Learning media-based android for technical drawing courses

Nopriyanti1*, E D Kurniawan1 and H Fatihah2

1 Departement of Mechanical Engineering Education, Universitas Sriwijaya, Indonesia
2 Departement of Pancasila and Civic Education, Universitas Sriwijaya, Indonesia
*nopriyanti@fkip.unsri.ac.id

Abstract. This type of research is research and development that aims to produce a valid and practical learning media based on Android. The validation of learning media is carried out by media experts and material experts. The product trial subjects are students of Mechanical Engineering Education who take technical drawing courses in the 2019/2020. The development model used is ADDIE. Trial respondents were chosen who represented the target group. Trials produce findings of weaknesses, deficiencies, product errors and suggestions. The results of the development of the expert validation of the material indicate the assessment of the usefulness of the learning media based on android to get an assessment score in the excellent category. Media expert judgment is found in a good category so the learning media product based on android is said to be valid. One to one trial evaluation is in the "Good" category, Small Group Trials in the "Very Good" category and the android "Very Good" category. So that it can be concluded that the learning media based on the android subject matter of engineering drawing is said to be valid and practical.

1. Introduction
21st Century learning requires students to be able to think creatively. 21st Century Assessment and Teaching Skills, organizing skills, knowledge and attitudes into four categories: ways of thinking, ways of working, tools for work, and living in the world [1]. The success in creating graduates who are competent and have a high ability cannot be separated from the role of lecturers and facilities in the learning process in the classroom [2].

The critical success factors in the learning process include lecturer pedagogical competence and the use of media [2]. Educational media play an important role in the learning process. The use of educational media can assist lecturers in delivering lecture material. The success of learning is largely determined by two main components, namely the teaching method and learning media [3].

Based on observations of daily values obtained results include: (1) student learning outcomes are still low; (2) most students still have difficulty understanding the material presented; (3) the way the delivery is done by the lecturer in the learning process is still oriented to the lecturer-centered learning approach; (4) some of the available material is still manual and non-interactive; (5) student activities in this learning activity sometimes occasionally still use a smartphone.

The phenomenon of using smartphones is unavoidable, every student currently has all smartphones. The results of observations in class 100% of students already have a smartphone, some have more than one. The use of Android-based learning media is one application of the 21st-century learning style [4].

The use of instructional media can help improve learning outcomes of students' cognitive domains [5]. The purpose of learning media is to facilitate and streamline the learning process in class. The
implementation of learning using a smartphone can have a positive impact on the dimensions of cognitive, metacognitive, affective, and socio-cultural[7]. This type of learning media allows students to learn unlimited by time and place with interesting applications [8].

Android is an operating system that turns on more than one billion smartphones and tablets. Because this device makes our lives so sweet [9]. Android is an open-source allows being modified and distributed freely. Android allows users to communicate with anyone at any time and place almost without obstacles. [10]. Smartphones and tablets have the power to transform learning experiences. In addition, Android-based applications can be run on almost all personal computers through an Android emulator; and this capability drives Android's growth in the global market, leaving behind many other rivals [10]. Some of the advantages of learning by using the Android application can be used anywhere at any time, relatively cheaper prices, small size, can reach many students[3].

Technical Drawing Engineering is a tool to express a person's idea or the idea of an engineer and has three important functions, such as to convey information, as documentation material, pouring ideas for development [11]. Engineering Drawing Courses are compulsory subjects that must be taken by Mechanical Engineering Education Study Program Students of FKIP Sriwijaya University. This technical drawing course is taken by first-semester students and weighs 3 SKS. Based on the above problems, the aim of this research is to develop an Android-based learning media on a valid and practical Engineering Drawing Course.

2. Research Methods
This type of research is Research and Development (R&D). The development model used is ADDIE. ADDIE is an acronym for Analyze, Design, Develop, Implement, and Evaluate. The educational philosophy for the ADDIE application is that intentional learning must be student-centered, innovative, authentic, and inspirational [12]. The concept of developing ADDIE is as follows:

![Figure 1. ADDIE development concept](image)

Trials produce findings of weaknesses, deficiencies, product errors and suggestions submitted by respondents to developers. This trial was conducted 3 times of trials and conducted on different respondents in order to produce a truly maximum learning media product so that it can be used in daily learning activities.

The subject of product validation was 2 experts’ namely material experts and media experts. Material experts are from lecturers who take the Technical Drawing Course, while media experts are people who understand the design of developed learning media. While the product trial subjects in this study were students. In this study, the data were analyzed using the data tendency categories. Score results are then converted into values. The data tendency table used refers to [13] as presented in table 1.
Table 1. Data tendency categories

| Interval                                      | Category          |
|----------------------------------------------|-------------------|
| \((\bar{X}_i + 1.80 \text{ Sbi}) < X\)     | Excellent         |
| \((\bar{X}_i + 0.60 \text{ Sbi}) < X \leq (\bar{X}_i + 1.80 \text{ Sbi})\) | Good              |
| \((\bar{X}_i - 0.60 \text{ Sbi}) < X \leq (\bar{X}_i + 0.60 \text{ Sbi})\) | Enough            |
| \((\bar{X}_i - 1.80 \text{ Sbi}) < X \leq (\bar{X}_i - 0.60 \text{ Sbi})\) | Less              |
| \(X \leq (\bar{X}_i - 1.80 \text{ Sbi})\) | Very Less         |

Description:
\(\bar{X}_i = \frac{1}{2} (\text{ Maximum + minimum score})\)
\(\text{Sbi} = \frac{1}{6} (\text{Maximum score} – \text{minimum scores})\)
\(X = \text{Actual Score}\)

3. Results and Discussion

The learning process at the Mechanical Engineering Education is carried out in both theoretical and practical forms. Practical learning aims to improve students' skills by using various methods in a systematic and directed manner. One practice learning is Technical Drawing. Taking into account the characteristics of a unique and comprehensive practice learning process, the development of learning media based on android is quite potential to meet the demands of learning. The learning media based on android can support teaching materials that already exist and direct students to learn independently and systematically. The development model learning media based on android is an ADDIE that consists of 5 main stages namely: analyze, design, develop, implement, and evaluate.

3.1 Analysis

Field analysis was conducted to see the condition of the lecture process directly. The results of the field analysis include: (a) media used on blackboards and books so that the lack of enthusiasm of students in learning; (b) educators apply methods namely lectures and demonstrations; (c) inadequate drawing space; (d) limited learning media; (e) media needs that are in accordance with the development of science and technology.

Analysis of student needs is obtained through interviews with students. It was found that they thought that the learning method was lecture so monotonous. The use of instructional media is limited to whiteboards and PowerPoint. Students have difficulty in absorbing and studying the material presented. Agree with the lecturer student also mentioned that he had difficulty in making a complete learning media such as books but can be taken anywhere. This makes a lot of time wasted and there are still some students who do not understand the explanation given, especially with students sitting in the back.

3.2 Design

The results obtained from the design stage are: researchers first make a flowchart. The goal is that the development of learning media based on android is not widespread and leads to other learning. Next, the creation of a storyboard that will be used to describe the shape of each display in each frame in the learning media based on open-source that is developed.

3.3 Development

The overall development of learning media based on android products discusses technical drawing material. The production process media is also based on the design of prototypes, flowcharts, and storyboards that have been made previously as well as supporting materials for making other products. The target users of this learning media product are students in semester 2 (two) who take technical drawing lectures. This learning media based on android is packaged in two forms of storage, namely in the form of compact disc and flash disk.
3.4 Validation
The learning media based on android products in drawing engineering courses that have been completed before being tested by the developer first. Validation is contained in a questionnaire filled by both material experts and media experts in accordance with the aspects of the evaluation of each validator. The assessment of material experts and media experts is used to determine the quality of this learning media product design. The validator lecturer gives an assessment to be revised until the product is considered worth testing to students.

The expert validation of this material was carried out to 2 lecturers supporting the Engineering Drawing course in the Mechanical Engineering Education. The results of the validation by the material experts can be concluded that it has a “very good” category with an average of 4.28.

The validation of the media expert was carried out by 2 lecturers who understood the learning media and were a lecturer in the Mechanical Engineering Education. The results of the validation by media experts obtained an assessment with the category "very good" with an average of 4.2.

3.5 Implementation
The Products of Learning media based on android which is declared feasible by experts will then be implemented/tried out to students of mechanical engineering education. The implementation/trial was carried out by 32 students consisting of several stages, namely: (1) the first stage with 3 students called individual trials; (2) the second stage with 9 students called limited trials; (3) the third stage with 20 students called field trials.

This one-on-one trial was conducted on 3 students, after using this learning media, students were asked to provide assessments, comments and suggestions for improvement. From the results of the assessment of students, it can be concluded the assessment in the category of "good" with an average of 4.04.

After conducting one-on-one trials and revisions, the developer continues with small group trials. Respondents who were the subjects of this small group trial numbered 9 students. Of the several items assessed it can be concluded that this learning media has an average rating of 4.5 in the "very good" category.

The last test is a field trial. This trial is used to measure the feasibility of an Android-based learning media product developed. The field trial was conducted by 20 students and it can be concluded that the learning media developed obtained an average score of 4.4 in the "very good" category.

3.6 Evaluation
The product was declared feasible by the experts then implemented and assessed by students in the form of trials. Suggestions and criticisms from students given in each trial will also be revised to improve this android-based learning media. The trial consists of: (a) Individual trials conducted by 5 people (b) Limited trials conducted by 15 people (c) after revision field trials were conducted by 30 students. The assessment results from the field trials were revised to be the final product.

4. Conclusion
Based on the results, it can be concluded that the products of learning media base on android in engineering drawings is valid. Material expert judgment is in the “very good” category and media expert judgment is obtained in the “very good” category. In addition, produced learning media based on android is practical. The trial evaluation one to one category is “good”, small group category is “very good” and field test category is “very good”.

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