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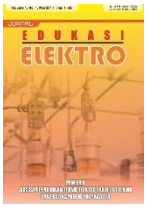

The Implementation of Mobile-Based Learning on Vocational High School Students: Systematic Literature Review

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Abstract— This study aims to analyze the impact of mobile-based learning, especially android-based, on learning outcomes, student interest, and work readiness in Vocational High School. Using the Systematic Literature Review (SLR) method based on the PRISMA approach, researchers identified and analyzed 31 relevant publications from 2020 to 2024. The results of this study indicate that android-based learning significantly improves learning outcomes of vocational high school students, especially in vocational subjects. Android-based applications provide flexibility and interactivity that allow students to understand the subject matter more deeply than conventional learning methods. In addition, android-based application also plays an important role in increasing student interest. Interactive features, such as interesting simulations and visualizations, have been shown to increase student interest in the learning process, making learning more interesting and relevant to them. On the other hand, the use of android media in learning also has a positive impact on student work readiness. Project Based Learning (PjBL) and practical simulations integrated into android-based learning applications strengthen students' basic knowledge and help them to develop practical skills that are relevant to the demands of the industrial world. Overall, this study confirms that android-based learning has great potential in improving the quality of Vocational High School education, both in terms of academic aspects and work readiness skills.

Keywords: mobile-based learning, android-based learning, vocational high school, learning outcomes, student interests, work readiness, systematic literature review.

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1 Introduction

Digital technology is changing rapidly along with the times and bringing significant changes in various aspects of life, including in the field of education. In this era, the use of mobile technology, especially android-based applications, has begun to be widely applied in the world of education to facilitate the teaching and learning process. This technology offers various advantages such as

flexibility, accessibility, and the ability to increase student activities in the learning process. According to Sitaman Said [1], learning technology provides a variety of interactive resources, simulations, games, and assessment tools specifically designed to engage students in authentic critical thinking and problem-solving activities. In addition, Judijanto et al. [2] stated that the use of technology-based learning media can foster students' desires, new interests, and motivation to learn. In the context of education in Vocational High Schools, the integration of this technology becomes more crucial considering the need for students for practical skills that are relevant with the demands of the industrial world.

Android-based learning application can be an innovative solution in the world of education, especially in Vocational High Schools, to overcome the challenges of delivering complex material and making students quickly bored. Android-based applications allow students to learn independently, flexibly, and interactively, which can directly increase their involvement in the learning process. Widiyatmoko [3] stated that the implementation of android-based learning applications can significantly improve students' critical thinking skills. In the vocational field, Yuntoto [4] found that the use of android applications in teaching electronic control systems can make it easier for students to understand theory while improving their practical skills. These studies show that android-based applications not only facilitate access to learning materials but also significantly support the development of student competencies both in terms of theory and practice.

However, the development and implementation of android-based learning application in Vocational High Schools still face a number of challenges. One of the main challenges is the limited technological infrastructure, especially in schools located in remote areas. This includes the lack of access to stable internet and adequate hardware to support the use of mobile applications in learning [5]. In addition, there are challenges related to teacher readiness in integrating this technology into their teaching. Many teachers are still less skilled in utilizing new technologies and need additional training in order to be able to use android applications effectively in the teaching and learning process [6]. Resistance to changes in learning methods can also occur, both among students and teachers, especially for teachers who are more comfortable with conventional learning methods. Therefore, in addition to providing infrastructure, it is important to provide adequate support and training to teachers so that the transition to technology-based learning can run smoothly.

The goal of this study is to conduct a Systematic Literature Review on the development and implementation of mobile-based learning media and its effects on learning outcomes, student interest, and work readiness in Vocational High Schools. This literature review will identify patterns of use, benefits, and challenges faced in implementing this technology in Vocational High Schools. The results of this study are expected to provide practical guidance for educators and application developers in maximizing the use of mobile-based technology for the learning process of Vocational High Schools in Indonesia.

2 Method

This study uses the Systematic Literature Review (SLR) method with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) approach. This study focuses on studies published between 2020 and 2024. This SLR method allows researchers to systematically search for, select, and analyze articles relevant to the research topic [7]. The initial step taken to start this research is to create research questions with the PICO (Population, Intervention, Comparison, Outcome) framework. The PICO framework facilitates the development of sharper research questions and provides a clear structure in systematic analysis can be seen in Table 1 [8].

Table 1. PICO framework for research questions

Element	Inclusion Criteria
Population (P)	Vocational High School Students
Intervention (I)	Mobile based learning, android based learning
Comparison (C)	Methods other than mobile-based learning or android based learning
Outcome (O)	Learning outcomes, student interests, and work readiness

From the PICO framework that has been created, questions can be made that focus on the issues to be answered. These research questions can be seen in Table 2.

Table 2. Research questions

No	Question
1	How does mobile-based learning influence the learning outcomes of Vocational High School students?
2	How does mobile-based learning influence Vocational High School students' learning interests?
3	How does mobile-based learning influence Vocational High School students' work readiness?

To answer this question, researchers used the PRISMA approach by using three main steps in identifying relevant information or research including identification, screening, and inclusion, as shown in Figure 1 [1].

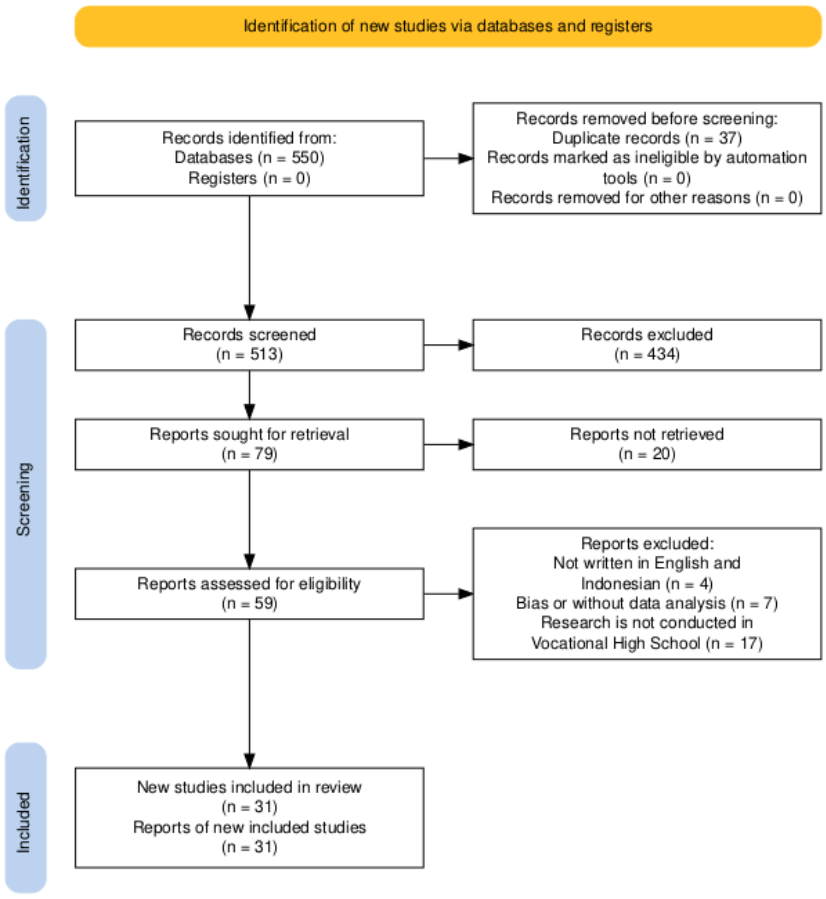

Figure 1. PRISMA SLR framework [9]

The purpose of the identification stage is to identify all relevant studies through database searches or other registers [9]. Researchers conducted database searches on Google Scholar and Semantic Scholar to find studies relevant to the topic of the implementation of mobile-based learning in the learning process of Vocational High School student. The search focused on research related to android-based learning media, learning outcomes, student interests, and work readiness. Researchers used alternative searches to identify all relevant studies. For example, the search pattern used on Google Scholar and Semantic Scholar is "android based learning OR mobile based learning AND student competence OR learning outcome AND student interest AND work readiness ". To facilitate the search for relevant articles, Publish or Perish software was used with research limitations conducted in the period 2020 to 2024. From the search results, 550 publications were obtained that matched the research topic and after further identification and screening stage there were 31

publications which were then used as references for further analysis. Table 3 below is a display of the inclusion and exclusion criteria which are the limitations in selecting publications. Inclusion criteria are the criteria that make a study included in the SLR. Exclusion criteria are criteria that cause a study to be ultimately excluded from the SLR [10].

Table 3. Criteria inclusion and exclusion

Inclusion	Exclusion
Journals published in the period 2020 to 2024	Journals published outside the 2020 to 2024 timeframe
Use Indonesian or English	Using other languages besides Indonesian and English
Title and abstract according to research topic	Title and abstract do not match the research topic
Fully accessible	Limited access
Focus on research in vocational schools	Research was not conducted at vocational schools
Based on empirical research	Biased or no clear data analysis

3 Result

At this stage, information will be extracted from the data obtained based on the questions that have been created in Table 2. From these questions, the answers will be used to determine the impact of mobile-based learning on Vocational High School students. To facilitate the analysis related to the research results from the 31 articles studied, the research results were classified based on (a) learning outcomes, (b) student interests, and (c) work readiness.

Table 4. Classification of Research Results

Researcher	Year	Research Objective	Outcome		
			a	b	c
Handaru & Pujiriyanto	2020	Analyzing the influence of android-based learning application in Creative Product and Entrepreneurship subjects at Vocational High Schools located in Klaten for students' interest and work readiness		✓	✓
Sukardi et al.	2020	Knowing the influence of mobile-based learning on student outcomes at Vocational High School located in Padang	✓		
Filianti et al.	2020	Developing an android-based application that support Project Based Learning in Office Layout subjects at Vocational High School	✓		
Hidayat et al.	2020	Developing mobile-based learning media for photography equipment courses named Camlearn at SMKN 10 Malang		✓	✓
Ramadani et al.	2021	Developing an android-based E-module to increase students' learning outcomes, especially in Pastry & Bakery Products at SMKN 8 Surabaya	✓		
Fahrezi & Susanti	2021	Developing an android-based contextual Flip Book teaching materials on Inventory Accounting material at SMKN 1 Geger Madiun		✓	
Pritasari et al.	2021	Knowing the impact of android-based learning in Modern Hair Bun course at SMKN 8 Surabaya	✓		
Rahmadani et al.	2021	Developing an android-based media to enhance learning in Electrical Lightning Installation subject at Vocational High School Located in Medan	✓	✓	
Siregar et al.	2021	Developing an android-based learning application to increase student motivation and learning outcomes at SMKN 1 Bawlato Nias	✓	✓	
Nuryanto et al.	2022	Developing an android-based learning module dan knowing the effect on Metal Fabrication Technique at SMKN 2 Klaten	✓		
Hidayat et al.	2022	Developing a mobile application based on Project-Based Learning (PjBL) and knowing the effect for accounting students at SMKN 1 Sei Suka Batubara	✓		✓
Kholis et al.	2022	Developing the Project-Based Learning integrated to mobile application and knowing the effect for students at Vocational High School located in North Sumatra Province, Indonesia	✓		
Elmunsyah et al.	2022	Developing a mobile application in Print Graphic Design subject to grow students' interest at SMKN 10 Malang		✓	
Nurdianah & Sudira	2022	Developing a mobile career learning model and knowing the effect for Vocational High School student majoring in Electronics Engineering			✓
Nurdin et al.	2022	Knowing the effect of mobile learning application on students' self-regulated at Vocational High School located in Surakarta		✓	
Dewi et al.	2022	Knowing the effectiveness of android-based learning application integrated with Project Based Learning to increase learning outcome majoring in Accounting at SMKN 1 Surakarta	✓		

Researcher	Year	Research Objective	Outcome		
			a	b	c
Helmiza et al.	2022	Developing an android-based application in learning Network Service Technology for Vocational High School	✓		
Sudarsono et al.	2022	Developing an android-based student performance tool called Tunersindro to improve work readiness skill at SMK Muhammadiyah 2 Tempel			✓
Purnomo et al.	2023	Developing an android-based learning media on Motorcycle Electrical materials at Vocational High School located in Yogyakarta	✓	✓	
Prayudha et al.	2023	Developing an android-based learning and knowing the effect for students in Infromatics subject at SMKN 9 Padang	✓		
Agustina & Cahyono	2023	Developing an android-based E-LKPD to improve student learning outcome at SMKN 1 Turen	✓		
Palealu et al.	2023	Developing an android-based learning application in Computer and Basic Network subject and knowing the effect for students at Cokroaminoto Vocational High School	✓		
Nurjanah & Suprihatin	2023	Developing an android-based learning application u in Making Suit Patterns Subject and knowing the effect for students at SMKN 2 Godean		✓	
Saputri et al.	2023	Knowing the effect of android-based learning application in Digital Simulation subject at Vocational High School located in Padang	✓		
Jayat et al.	2023	Developing an android-based E-modules in Wide Area Network (WAN) Technology Subjects and knowing the effect for students at SMKN 3 Jombang	✓	✓	
Karim, et al.	2024	Analyzing the impact of game-based learning model for Vocational High School students located in Padang	✓		
Putri et al.	2024	Developing an android-based learning application in learning Object-Oriented Programming and knowing the effect for Vocational High School at SMKN 1 Ranah Ampek Hulu Tapan		✓	
Wardini et al.	2024	Developing a mobile-based learning media to improve Students' Mathematical Communication skills in Vocational High Schools located in Tulungagung	✓		
Ma'rufiati et al.	2024	Knowing the effect of android-based CNC Simulator application on the learning achievement of Vocational High School	✓		✓
Malik et al.	2024	Developing an android-based mobile learning application to increase learning outcomes at SMK Tlogosari Semarang	✓		✓
Jazila & Lutfi	2024	Analyzing the effectiveness of android-based BEMO game as a learning media for molecular shape material at SMK Kartika Surabaya		✓	

Based on Table 4, it was known that every year from 2020 to 2024 there was research related to the implementation of android-based learning media in Vocational High School. Until now android-based learning applications are still a good alternative in helping to improve students' understanding and interest in learning and work readiness skills. A comparison of the number of publications per year can be seen in Figure 2, while a comparison of the number of aspects studied between 2020 to 2024 can be seen in Figure 3.

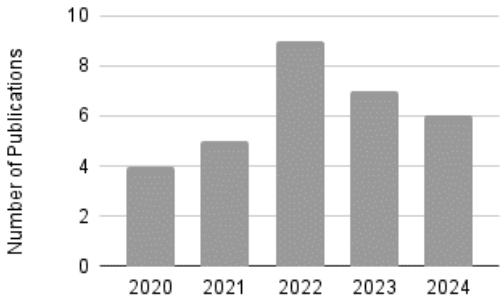

Figure 2. Graph of eligible publications per year

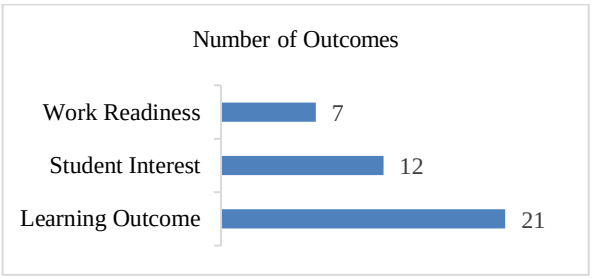

Figure 3. Number of Outcomes Each Aspect

3.1 Mobile-based learning on learning outcomes

Mobile technology-based media, especially android applications, offer ease of access, interactivity, and flexibility that can facilitate deeper student understanding. Based on research conducted by Purnomo et al. [11] in class XI TBSM in the subject of motor electrical maintenance at a Vocational High School located in Yogyakarta, it is known that students who use android-based learning application experience a significant increase in learning outcomes when compared to classes that use conventional learning models. Due to its flexibility, android-based learning media can be integrated with various learning models. According to Hidayat et al. [12], android-based learning media integrated into Project Based Learning (PjBL) can encourage students to be more active and creative in the learning process that contributes to learning outcomes. Android-based learning applications are very suitable for subjects that involve technology [13]. Not only does it improve students' understanding of theory, android-based learning application also helps students master practical skills [14].

The results of a study conducted by Sukardi et al. [15] showed that the implementation of mobile-based learning is effective in improving student learning outcomes. In a study conducted at a Vocational High School in Padang, class X computer assembly subjects, students who used mobile-based learning media showed a great improvement in post-test results compared to pre-tests. On the other hand, Filianti et al. [16] utilized the OLA (Office Layout Application) application to improve student learning independence in office layout subjects by giving students the freedom to set their own study schedules and evaluations during the Covid-19 period. As a result, students who used the OLA application experienced a significant increase in learning outcomes. The development of mobile-based learning applications is very important because the use of monotonous learning methods and media, such as PowerPoint and YouTube videos, does not provide an interactive and interesting learning environment [17]. Kholis et al. [18] developed mobile media based on project-based learning (PjBL), which allows students to work independently in completing real projects. With this approach, students are more involved in learning and more capable of applying the concepts they have learned.

According to research conducted by Wardini et al. [19] at SMKN 1 Rejotangan, it is known that the use of mobile-based learning application has proven effective in improving students' mathematical communication. The test results showed that students in the experimental class who used mobile learning had higher scores than the control class who did not use mobile learning. Research on the aspect of learning outcomes shows that the use of android-based learning applicaton significantly improves student learning outcomes in various subjects. Ma'rufiati et al. [20] revealed that the use of an android-based CNC simulator significantly improved student learning outcomes in operating CNC machines. Meanwhile, Pelealu et al. [21] found that android-based learning media in computer network material improved students' understanding of IP address settings, which resulted in better learning outcomes.

Malik et al. [22] studied the use of android-based applications for Automotive Engineering students at Vocational High School. The results showed that after using this media, the average student learning outcome score increased to 86.94 with a gain value of 0.72 which is included in the high category. This media also allows students to learn independently, and the results of statistical tests

showed a significat difference between before and after using the media, indicating the effectiveness of the media in improving student learning outcomes. A similar study was conducted by Saputri & Fransisca [23] who examined the effectiveness of android-based learning application in digital simulation subjects at vocational schools. The average effectiveness of using this media was 84.96%, indicating a significant increase in student learning outcomes. Meanwhile, Dewi et al. [24] also found that project-based android media in accounting learning increased student learning outcomes by 56%, which was categorized as quite effective. Although the increase was lower than other studies, these results still show that android-based application can improve students' academic achievement in the context of vocational education. These studies confirm the great potential of android-based learning application in increasing student learning outcomes in various vocational fields.

The development of android-based E-Modules in Wide Area Network Technology (WAN) subjects in Vocational High School can significantly improve student learning outcomes. The results of the study showed that students experienced an increase in understanding of the material and skills in operating Wide Area Network technology (WAN). This E-Module provides easy access and is more interesting than printed modules, thus helping students to study the material independently before practicing [25]. Research by Rahmadani et al. [26] also showed similar results in the development of android-based learning media for the Electrical Lighting Installation subject in Vocational High School. This learning media is considered effective in increasing student learning outcomes, especially in understanding the concepts of electrical installations. This media allows students to learn with clearer visualizations through animations, videos, and other interactive elements, making it easier to understand the theory and practice required in electrical installations.

Helmiza et al. [27] emphasized that android-based learning media has a great impact on improving the competence of Vocational High School students in the subject of network service technology. This media is considered very effective in helping students understand technical concepts and improving their competence in the field of network technology. By using this media, students can more easily understand material that was previously considered difficult and have more flexible access to learn anytime through their android devices.

3.2 Mobile-based learning on student interest

The results of the study on the aspect of student interest show that the use of android-based learning application can increase student involvement and enthusiasm in the learning process. Purnomo as stated in [11] found that students who learned using an android-based application for motorcycle electrical maintenance material showed a significant increase in interest compared to conventional methods. This android-based media allows students to be more active and involved in learning because of the interactivity provided by the application features, such as interesting simulations and visualizations. This encourages students to be more interested in learning material that is usually considered difficult and less interesting with traditional learning methods. Furthermore, Handaru & Pujiriyanto [28] also stated that android-based interactive multimedia is effective in increasing students' interest in learning, especially in the context of online learning. In the Creative Products and Entrepreneurship subject, students who previously felt bored with conventional online learning methods, such as using WhatsApp, became more interested and involved when using android-based multimedia. The interactive features and attractive visuals offered by this media can maintain students' interest, make them more active in participating in learning, and improve their overall learning experience. This study emphasizes that the use of interactive technology not only makes learning more interesting but also provides easier and more enjoyable access to various learning resources.

The use of mobile-based learning media significantly increases students' interest in various subjects in Vocational High School. Research by Elmunsyah et al. [29] found that the application of mobile media based on Contextual Teaching and Learning (CTL) in learning Print Graphic Design was able to increase students' interest in learning by 82.8%. Students felt more interested because the media provided an interactive and independent learning experience, which was more in line with their preferences than conventional methods such as textbooks. Similar results were found by Karim et al. [30] in the application of the Game-Based Learning (GBL) model . Students who used GBL

in lessons involving motor skill development showed a significant increase in interest in learning because they could learn while playing, so the learning process became more fun and interactive. In addition, research by Putri et al. [31] showed that android-based learning application in Object-Oriented Programming subjects also increased students' interest. Before using the media, students were less motivated because they only relied on conventional learning media, but after using the android application, student interest increased significantly, as evidenced by the high results of the practicality test of 85.89%. Overall, the use of technology-based media such as mobile learning and GBL not only makes learning more interesting but also increases student engagement and interest in learning.

Research on the aspect of student interest shows that the use of android-based learning media significantly increases students' interest in learning. Nurdin et al. [32] found that the use of android-based mobile games in learning can increase student interest and involvement, because students are more motivated to learn independently and are interested in the interactive experience offered by the game. In addition, Nurjanah and Suprihatin [33] found that the development of android-based learning media on the material of making jacket patterns significantly increased students' interest in learning. Students feel more interested because this media presents the material in a more interactive, accessible, and enjoyable way. These two studies show that the integration of android-based technology in learning can create a more interesting learning experience and increase students' interest in learning.

Fahrezi & Susanti [34] found that the use of contextual Flip Book-based teaching materials based on android was able to attract students' interest in learning effectively, with student responses reaching 95.6%, which showed high enthusiasm for this media. Interactive media and rich multimedia features such as text, images, and videos help students be more interested in learning accounting material. Similar findings were also conveyed by Hidayat et al. [35], where the Camlearn application, which is used for learning photography equipment, has succeeded in increasing students' interest in learning. Students feel more interested and motivated because this media presents material visually and practically. The high level of media feasibility of 82% indicates that students enjoy learning using the application more. In addition, Jazila & Lutfi [36] reported that the use of android-based educational games, such as BEMO, can increase student engagement and interest in learning chemistry material, with 86.67% of students showing higher interest when using this media. Students feel more motivated and more active during the learning process. Overall, these studies confirm that Android-based learning media has a strong positive impact on increasing students' interest in learning.

The discussion on student interest in android-based learning shows various views from several researchers who focus on the use of technology as a learning medium in vocational schools. Jayat et al. as stated in [25] argue that android-based E-Modules can increase students' interest in the material being taught, especially on the topic of wide area network (WAN) technology. According to them, android-based media offers a more interactive display than conventional printed modules. The use of animation, video, and attractive interface designs make this module more attractive to students and encourage them to be more actively involved in learning. This is evident from the increase in student motivation who appear more enthusiastic when using the E-Module, so that learning becomes more effective. A similar opinion was also expressed by Rahmadani et al. as stated in [26] who emphasized the importance of android-based learning multimedia in increasing student interest. In their study, the development of multimedia for the Electrical Lighting Installation subject in vocational schools was proven to be able to significantly increase student interest. Rahmadani and his team noted that multimedia displays that use a combination of text, video, animation, and sound can make students more interested and enthusiastic in participating in learning. Students are not only more focused on the material but also feel more involved because they can learn in a more interactive way. Meanwhile, the research results of Siregar et al. [37] show that students who use this application have a higher interest in learning compared to students who use conventional learning methods, and they are more motivated to learn the material because of the more dynamic interaction with the learning content.

3.3 Mobile-based learning on work readiness

The results of the study on the aspect of student work readiness show that the use of android-based learning application plays an important role in preparing students to enter the workforce. Hidayat et al. [12] found that the use of Project-Based Learning (PjBL) based mobile applications in accounting learning in Vocational High Schools helps students develop practical skills that are highly relevant to the world of work. Students who use this application are more skilled in preparing financial reports and understanding the transaction management process, which are core competencies in the accounting profession. This increases students' readiness to work in finance or start an independent business after graduating from school. In addition, Handaru & Pujiriyanto [28] emphasized that the use of android-based interactive multimedia in Creative Products and Entrepreneurship also contributes to increasing students' work readiness, especially in the field of entrepreneurship. This media not only attracts students' interest but also equips them with the skills to design, produce, and market products or services independently. By using this technology, students are trained to become creative and innovative entrepreneurs, so that they are better prepared to face the challenges of the world of work, both as workers and as entrepreneurs in the industrial era 4.0.

The use of mobile-based learning models for career development significantly improves the work readiness of Vocational High School students, especially in the field of Electronic Engineering. Research conducted by Nurdianah and Sudira [38] shows that this learning model successfully integrates vocational learning with career guidance, which helps students recognize job opportunities that match their competencies and develop skills that are relevant to industry needs in the Industrial Revolution 4.0 era. This model also increases students' confidence in making career decisions and prepares them for challenges in an increasingly digitalized world of work. With this approach, students are not only able to master technical skills but are also better prepared to adapt to new technologies and the dynamics of modern industry, thereby increasing their readiness to enter a competitive job market . Research conducted by Ma'rufiati et al. as stated in [20] shows that the integration of technology in learning, such as the use of an android-based CNC simulator, can improve the work readiness of Vocational High school Students. The use of this simulator provides a learning experience that is close to real conditions in the industry, allowing students to be better prepared to master the technical skills needed by the world of work. The results of this study emphasize the importance of using android-based technology in preparing Vocational High School students to face challenges in the industrial worlds, especially in fields that require high technical skills.

Malik et al. as stated in [22], found that android-based application for Automotive Engineering students was very effective in preparing students to face challenges in the workplace. With this media, students gain a better understanding of work equipment and supplies, with student learning outcomes showing a significant increase, namely an average of 86.94, and a gain value of 0.72, which indicates higher readiness to enter the industrial world. In addition, Hidayat et al. [35] through the development of the android-based Camlearn application, which is used for learning photography equipment, also found that this application helps multimedia students to be better prepared in mastering the technical skills needed in the world of work. The results of the application feasibility test showed that 82% of students felt more prepared after using this media, especially in understanding the types of cameras and photography equipment that are relevant to the industrial world.

Discussion of the work readiness aspect in research conducted by several researchers shows that mobile-based learning, especially android, has a significant impact on preparing Vocational High School students for the industrial worlds. Sudarsono et al. [39] argue that the development of an Android-based student performance aid, called Tunersindro , is very effective in improving the work readiness of vocational high school students in the field of Automotive Engineering. According to them, this tool was developed by considering industry needs and aims to train students' practical skills according to the demands of the world of work. Sudarsono and his team found that after two trials, Tunersindro proved to be very effective in helping students hone their practical skills and improve their readiness to work. Students who used this tool showed significant improvements in terms of work readiness, especially in aspects of practical skills, technical knowledge, and professional attitudes required by the industry. In line with the views of Rahmadani et al. [26] who stated

that android-based multimedia developed for Electrical Lighting Installation courses also plays an important role in improving students' work readiness. They emphasized that mastery of electrical installation competencies is very important for students as a provision for entering the world of work. The use of interactive android-based multimedia facilitates students in understanding procedures and work practices that are in accordance with industry standards. With this media, students not only understand the theory, but are also practically ready to carry out relevant tasks in the world of work. The results of the study showed that this multimedia greatly helped students in improving the technical skills needed for work in the field of electrical installations.

4 Discussion

Overall, the problems faced by students in Vocational High Schools are almost the same, namely the lack of innovative learning that motivates them to learn independently and actively. Many schools only have learning resources from textbooks and minimal other learning resources, making students quickly bored in the learning process and ultimately affecting their learning outcomes. Based on research that has been conducted, mobile-based learning can be a solution to students' learning difficulties. Purnomo et al. [11], Hidayat et al. [12], Nuryanto et al. [14]],Prayudha et al. [13], and Malik et al. [22] consistently show that android-based learning application can increase student learning outcomes because it offers greater interactivity, flexibility, and accessibility than conventional learning methods, making it simpler for students to understand the subjects matter. This can be seen from the better grades obtained by students when using mobile-based learning application compare to conventional learning methods. Research by Sukardi et al. [15] and Agustina & Cahyono [17] found that the use of mobile learning application integrated with the Project Based Learning (PjBL) model can improve student learning outcomes in cognitive, psychomotor, and affective aspects compared to conventional learning methods. Based on all relevant studies analyzed, android-based learning application makes a major contribution to improving student learning outcomes. By utilizing technology that is already familiar to students, android-based learning application has succeeded in bridging the gap between theory and practice in vocational schools.

In addition to improving learning outcomes, android-based learning applications have also been proven to be able to increase students' interest in learning. Handaru & Pujiriyanto [28] found that students involved in technology-based learning are more likely to be proactive in seeking information and completing assignments, which directly increases their motivation and interest in learning. Jazila & Lutfi [36] added that inserting educational games in android-based learning application is also effective in increasing students' interest in subjects that are more difficult to learn. With interesting game elements, students feel more motivated to learn and more active in participating in the learning process. Good student interest in the learning process will lead to good learning outcomes.

Another important aspect of this study is the impact of android-based application on students' work readiness. Hidayat et al. [12] showed that students who use PBL-based mobile applications are better prepared to enter the workforce, especially in accounting. This application allows students to develop practical skills relevant to the industrial world, such as preparing financial reports and managing financial transactions. A similar thing was also found in the research of Handaru & Pujiriyanto [28], where android-based multimedia helps students develop the entrepreneurial skills needed to start an independent business or participate in the creative industry. The ability to design, produce, and market products taught through this media is an important capital for students in facing the challenges of industrial era 4.0. Research by Sudarsono et al. [39] specifically focuses on improving students' work readiness through the development of an android-based student performance aid, namely Tunersindo. This study reveals that this tool not only improves students' technical skills but also helps prepare them for the demands of the industrial world, especially in the field of automotive engineering.

5 Conclusion

Android-based learning enhances learning outcomes, student interest, and work readiness in Vocational High Schools. It provides accessibility, interactivity, and independent learning opportunities, helping students understand theoretical and practical content more effectively. Research shows that these applications improve student engagement, motivation, and participation through interactive features like simulations, visualizations, and game elements. As a result, students become more interested in subjects that are typically seen as difficult or unappealing with conventional methods.

Additionally, android-based learning supports work readiness by equipping students with industry-relevant skills. These applications strengthen the basic knowledge of students and help them doing practically correctly. By integrating both theoretical and hands-on learning, mobile-based education prepares students for the demands of the Industrial Revolution 4.0 era. To maximize its benefits, schools must ensure proper infrastructure, teacher training, and ongoing support for effective implementation.

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