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Meta Analysis: Effects of Android-based Interactive Learning Media on Student Learning Outcomes at Vocational High Schools (SMK)

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ABSTRACT
Education is a conscious and planned effort carried out in the learning process. Vocational education is education that studies specific training that can be used in the world of work. The use of media in learning functions as an intermediary tool in the delivery of learning material. The purpose of this study was to analyze the use of interactive media based on Android on student learning outcomes in vocational high schools. The method used is meta-analysis with a quantitative approach. An analysis of articles from 18 national journals that had ISSNs was carried out. Results Analysis show that usage of Android-based interactive learning media has a big influence on student learning outcomes in vocational high schools, with effect *size* of 1.14 (ES > 1.1). This proves that Android-based interactive learning media is effectively used to improve the learning outcomes of vocational high school students. Android media allows students to study anywhere and anytime without any time and place restrictions.

Keywords: *Media, Learning, Interactive, Android.*

1. INTRODUCTION

The spread of the corona virus in Indonesia has had a huge impact on the economic, social and educational world [1]. The Covid-19 pandemic has affected all education systems from elementary to tertiary levels. Based on the ABC News report March 7 2020, school and college closures have occurred in more than dozens of countries due to the Covid-19 pandemic, this has had a major impact on the learning process and educational curriculum [1]; [2].

Education is the first step in which a person can achieve and develop knowledge, attitudes, experiences and skills which will later become the basis for contributing to the nation and state development process [3]. According to Winarno (2014: 3) education is a conscious and planned effort carried out in the learning process so that students can develop their potential. Vocational education is education that studies specific training that can be used in the world of work [4]

Vocational education is a comprehensive experiential concept for every individual who studies for success in the world of work [5]. In this case, vocational education learns a lot about preparation before entering the world of work. This learning includes cognitive, affective, and psychomotor learning. Vocational education is education that is oriented towards the development of processes and results of learning. The process will help students to be able to achieve the expected competencies. The benchmark for the success of vocational education is the large number of alumni of vocational education in the world of work and the business world, this of course cannot be separated from the role of the teacher.

The teacher has an important role in the learning process because the teacher has the responsibility to manage, design, implement and evaluate learning, so that the teacher becomes one of the determinants of success in the learning process. Therefore the teacher's role in bridging between learning needs and learning objectives is important [6]. In its role to provide student learning, teachers can usevarious learning methods in conveying subject matter to students. [7] said that the use of learning media can generate new desires and interests, generate motivation, and stimulate learning activities, and will have psychological effects on students.

To produce students who have skills and knowledge, and have noble character, are independent and have good

personalities, it is necessary to have Graduate Competency Standards. This is stated in Government Regulation no. 19 of 2005 concerning National Education Standards Chapter I Article 1 which states that Graduate Competency Standards are graduate qualification standards that include attitudes, knowledge and skills. In order to achieve these graduate competencies, it is necessary to set content standards which are criteria regarding the scope of material and the level of competence of students to achieve graduate competence at certain levels and types of education. This is in accordance with Permendikbud No. 21 of 2016 concerning Content Standards for Elementary and Secondary Education. These three competencies have a learning process that different, this cannot be separated from the standard learning process in educational units.

The use of media in learning can function as an intermediary tool in delivering learning material so that students can receive the learning more easily [8]. The use of appropriate media in the learning process can attract students' attention and can generate new desires and interests, as well as generate student learning motivation [9]. The use of appropriate interactive media in learning shows effective results for training students' understanding of concepts ([10]. This is reinforced by the research results of [11] which say that teachers feel the need for interactive multimedia programs to support the learning activities they carry out so that they are motivated to develop learning media and students feel there is a need for learning media in order to make it easier to understand the learning material. In line with this statement, [12] states that learning that uses interactive learning multimedia is able to make students feel happier and motivated to learn according to the speed of students' understanding in independent learning. This is possible because interactive multimedia has characteristics that can involve students directly in operations during the learning process so that students become more active [13]

The era of technology which is always developing and which makes human life easier, makes everything flexible, easy to operate anywhere and anytime. Entering the 21st century encourages the creation of technology that can not only provide information but can also be a human personal assistant, one of which is Smartphone Android, almost everyone now has Smartphone Android which can be accessed anywhere and anytime. The development of technology which is always improving does not rule out the possibility of the development of technology in the field of education. Therefore, to produce graduates who are competent in their fields and have a good work ethic in social life, the Government as the manager of education needs to carry out activities for implementing components of the education system that are in accordance with the National Education Standards through education units as education providers in facing the Industrial Age 4.0 which requires workers who have skills in digital literacy, technological literacy, and human literacy [14].

Learning in the era of the industrial revolution 4.0 requires teachers to be able to utilize technology, so that the learning process becomes easier and can improve student learning outcomes. Technology that is increasingly advanced and developing will already have an effect on the world of education, including in terms of learning [15]. To see an overview of the effectiveness and a number of obstacles in interactive media-based learning Android. In this regard, a meta-analysis has been carried out on a number of studies conducted by several researchers, both local and international abroad in a design context experiment.

2. METHOD

This research uses a meta-analysis method. Meta-analysis can be interpreted as a study of a number of research results that have the same or similar problems. This research sample was found from articles based on

Table 1. The formula for determining the effect size (IS)

No	Statistics	Formula
1	Average in one group	$ES = \frac{\bar{X}post - \bar{X}pre}{SDpre}$
2	Average in each group (two groups posttest only)	$ES = \frac{X\ eksperimen - X\ kontrol}{SDkontrol}$
3	Average in each group (two group pre-posttest)	$ES = \frac{(\bar{X}p\ ost - \bar{X}pre)e - (\bar{X}post - \bar{X}pre)k}{\frac{SD\ pre\ k + SD\ pre\ e + SD\ post\ k}{3}}$
4	t count	$ES = t\sqrt{\frac{1}{n_{eksperimen}} + \frac{1}{n_{kontrol}}}$
5	Chi-Square	$ES = \frac{2r}{\sqrt{1-r^2}}\ ;\ r = \sqrt{\frac{X^2}{n}}$
6	P Value	CMA (Comerhensive Meta Analisis Sofware

their suitability with the research theme. Meta-analysis is a quantitative analysis that requires several amounts of data to be included in statistical tests and applied on information from a large sample of articles that have been collected for the purpose of accomplishing other objectives. The type of meta-analysis method used in this study is Study Effect Size which aims to determine the effectiveness of the influence of learning media interactive based android on student learning outcomes in Vocational High Schools (SMK).

To describe the effect of Android-based interactive learning media on student learning outcomes in vocational high schools (SMK), a meta-analysis is carried out by first looking for some research results related to the theme. The search was carried out through search engines to obtain complete articles, with keywords: the influence of learning media interactive, and android. Then, using 18 articles that have been selected as a sample, coded each article obtained as information. The next step is to analyze the data using the statistical formula as in Table 1.

After measuring *the Effect Size* using the appropriate formula, then the Effect Size value can be interpreted into the following table 2.

Table 2. Criteria *for Effect Size* (ES)

No	ES	Category
1	ES ≤ 0.15	Very Low
2	0.15 < ES ≤ 0.40	Low
3	0.40 < ES ≤ 0.75	Currently
4	0.75 < ES ≤ 1.10	Height
5	ES > 1.10	Very Height

3. RESULTS AND DISCUSSION

This research was conducted to see the influence of Android-based interactive learning media on student learning outcomes at vocational high schools (SMK). The result obtained from the calculation Effect Size The 18 articles that have been analyzed can be seen in the table 3.

Based on the results effect size What has been obtained, the effect of Android-based interactive learning media on student learning outcomes in vocational high schools is categorized into three, namely very low, medium and very high categories. Based on the 18 articles found, there are 3 articles in the very low category, 2 articles in the medium category and 13 articles in the very high category. To be clearer about the various value criteria effect size based on 18 articles collected regarding the influence of Android-based interactive learning media on student learning outcomes in vocational high schools can be seen in table 4.

Based on the calculation results effect size in the articles that have been collected (Table 3), the range from 2014 to 2022 displays uneven results. After statistical calculations, the average value obtained is the effect size of android-based interactive learning media on student learning outcomes in vocational high schools based on the year of the article is included in the very high category. The Effect of Android-Based Interactive Learning Media on Student Learning Outcomes in Vocational High Schools reviewed by year of article can be seen in more detail in table 5.

Table 4. Effect Size Criteria

Code	Criteria *Effect Size*	Mount
PIBA 1, PIBA 2, PIBA 3	Moderate Effect Very Low Effect	2 3
PIBA 4, PIBA 5, PIBA 6 PIBA 7, PIBA 8, PIBA 9 PIBA 10, PIBA 11, PIBA 12, PIBA 13, PIBA 14, PIBA 15,PIBA 16, PIBA 17, PIBA 18	Height Effect	13
Total		**18**

Table 5. The Magnitude of Influence of Android-Based Interactive Learning Media on Student Learning Outcomes in Vocational High Schools.

Code	Year	Average Effect Size	Amount
PIBA 2	2014	0,67	1 article
PIBA 7	2015	0,055	1 article
PIBA 4	2016	0,743	1 article
PIBA 17	2017	0,96	1 article
PIBA 5	2018	0,847	1 article
PIBA 3, PIBA 12	2019	0,848	2 article
PIBA 1,PIBA6,PIBA 11,PIBA13,PIBA 14	2020	0,715	5 article
PIBA 8,PIBA 9, PIBA 10	2021	0,570	3 article
PIBA 15, PIBA 16, PIBA 18	2022	3,13	3 article
Total			18 article

4. DISCUSSION

Table 1 shows the individual distribution of impact magnitude from several research. Based on 18 papers, the overall average impact size is 1.14, which falls into the extremely high category. This interactive learning medium based on Android has a positive impact on learning outcomes in vocational high schools. According to research [16] using Android-based learning media has

a favorable influence since it may draw students' attention to learning and make the information easier to grasp. Learning media may be used as an intermediary tool in providing learning content, allowing students to acquire it more readily [17].

Table 3. List of Studies, Coding and Effect Sizes

Researcher	N	*ES*	Variable	Code
Rizma Panca Patriani dan Indrati Kusumaningrum 2020	27	1,78	Learning 2- and 3-Dimensional Animation Techniques.	Android-based interactive learning 1
Fatwa T. Radityan, Iwa Kuntadi, Mumu Komaro 2014	35	0,67	Against Student Learning Outcomes in Differential Improvement Competencies	Android-based interactive learning 2
Tommy Rahardjo, I Nyoman Sudana Degeng, Yerry Soepriyanto 2019	33	0,88	Development of Mobile Learning Interactive Multimedia Based on Android Script	Android-based interactive learning 3
Suyitno 2016	60	0,74	Measurement Techniques to Improve Learning Outcomes	Android-based interactive learning 4
Dian Puspita Eka Putri , Ali Muhtadi 2018	30	0,85	Android-Based Chemistry Interactive Learning	Android-based interactive learning 5
Abdurrahman, I Nyoman Jampel, I Gde Wawan Sudatha 2020	36	0,056	Interactive Learning to Improve Social Studies Learning Outcomes	Android-based interactive learning 6
M. Ghafur Vikario F, Andi Kristanto, S.Pd., M.Pd 2015	72	0,055	Interactive Multimedia Based on Android Applications in Basic Programming Subjects in Branching Control Structure Material	Android 7-based interactive learning
Mely Tri Octavina, Susanti 2021	20	0,823	Android-Based Lectora Inspire Program Interactive Media on Service Company Adjustment Journal Material	Android-based interactive learning 8
Salman Alfarizi, Aditya Prapanca 2021		0,87	Android-Based Interactive Learning in 3d Subjects	Android-based interactive learning 9
Ratna Nur Hamidah, Euis Ismayanti, Tri Wrahatnolo, Tri Rijanto 2021	10	0,011	Interactive Multimedia Learning General Road Description	Android-based interactive learning 10
Denih Handayani, Diar Veni Rahayu 2020	35	0,95	Android-Based Interactive Learning Media Using I-Spring and Apk Builder	Android-based interactive learning 11
Doni Dwiranata, Dewi Pramita, Syaharuddin 2019	55	0,82	Android-Based Interactive Mathematics Learning on Three Dimension Material	Android-based interactive learning 12
Radinal Fadli, Muhammad Hakiki 2020	4	0,849	Android-Based Interactive Learning in Computer Subjects and Basic Networks	Android-based interactive learning 13
N A Handoyono1 and Rabiman 2020	40	0,84	Development of android-based learning media using the EFI application	Android-based interactive learning 14
Meutia Nur Safitri, Durinta Puspasari, 2022	105	4,03	Instructional Media Android Based on OTKP Student Learning Outcomes	Android-based interactive learning 15
Muhamad Ansar Muzakkir, Sarson W. Dj. Pomalato, Muhammad Rifai Katili, 2022	28	1,91	Smartphone-Based Interactive Multimedia for Mathematics Learning	Android-based interactive learning 16
Muhammad Naim dan Nuchron, 2017	63	0,96	Learning Media on Learning Outcomes of Lathe Machining Engineering Subjects	Android-based interactive learning 17
Muhammad Ilham Dwi Putra, Subuh Isnur Haryudo, Tri Wrahatnolo dan Yulia Fransisca, 2022	25	3.44	Interactive Learning Media Electrical Lighting Installation At SMA Pgri 1 Surabaya	Android-based interactive learning 18
Average ES		1,14		

Thus, it can be proven that Android-based interactive learning media is effectively used to improve the learning outcomes of vocational high school students. The use of appropriate interactive media in learning shows effective results for training students' understanding of concepts [18]. This statement is supported by one of the results of

Muhammad Fahmi's research, 2019 which revealed that Android-based learning media has effectiveness on learning outcomes. In line with [19] also states that Android-based learning media can improve the effectiveness of vocational high school students.

In general, the results of research on the influence of Android-based interactive learning media currently have a positive impact on student learning outcomes. Media implementation learning This Android-based interactive has increased student involvement in learning programs in the revolutionary era industry 4.0. This is possible because interactive multimedia has characteristics that can involve students directly in operations during the learning process so that students become more active [20].

The use of android-based interactive media on student learning outcomes in vocational high schools still has drawbacks, based on Table 1, we can see that there are three researchers who have effect size with low category. Writing this meta-analysis is expected to help other researchers see the use of Android-based interactive media on student learning outcomes in vocational high schools. During the Covid-19 pandemic and also learning in the future it was very useful for students and teachers in facilitating the teaching and learning process. The use of interactive media is expected to be developed in later day, so as to improve the learning outcomes of vocational high school students in a more equitable and effective manner.

5. CONCLUSION

Based on a meta-analysis of several research on the use of Android-based interactive media, it is possible to conclude that this learning medium presents significant potential in attempts to enhance student learning outcomes in secondary vocational schools. The average size impact size of this Android-based learning medium is quite large, indicating a good effect. This demonstrates the effectiveness of Android-based instructional material in the learning process.

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