Mobile Application Smartphone: Does It Improve the 21st Century's Competence of Vocational School Students?

Setuju, Bruri Triyono, Ali Muhtadi, and Asri Widowati

***Abstract*—Gadgets or smartphones have become primary needs for everyone, especially students and teachers during online learning. These devices provide helps in searching for unlimited learning resources. However, there are only few which provide vocational learning resources. As a solution to this problem, it is important to study and develop mobile application-based media to improve students' competence. The product was developed using the ADDIE model and was tested on students and teachers at a vocational school in Yogyakarta. The results indicate that Android-based mobile media is very feasible. The empirical testing result also shows that the developed product can promote 21st century's competence.**

***Index Terms*—Competence, mobile, smartphone, vocational student.**

I. Introduction

The rapid development of technology and science demands human resources in managing the technology as well as possible so that it can be useful in their lives. Information and communication technology is very useful in supporting the creation of effective and efficient learning. Education is expected to be able to deliver students in developing their potential and adapting to existing developments.

Meeting the demands of the global economy by modeling, and instilling in teaching, the mastery of 21st century skills such as problem solving, critical thinking, communication, collaboration and creativity and innovation [1]. 21st century learning is surrounded by digital media, so it requires guidance on how to best apply available media resources for the learning process and use media creation tools to create appropriate communication products [2]. The integration of Information and Communication Technology (ICT) in the classroom can improve 21st century learning skills designed in the curriculum [3]. The integration of technology in learning actually introduces a new set of variables and adds complexity, because the nature of technology is constantly changing and evolving [4].

Smartphone is one of the devices in the world of Information and Communication Technology. Smartphones have penetrated various circles of society, ranging from children, teenagers, to adults. Android-based smartphones have opportunity to be used as learning media in supporting student learning independently. In addition to its functions for phones, cameras, social media, Whatsapp., and others, smartphones can be used as digital-based learning media devices. Android-based media provides convenience, easy access, and cheap [5]. Thus, smartphones become mobile learning devices for students and teachers. Mobile learning is a variation of learning by utilizing handheld and mobile IT (information technology) to learn or access subject matter whenever and wherever [6]. This is a form of utilization using interactive multimedia technology that helps speed students' understanding of the subject matter [7].

According to Statista, the number of smartphone users worldwide increased to over three billion in February 2020. Needless to say, out of all the operating systems running on different smartphones, Android is considered as the most favorite among people. Powering numerous brands of smartphones and tablets, Android has reached all the corners of the world. Android-based media can also be used for learning physics anytime and anywhere [8]. The use of technology in the form of android applications is more practical and flexible than other learning media. Android can improve the competence of diagrammatic and argumentative representations in learning physics. the media is applicable to be used as a medium for learning physics both inside and outside the classroom [9]. The use of android applications in learning can also increase speaking competence in English and be more flexible in its use and students to improve their learning motivation and creativity [10].

Online learning in the Covid-19 condition is a challenge for teachers in creating interesting and engaging learning. The lack of effectiveness of online learning so far is due to the limited ability to design interesting learning, especially related to the procurement of digital-based learning resources. The limited ability of resources to utilize educational technology is an obstacle to online learning [11]. The impact of ineffective online learning is that students do not understand the material provided so that the achievement of competence is low and students are not interested in learning [12].

Android-based smartphones as mobile learning based on research can improve students' competence. However, teachers have not been able to organize interesting online learning, according to the needs of students. This results in ineffective learning. In addition, teaching materials based on Android applications on smartphones for materials are still rarely available, especially for learning about drawing technique in vocational education. It is hoped that with digital media-based learning resources, vocational students have an

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interest in learning and achieve competence so that vocational high school graduates are ready to work.

With increasing mobility in technology, it is important to find ways to create paintings using tablets and smartphones while vocational students are on move. This reason makes it important to develop an android-based smartphone to see the response of interest or interest in learning and increase the cognitive competence of vocational students during online learning. As the purpose of secondary school education according to the 2003 National Education System Law, vocational education is a type of secondary education that has the task of developing human resources in order to meet the needs of manpower for the success of national development.

II. Methodology

A. Type of Research

The development model used in this research is the ADDIE (Analysis, Design, Development or Production, Implementation or Delivery and Evaluations) model proposed by Dick and Carry. The selection of the ADDIE model is based on the consideration that this model is systematically structured for continuous learning problems according to the characteristics of students in learning media.

B. Research Subject

This research was conducted in Vocational High Schools with a focus on developing learning media for students majoring in Mechanical Engineering.

C. Research Instrument and Procedure

Questionnaires were distributed to reveal the evaluation of the developed product by media experts and students. The students questionnaire shared to those from vocational schools in Yogyakarta and Central Java elicited their responses while using the application. Questionnaires were based on modification [13].

III. Results and Discussion

This research is intended to produce technical drawing learning media based on Android Mobile application for vocational students, according to experts and practitioners. In addition, it is also to find out students' responses to the developed media. The development process in this study employs the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The stages of the development are 1) Analysis, namely knowing the conditions of learning in schools. The researchers did some classroom observations to reveal the existing learning media; 2) The design includes several design stages starting from determining the application flow and the orientation the product (21st century competence); 3) The development and implementation phase which includes the process of improving learning media in the form of Android application; and 4) Evaluation as the final stage of implementing the developed product as a learning medium.

The design stage can be illustrated in the flow-chart below as shown in Fig. 1.

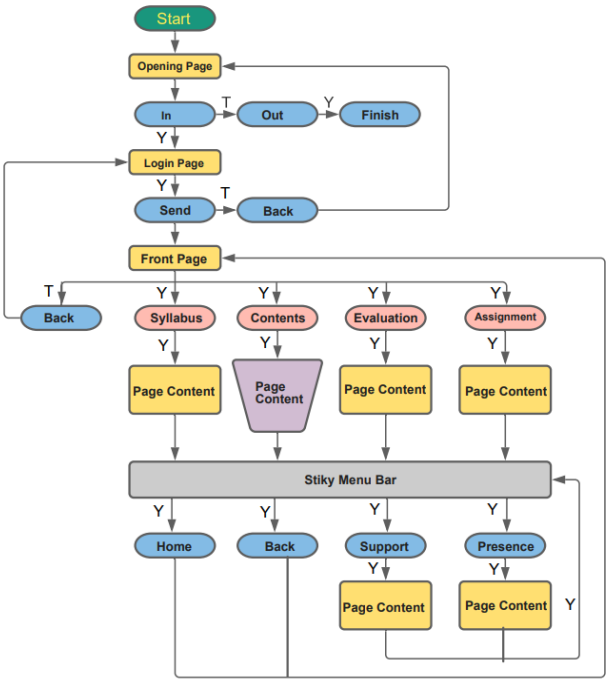

Fig. 1. The design development.

The determination of the media interface or display and the menu design is shown in Fig. 2. Media interface.

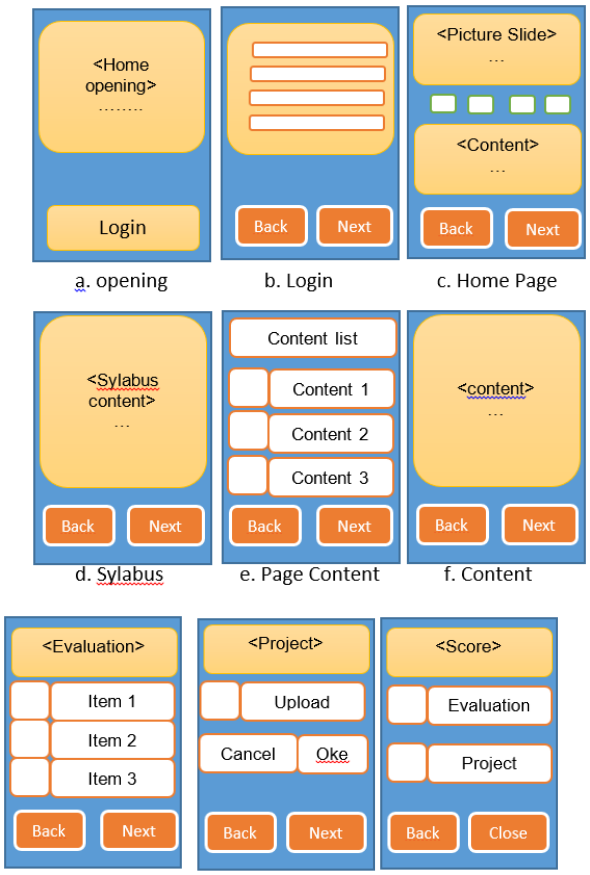

Fig. 2. Media interface.

The feasibility of the media was evaluated based on the assessment of 4 media experts, 4 material experts. The results of the material expert assessment include aspects of learning, material content, and benefits, which are converted into categories in the following categories Table I.

TABLE I: RESULTS OF VALUE DATA FROM MATERIAL EXPERTS

No	Aspect	Validator	Category
01.	Learning	38.00	Very good
02.	content	28.00	Very good
03.	Benefit	8.00	Good
Total score		**74.00**	**Very good**

The average score of 74 material experts is in the "very good" category. Considering the consequences of the material experts' assessment results, it tends to be reasonable that the technical drawing learning media are in the "very good" category and can be applied in teaching and learning processes, especially for developing 21st century competence.

The material experts provided input and comments on the technical drawing learning media based on Android mobile application developed by the researchers. The received feedbacks and comments indicate "very good" category since there were almost no revisions to the product. This is reinforced by input from material experts that the material coverage is relevant to the applied curriculum and the assessment fulfills the ideal criteria.

The media experts' judgment or assessment includes display and software, as presented in Table II.

TABLE II: RESULTS OF VALUE DATA FROM MEDIA EXPERTS

No	Aspect	Validator	Category
1.	Appearance	39.00	Very good
2.	Software	14.00	Very good
Total Score		**53.00**	**Very good**

The score obtained from media experts is 53.00 in the "very good" category. Considering the consequences of the media expert's assessment on media approval, it can be said that the developed product is appropriate to be used as a learning medium.

The result also showed that only minor revisions were needed. Besides, the product suits the current situation, i.e. online learning, since it can be operated on mobile device like handphone. However, an improvement to the evaluation display needs to be conducted as it seems too generic.

The results of the assessment from students of this small experiment group contain four parts of the assessment covering aspects of content, benefits, appearance, programs, and media perspectives. 125 students were involved in this process.

TABLE III: RESULTS OF SMALL STUDENTS GROUP ASSESSMENT

No	Aspect	Validator	Category
1	content	014.60	Very good
2	benefit	028.00	Very good
3	appearance	9.0	Good
4	software	39.20	Very good
Total score		**88.20**	**Very Good**
No	**Aspect**	**Validator**	**Category**
1	content	4, 4.6060	Enough
2	benefit	11.20	Bad
3	appearance	2.40	Bad
4	software	2.00	Bad
Total score		10.20	Bad

Table III Shows that the trial on content aspect got the average score of 14.60 or in the "very good" category; 28.00 in the "very good" category on the benefit aspect; 9.40 in the "good" category in terms of the appearance; and 39.20 in the "good" category for the software aspect. The total scores from all four aspects is 88.20, which is included in the "good" category; and it can be concluded that the technical drawing learning media developed is considered as a "very good" learning medium.

Table IV presents the results of field testing or judgments made by the large experiment group in terms of benefits, appearance, software, and media. 125 students were involved as the respondents. The average score obtained from the material is 18, classified in the "very good" category. In terms of its benefit, the average score reached 18.3, classified in the "very good" category. The third aspect, appearance, obtained 32.63 which is classified in the "very good" category; while the last aspect or software obtained 11.4 of score and is classified the "very good" category. The total score of the four aspects from the assessment is 80.37, which is included in the "very good" category. Thus, it can be concluded that the developed media are labelled "very good" and are appropriate to be used as learning media.

TABLE IV: RESULTS OF THE LARGE STUDENTS GROUP ASSESSMENT

No	Aspect	Validator	Category
1	content	18.00,0	Very good
2	benefit	18.30	Very good
3	appearance	32.63	Very Good
4	software	11.40	Very Good
Total score		**80.33,**	**Very Good**

Teaching materials are all materials (information, tools, and texts) that are systematically arranged displaying a complete figure of competencies to be achieved by students. The material is one of the main components in ideal teaching and learning processes. Good teaching materials can present the depth of material that can facilitate students in their learning process to achieve their competencies. A learning material must accommodate materials that can be accounted for, meaning that it must come from relevant sources, so that there are no false concept as it is the core part of a teaching material. Therefore, the material must be developed according to the competencies and indicators that have been set previously. According to the National Center for Competency-Based Training as cited in teaching materials are all forms of materials used to assist teachers or instructors carrying out the learning process in the classroom [14]. The materials can be in form of written or unwritten. Other experts mention that teaching materials are a set of materials that are systematically arranged to create an environment or atmosphere that allows students to learn. The quality of the content developed in android-based teaching materials based on student responses and media experts is in the very good category. Therefore, these teaching materials can be used as learning resources for vocational high school students, especially for learning technical drawing.

Android is an operating system for mobile that is based on Linux and is an open source [15]. Argues that Android is an operating system platform favored by the community due to its open-source nature that allowing users to develop. Android is a new generation of Linux-based mobile platforms that includes an operating system and middleware

[16]. Accordingly, Android-based learning media allow students to get information and learning materials anytime and anywhere in such an effective and efficient way.

Learning media can improve the quality of learning as it refers to any materials that convey or distribute messages from any planned sources to promote a conducive learning environment where recipients are able to conduct their learning process efficiently and effectively [17], [18]. By using android-based learning media, teachers can motivate students to learn the material immediately [19]. The technical drawing learning media that is based on android mobile application can offer solutions to the problems faced by vocational high school students. A common problem happens in technical drawing, students' low learning outcomes, can be overcome by providing this learning media. Eventually, it is expected that students will show higher motivation and interest in learning technical drawing.

The Vocational High School 125 students' responses in learning technical drawing by using the android-based media can be illustrated in the following Table V.

TABLE V: RESPONSES TO THE USE OF ANDROID-BASED TEACHING MATERIALS

Indicator	Score	Category	Students
Feeling pleased	86.00	Very high	120
Showing interest	78.00	High	115
Giving attention	87.00	Very high	121
Being engaged	80.00	High	122
Mean	82.75	Very high	
Indicator	**Score**	**Category**	**Students**
Feeling pleased	14.00	Low	5
Showing interest	22.00	Low	10
Giving attention	13.00	Low	4
Being engaged	20.00	Low	3
Mean	17.25	Low	

The students felt delighted while using android-based media on technical drawing and were excited during the learning experiences as the learning medium can be easily accessed on their smartphones. This positive learning environment eventually may promote the students' learning interest. In addition to its easy access, the mobile learning is affordable and provides more engaging and motivating learning atmosphere because such application promotes the students' digital skills. The use of the application also adds flexibility to the learning as it can be employed anytime, anywhere, and under any conditions [20]. The results of this study show that the students' responses are all in good category and indicate effectiveness. Judge proposes that android-based teaching materials can be used more flexibly in learning to increase higher engagement. Students' interaction is also enhanced through question-and-answer session during the assessment as well as discussion. Though the use of technology is quite common in education, the integration of android-based learning application in the learning process remains both promising and challenging. Teachers should consider using it to enrich their instruction. This study provides results that such android-based learning application indicates positive influences on students' interest and involvement to support higher learning outcomes. Online learning resources promote students' interest in learning, especially during the Covid-19 outbreak, as some research points out that the students' interest in learning online during this pandemic era is still low [21]. Android-based digital teaching materials are effective [22]. Although the majority of students feel comfortable, happy and can increase their interest in learning with android-based technical drawing learning media, there are a small number of students who do not feel this way. This media presents advantages that can be used for students to learn, such as learning can be done anywhere and anytime, with easy-to-use devices, exercises can be used repeatedly. But it is also undeniable that every tool has its obstacles, such as this media, in practice, it must use internet access and devices used with the Android version of the operating system.

IV. CONCLUSION

The development of technical drawing learning materials based on Android Mobile Application with the ADDIE referring to the results of the needs analysis of learning media has been highly validated. The results indicate that students show increasing interest in learning technical drawing after the existence of Android-based teaching material due to several factors: its easy access, the flexibility of learning time, and the fact that the module is equipped with practice activities and assignments. This media presents advantages that can be used for students to learn, such as learning can be done anywhere and anytime, with easy-to-use devices, exercises can be used repeatedly. But it is also undeniable that every tool has its obstacles, such as this media, in practice, it must use internet access and devices used with the Android version of the operating system. Researchers recommend research on the development of learning media that can be accessed through various operating systems on smartphones.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR'S CONTRIBUTION

Agree to conduct research on the development of digital-based modules, this is due to the pandemic (Covid). Products are used in vocational schools and provide motivation or interest in learning. Bruri Triyono suggested that the research results be made into articles and reviewed. Ali Mahmudi reviewed and edited the language, suggesting looking at articles that could support his research results. Asri widowati reviewed and provided suggestions in presenting the results of data processing and conclusions. All authors have approved the final version.

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