning media that is less attractive, and the low feasibility of current learning media (Novaliendry et al., 2020). In addition, (Alwi, 2017) also mentioned that often learning materials that are too abstract can make it easier for students to accept the material provided. Darling in Muhali (2019) explains that learning in the 21st century presses educators to be able to process and teach in the learning process effectively, as well as in the use of technology to improve the quality of the learning process. Vocational High School (VHS) is one of the national education systems that seeks to equip students with skills (Setiyawan & Kurniawan, 2021; Sunyoto & Setiyawan, 2021). Vocational High School is a school that attempts to produce competent graduates in their disciplines who are ready to enter the workforce (Setiawan & Muchlas, 2021). Aside from the economic losses and their negative effects, it has also made a significant contribution to the country's present rise in the number of young people without jobs (Auta & Kurniawan, 2022). In addition, (Chuang, 2014) also states that the development of technology as a learning medium can overcome the problem of learning difficulties for students, especially on the display of exciting learning media that will motivate students to learn more. It has been proposed that sufficient training and collegial support increase instructors' desire to integrate technology into their classroom instruction and build successful technology-assisted teaching methods (Becker et al., 1999; Hohenwarter & Lavicza, 2007). Technological innovations are constantly changing and creating new challenges for higher education and the importance of competency development in engineering education (Tordai & Holik, 2018).

Based on the results of interviews with Mr. Ibnu Mahdi, S.Pd., a teacher majoring in automotive and light vehicle engineering class Dr. Tjipto Semarang on 31 January 2022, explained that when teaching in class, students seemed to pay less attention to the explanation of the teacher, this shows that the lack of motivation of students to learn is caused by several reasons such as the use of learning media used is still not varied, especially in cooling system maintenance material so that

students quickly feel bored. The achievement of student learning outcomes is also relatively low, namely an average of 60.54 or can be categorized as still below the KKM. In addition, students also have Android smartphones that are allowed to be brought to school so that they are busier with their smartphones, such as playing games and social media, than concerned with school lessons. This shows there is no optimal use of Android smartphones in the learning process, significantly cooling system maintenance material. In the learning process, learning media has several functions, including IT-based learning media that can be used to facilitate the delivery of information in the form of facts and awareness to many people (Setiyawan, 2017, 2020; Setiyawan et al., 2021b). In IT classrooms, multimedia tools, including computers, laptops, monitors, speakers, projectors, scanners, cameras, and other devices, are crucial to learning (Sundari et al., 2022). Based on the explanation in the previous point, learning media is a supporting component in achieving learning objectives. Along with the times, learning media will continue to develop following technological developments. According to (Wirjawan et al., 2020), a Smartphone is a device that can visualize physical phenomena. Besides that, smartphones can also be carried everywhere, unlike computer-based media. Hence, learning resources like smartphone applications are suitable for self-study outside school hours. Learning media features have an influence on collaboration between teachers and students (Muchlas et al., 2023).

(Lu'mu, 2017) also explains that Android is a Linux-based operating system created for touchscreen-based mobile phones. In addition, (Busran and Fitriyah, 2015) also explained that Android is an open-source operating system from the company Google Inc. for mobile devices that include operating systems, middleware, and applications. Android provides an open platform for developers to develop their applications. Thus, developers can develop applications according to their wishes for various purposes, such as learning media needs. According to (Siahaan et al., 2020), android-based learning media has the advantage that it can be used independently both inside and outside of school because this media is easy to obtain, downloaded via Google Drive so that it can be used practically and can be downloaded via gadget or computer.

One way to develop Android-based learning media is through the Smart Apps Creator application. According to (Khasanah et al., 2020), Smart Apps Creator can be used easily to create Android applications without going through the programming or HTML process; animation content can also be added, making learning media more varied. Therefore, researchers develop Android-based cooling system maintenance learning media using Smart Apps Creator.

Method

This research is Research and Development, which refers to the ADDIE development model. According to (Aldoobie, 2015), the ADDIE development model consists of five stages of development

activities, namely (1) Analyze, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation.

The analysis stage is divided into needs analysis, curriculum analysis, and analysis of learner characteristics (Setiyawan, 2023; Setiyawan et al., 2021a). Needs analysis is used to identify problems and needs needed by students. Curriculum analysis is used to determine competency standards, basic competencies, and learning objectives that will be used in developing learning media. At the same time, analyzing learner characteristics intends to obtain information about the conditions, facilities, and infrastructure previously used by students in the learning process. The design stage in this research aims to design and develop learning media based on the analysis that has been done in the previous stage. With this, the researcher divides it into three parts: collecting material, creating a navigation structure, and creating a storyboard. This implementation stage is a stage to implement the learning media design developed in an actual learning process. The evaluation in this study is formative, a stage carried out in providing an assessment of something that is developed and can be carried out at all steps of the activity as a revision requirement to achieve optimal development results (Trisiana and Wartoyo, 2016).

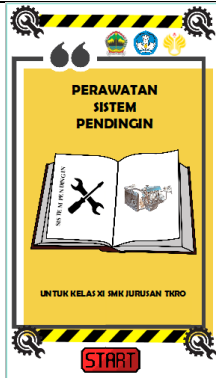



Result and Discussion

Result

After conducting interviews and observations, the result of student needs analysis were also obtained as follows. First, learners need the development of learning media that can be used to increase their knowledge of cooling system maintenance. Second, students need learning media products that are aligned with their needs of students, namely Android-based learning media. Third, students need learning media that can be used flexibly. Learning for students previously only used PowerPoint media displayed using projector media whose material was explained directly by the teacher. In addition, students also have their own Android smartphones that can be used or brought to school, but there is no use of Android smartphones as learning media. Therefore, researchers intend to develop android-based learning media, hoping that students can learn independently, practically, and flexibly. The material on the learning media developed refers to the Core Competencies (CC) and Basic Competencies (BC) in the 2013 revised 2018 curriculum on cooling system maintenance material at Dr. Tjipto Semarang VHS, namely BC 3.3 Apply how to maintain the cooling system and BC 4.3 Periodically maintain the cooling system.

Product development is carried out by the previously designed design at this stage. Here are some initial product development designs that have been developed:

Table 1. Development Result

Item	Development Result	Item	Development Result
Cover		Sub Learning Material	
Main Menu		Quiz	

After completing the development of the learning media, the learning media is submitted to media experts and material experts; this aims to determine the feasibility level of learning media in terms of media and material before being implemented by students.

The material validation test on learning media was conducted on two material validators from Mechanical Engineering at Semarang State University and teacher at Dr. Tjipto Semarang VHS. The following is the data from the assessment of material experts on the development of learning media on Android-based cooling system maintenance using Smart Apps Creator:

Table 2. Expert Judgment Validation

Expert Judgment	Score
Learning Material Expert 1	74
Learning Material Expert 2	75
Total Score	149
Maximum Score	160
Percentage (%)	93,13%
Category	Very Feasible

The feasibility test by material experts received a total score of 149 out of the highest score of 160 and a percentage of 93.13% which can be categorized as "very feasible" to be implemented in the application of teaching and learning at Dr. Tjipto Semarang VHS.

The learning media validation test was carried out by three media validators, Media Expert 1 from Mechanical Engineering at Semarang State University lecturer, Media Expert 2 from the Central Java Province Multimedia Development Agency for Education and Culture (BPMPK), and Media Expert 3 from Dr. Tjipto Semarang VHS teacher. The following are the results of the assessment of media experts on the development of learning media on Android-based cooling system maintenance using Smart Apps Creator.

Table 3. Media Expert Validastion

Learning Media Expert	Score
Learning Media Expert 1	111
Learning Media Expert 2	103
Learning Media Expert 3	115
Total Score	329
Maximum Score	375
Percentage (%)	87,73%
Category	Very Feasible

This implementation stage is the stage for implementing the learning media design developed in an actual learning process. To find out how much the effectiveness of using the learning media developed, students are given pretest and posttest questions. Before the pretest and posttest questions were implemented, the questions were tested for validity and reliability. First, the validity and reliability tests were carried out in the automotive and light vehicle engineering class of Dr. Tjipto Semarang, which totaled 30 students. The following are the results of the validity and reliability tests.

Validation tests are carried out to ensure the questions developed suit student testing. The validation test is a parameter for the questions that will be used. For $\alpha = 5\%$ with $n = 30$ obtained $r_{table} = 0.361$. if $r_{pbis} > r_{table}$, then the question is said to be valid. The following is an analysis of the results of the validity test of the test instrument.

Table 4. validity Test Result

Question	r_{pbis}	r_{table}	Description
1	0,56624	0,361	Valid
2	0,4172	0,361	Valid
3	0,324712	0,361	Not Valid
4	0,377288	0,361	Valid
5	0,447323	0,361	Valid
6	0,159403	0,361	Not Valid
7	0,539526	0,361	Valid
8	0,422055	0,361	Valid
9	0,576873	0,361	Valid
10	0,26838	0,361	Not Valid
11	0,47925	0,361	Valid
12	0,224026	0,361	Not Valid

Question	r_{pbis}	r_{table}	Description
13	0,466781	0,361	Valid
14	0,569406	0,361	Valid
15	0,047851	0,361	Not Valid
16	0,49978	0,361	Valid
17	0,43332	0,361	Valid
18	0,492507	0,361	Valid
19	0,533426	0,361	Valid
20	0,433768	0,361	Valid
21	0,458504	0,361	Valid
22	0,62532	0,361	Valid
23	0,441209	0,361	Valid
24	0,045937	0,361	Not valid
25	0,791349	0,361	Valid
26	-0,03374	0,361	Not Valid
27	0,543579	0,361	Valid
28	0,285401	0,361	Not Valid
29	0,62806	0,361	Valid
30	0,619777	0,361	Valid
31	0,46008	0,361	Valid
32	0,62532	0,361	Valid
33	0,671447	0,361	Valid
34	0,462575	0,361	Valid
35	0,768668	0,361	Valid
36	0,488835	0,361	Valid
37	0,656625	0,361	Valid
38	0,433768	0,361	Valid
39	0,637611	0,361	Valid
40	0,023548	0,361	Not Valid

Reliability Test

Question items can be categorised as reliable if $r_{(11)} > 0.80$.

Table 5. Reability Test Result

Test	r_{11}	Standard	Description
Reliability	0,9146	0,80	Reliable

Based on the data analysis of the validity and reliability tests above, it was found that there were 31 valid items and nine invalid items, and based on the reliability test, it was stated that the items were reliable. Therefore, the researcher decided to take 30 valid items and then apply them to the pretest-posttest with treatment using the learning media developed for students in automotive and light vehicle engineering A class of Dr. Tjipto Semarang. The following are the results of the data analysis of the pretest-posttest assessment results:

a. Normality Test

By using the help of the SPSS Statistic 25 program using a significance level (α) of 0.05, the data output is as follows.

Table 6. Normality Test Result

Test	(sig)	α	Description
Pretest	0,072	0,05	Normally distributed
Posttest	0,149	0,05	Normally distributed

Data is normally distributed if the significance value (sig) that appears on SPSS is greater than α (0.05) and vice versa. The data is not generally distributed if the significance value (sig) that appears on SPSS is smaller than α (0.05). So it can be concluded that the data in this study are normally distributed.

Homogeneity Test

After conducting the homogeneity test, the F_{value} is 1.65 for a significance level of 5%, the F_{table} value is 1.85.

Table 7. Homogeneity Test Result

F_{value}	F_{table}	Description
1,65	1,85	Homogen

T-test

After conducting the t-test, the result shows that $t_{value} = 11.65$ and t_{table} at α equal to 5% is $t_{((0.05)(29))} = 2.045$.

Table 8. Homogeneity Test Result

t_{value}	t_{table}	Description
11,65	2,045.	There is a significant increase

Based on the results of the t-test data analysis above, there is a significant increase in student learning outcomes, so the conclusion is that the development of android-based cooling system maintenance learning media using smart apps creator at Dr. Tjipto Semarang VHS is effective for use.

Evaluation

Evaluation in this study is a formative evaluation, a process carried out to assess something developed. It can be done at all activity steps as a revision requirement to achieve optimal development results. However, the final stage of evaluation is carried out by giving a questionnaire to students who have received treatment using the learning media developed to find out the students' responses in terms of users. The following is an analysis of students' responses after using the learning media:

Discussion of Research Results

Feasibility of Learning Media

The final result of learning media development developed using Smart Apps Creator is an application that can be installed directly on an Android smartphone above version 4.1 (Jelly Bean). While the size of this application is 100 MB, the content of this learning media is material about cooling system maintenance which is aligned with CC, BC 3.3, and 4.3 in the 2013 revised curriculum 2017. The material of this learning media development is about the understanding of the cooling system, the function of the cooling system, the types of cooling systems, the components and functions of each component of the cooling system, how the cooling system works, and how to periodically maintain the cooling system.

Based on the experts' assessment results, this learning media can be categorized as "very feasible" to use. The results of the expert validity test themselves were carried out by two material experts and three media experts; the results of testing by material experts received a percentage of 93.13% feasibility or could be categorized as "very feasible," while the results of media expert validation received a percentage of 87.73% or categorized as "very feasible." These are the research results conducted by (Ernawati and Sukardiono, 2017). The learning media developed obtained validation results from material and media experts in the "very feasible" category. In addition, these results are also by research conducted by (Elvina and Dewi, 2020), that the learning media developed also received validation results from material experts and media experts in the "very feasible" category for use. Based on this study, this research can strengthen the results of previous studies that android-based learning media are very feasible to use in the learning process according to the assessment of material experts and media experts.

Effectiveness of Learning Media

To determine the effectiveness of learning media is done by giving pretest and posttest questions, where learning media is said to be effective if the results of the posttest assessment are more significant than the pretest. The items were tested for validity and reliability before the questions were tested to test the product's effectiveness. First, the validity and reliability tests were carried out in XI automotive and light vehicle engineering B class with 30 students. For the validity test, 31 items are valid, and nine items are invalid, while the reliability test gets a reliability value of 0.9146 or can be categorized as reliable items. Based on the data processing, it was decided to use 30 valid question items for testing at the next stage, namely in XI automotive and light vehicle engineering A class.

Previously, students were given pretest questions first to determine the level of knowledge of students before using learning media, and after using learning media, given posttest questions to

determine the level of knowledge of students after using learning media. After that, the data were analyzed; for the normality test analysis, the pretest results obtained a significance value of 0.072 or could be categorized as normally distributed, while the posttest results obtained a significance value of 0.149 or were also categorized as customarily distributed. For the homogeneity test, the F_{value} value is 1.65, or the two data can be categorized as homogeneous. After the validity test and homogeneity test, the subsequent hypothesis test analysis is carried out using the t-test for the t-test results to get results that there is a significant increase in learning outcomes after using learning media with the results of t_{value} 11,65. Meanwhile, the gain test obtained an average gain value of 0.64 which can be categorized as a medium improvement. The following are the results of the comparison of pretest and posttest scores:

The results of this study are research conducted by (Angreany and Saud, 2017) that the learning media developed is effective for use in the learning process to increase students' knowledge. In addition, (Faqih, 2021) research also found that the android-based learning media developed was adequate for increasing students' understanding of the material being taught. To prevent students from becoming disinterested in how the material is presented, the SAC application can simplify the process of learning activities by including engaging content. Based on this study, this research aligns with and strengthens previous research that developing android-based learning media effectively increases students' understanding.

Student Responses

As a step to determine the feasibility of learning media in terms of its users, students are given a questionnaire to find out the responses of students after using learning media. Based on the results of the data analysis, the learning media received an excellent response, with a percentage of 86.71%. Based on this, the development of an android-based cooling system maintenance learning media using smart apps creator at Dr. Tjipto Semarang VHS is effective for use in the learning process to increase students' knowledge level. This shows that this research strengthens the results of previous studies, such as research conducted by (Kusumawardhani et al., 2022), that the learning media developed received a very positive response from students.

Conclusion

Under the results of the development, implementation, and results of data analysis, the following conclusions can be drawn: The learning media developed is feasible based on the assessment results from experts, namely with an average percentage of 93.13% feasibility from material experts and 87.73% from media experts. The learning media is effectively implemented in the learning process. This is to the results of the t-test, which gets a t_{value} of 11.65, or it can be concluded that there is a significant increase in learning outcomes after using learning media. Students' responses after using

the learning media were classified as very good, with a percentage of 86.71%.

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