

## The Significance of Mobile Applications Based Learning in Creating Awareness of Occupational Health and Safety

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### ARTICLE INFO

**Received:** 3 March, 2024

**Revised:** 10 June, 2024

**Accepted:** 11 June, 2024

**Volume:** 4

**Issue:** 2

**DOI:** [10.56338/jphp.v4i2.5425](https://doi.org/10.56338/jphp.v4i2.5425)

### KEYWORDS

Mobile Application  
Practicum Learning  
Occupational Health and Safety

### ABSTRACT

**Introduction:** In this study, "We aim to develop and assess the effectiveness of mobile applications to raise students' awareness about occupational health and safety. This is in response to the low awareness among students in Surakarta, which has the potential to increase the risk of danger and diminish their ability to compete in the workforce. The mobile application's development is intended to address these issues".

**Methods:** This research method uses a type of research and development that adopts the theory from Alessi & Trollip, with 3 main stages: planning, design, and development. There were 120 research samples taken from vocational high schools in Surakarta. Data was taken through observation and interviews. Product validation also involves media experts, material experts, and practitioners in the field of Occupational Health and Safety.

**Results:** The research results indicate that the developed media has received high ratings from both experts and users, placing it in the "very good" category. Statistical analysis also reveals that the use of mobile applications has a significance level of  $0.000 < 0.05$ , suggesting that mobile applications have an impact on the tested samples. Furthermore, there is evidence of increased awareness of occupational health and safety, as evidenced by a control class score of 75.68 and an experimental class score of 86.73.

**Conclusion:** These results indicate that the developed media is more effective than conventional learning and can increase awareness of the importance of occupational health and safety among students. The study suggests the need for teacher training in utilizing this application and recommends further development of the application on a larger scale, along with the creation of diverse teaching materials.

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**Publisher:** Pusat Pengembangan Teknologi Informasi dan Jurnal Universitas Muhammadiyah Palu

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### INTRODUCTION

The development of technology and information in the world of education is moving rapidly so that adaptation is needed to adapt technological advances to enhance the quality of education, especially in the learning process (1). The rapid development of technology also has an effects on the world of education, so it is important to continue to study its influence in an effort to enhance the quality of learning process. The utilization of technology for information and communication purposes, including in the context of practical learning. Apart from that, the use of information and communication technology as a learning medium creates a conducive and productive practicum environment. The connection between utilizing technology and educational advancement requires more focus in order to enhance the standard of education (2).

The aim of educational technology is to find solutions to learning obstacles and facilitate the learning process, in order to improve performance and learning outcomes. Creative and innovative technology can be developed and applied to achieve this goal (3). There are various forms in which technological developments can be implemented in education, such as learning media. One popular approach is the STEM (Science, Technology, Engineering, Mathematics) approach. This approach can help students to hone their thinking skills and problem-solving abilities, while also providing practical opportunities to use technology in learning (4).

Technology greatly influences cognitive learning and student learning outcomes (5). The success of the learning process is greatly influenced by students' awareness of the importance of teaching material because this awareness can function as a motivating and driving factor so that students show great interest in practical lessons (6). Students' understanding and self-recognition of their learning process is called their learning awareness. This includes an understanding of learning goals, how to achieve those goals, and the desire to achieve those goals.

Teachers and students can use digital technology to engage in learning at any place and at any time (7). 21st-century education requires a modern platform to teach students essential knowledge and skills, including creativity and teamwork, as supported by previous research, without limitations (8). The implementation of learning technology using mobile applications has become an interesting research topic. Various studies have highlighted the application of Android-based mobile learning as a learning medium to improve student understanding and learning outcomes (9). For example, a study discusses the application of Android-based mobile learning in English language learning to improve student learning achievement on the topic of Degrees of Comparison (10). Apart from that, there is also research that develops augmented reality mobile applications to visualize spatial material, which has succeeded in improving student learning outcomes.

Learning can be made more enjoyable with the help of various learning applications (11). Studies have shown that using learning media is more effective than conventional learning in increasing one's passion for learning (12). As a result, teachers need to develop appropriate learning media to facilitate their students' learning. Based on various research, it can be concluded that implementing learning technology through mobile applications has proven to be effective in enhancing learning outcomes and student performance (13).

Based on the explanation above, it is known that the potential for developing mobile applications is very broad and can be applied in various learning conditions, one of which is practical learning (14). The advantages of using mobile applications as a practical learning medium include: (1) Wider access: Mobile applications allow access to learning from anywhere and at any time, and increase flexibility in learning; (2) Interactivity: Mobile applications can be designed to provide interactive learning experiences and increase student engagement in the learning process; (3) Supporting educational development: The use of mobile applications in practical learning can support educational development by utilizing technology that continues to develop (15).

Learning media refers to various forms of information and messages that are shared from the sender to the receiver. Assisting students in enhancing critical thinking abilities and sparking their enthusiasm for learning (12). The selection of the learning materials depends on the strategy for the educational system, which directs the entire learning procedure. Incorporating media in education can enrich the learning experience, leading to increased motivation, productivity, and understanding of the subject matter. As a result, it is our aspiration that the widespread and effective use of media in education can become a reality (16).

Effective and efficient learning requires the use of adequate learning media with high flexibility (17). Learning media refers to the tools or methods used to convey information or messages to students during the learning process (18). Mobile applications are an excellent example of learning media that meets these requirements. Mobile applications can serve as media and also as student learning resources. They can contain various learning materials, modules, videos, practice feedback questions, games, illustrations, and contextual materials. However, despite the potential benefits, many teachers still prefer to use conventional learning models and have not yet optimized the use of mobile applications in practical learning (19).

Research conducted at a Vocational High School in Surakarta found that students lack awareness of the importance of occupational health and safety during practical learning due to inadequate learning conditions. The study confirmed that Occupational Health and Safety learning was not carried out optimally, leading to a decline in knowledge of the importance of this material, which increased the risk of danger and accidents during practicum.

Students at all levels of education need to be aware of their learning. This is especially important for those attending Vocational High Schools where the focus is on developing skills that require training and practice. One of the majors at Vocational High Schools that needs special attention is Construction and Housing Engineering. Students in this field need to be aware of the importance of Occupational Health and Safety since they will be working with materials such as wood, iron, stone, and others that can be dangerous if not handled properly. Without strict supervision and a good understanding of Occupational Health and Safety, students can be at risk of harm.

The initial studies, which involved brainstorming with teachers and direct interviews with several students at Surakarta Vocational High School majoring in Construction and Housing Engineering, revealed the following results: 1) The students lack initial knowledge of the importance of Health and Safety Work; 2) There is limited interaction between teachers and students due to the learning process being centered around independent inquiry activities and assignments, making it more complicated; 3) The teaching media used to facilitate Occupational Health and Safety learning is not yet optimal. Students feel that the teacher only provides verbal directions without explaining the material in detail.

According to the initial study, lectures presented through PowerPoint are the primary method used to facilitate the learning process. However, students have raised concerns that this approach may not be optimal, as the media used lacks variety and context. This could potentially reduce students' awareness of Occupational Health and Safety, which, in turn, could increase the risk of potential hazards during practical learning sessions (20). Therefore, it is crucial to enhance students' understanding and awareness of Occupational Health and Safety to prevent any potential risks.

To address this issue, there is a need to increase students' awareness and knowledge of the importance of Occupational Health and Safety. One potential solution is to use mobile applications as learning media to facilitate achieving learning goals. (21). There is a need for changes in compiling learning materials and integrating them into more effective and efficient learning media tools (22). The rise of digitalization in learning 4.0 has increased the need for e-learning-oriented learning media. Additionally, smartphones are increasingly being used as a learning tool that can help students learn independently (23). Mobile applications can also assist students in understanding theoretical concepts before applying them in practice (24). An application can be designed to meet Occupational Health and Safety learning needs by compiling innovative, creative, flexible, efficient, and effective learning resources.

Several relevant studies can be used as references in efforts to overcome the problems above, such as research conducted by Andi Darussalam which shows an increase in motivation and awareness of learning by 15% using mobile application-based learning media (25) and research conducted by Morris et al., 2016 entitled "Mobile Technology: Students' Perceived Benefits of Apps for Learning Neuroanatomy" indicates a notable improvement in academic performance or learning achievements during educational trials. Therefore, this research aims to develop mobile application-based learning media as a digitalization of Occupational Health and Safety teaching materials to increase awareness of the importance of occupational health and safety during practicum. The development of this media will help students optimize the use of smartphones as a learning tool used to access learning resources before carrying out practicums (22). In this way, students' use of smartphones can be more optimal so that they can help achieve learning goals.

## **METHOD**

This study was conducted on 120 tenth-grade students enrolled in the construction and housing engineering program at a vocational high school in Surakarta, Central Java, Indonesia. The approach used in this study is research and development (R&D), which is a process aimed at developing and testing the validity of a product (26). The study utilizes the Alessi and Trollip development model (27). The study involves three phases of modification: planning, design, and development. The planning stage involves gathering information and planning, while the design stage includes the development of content ideas, task and concept analysis, and initial program trials. The development stage includes final product development, main field tests, main product revisions, operational field tests, operational product revisions, final field testing, and dissemination (27).

Based on the previously discussed development domains, this research will focus on developing learning products in the form of mobile application-based learning media. The goal is to increase awareness of potential hazards and hazard prevention in workshops at vocational high schools with Construction and Housing Engineering expertise competency. The research will utilize a modified development model tailored to the specific needs and objectives of the research itself. Learning media development standards encompass the entire process of creating, testing, improving and validating educational programs. This process involves testing the program by students and validating it by media experts, practitioner validators, and expert validators before finalizing the product for use in learning (28); (29). In order to determine the percentage of instrument validity, The average value of the questionnaire was determined using a validation questionnaire with a Likert scale. The values for each criterion are presented in Table 1, and the calculation formula used to compute the instrument's validity is as follows (30); (31).

$$Percentage = \frac{Score}{expectedscore} \times 100\%$$

**Table 1.** Likert Scale Assessment Criteria

No	Description	Score
1	If the rating strongly agrees	4
2	If the rating agrees	3
3	If the assessment does not agree	2
4	If the rating strongly disagrees	1

The criteria for interpreting the evaluation instrument score are listed in Table 2 (32). If the interpretation score is 61% or higher, the evaluation instrument is considered feasible. This means that media that has been tested and proven effective can be used in classroom learning to raise students' awareness of the significance of Occupational Health and Safety during practicums.

**Table 2.** Validation achievement conversion rate

No	Description	Percentage (%)
1	Very Worthy	81-100
2	Worthy	61-80
3	Decent Enough	41-60
4	Less Worthy	21-40
5	Not Worthy	0-20

## RESULTS

### Planning Stage

In the planning phase, the goal is to collect data on the educational process in schools, the level of students' understanding of occupational health and safety, and the instructional materials utilized during learning. The data was collected from vocational high schools in Surakarta, which specialize in construction and housing engineering and have teaching materials related to occupational health and safety. The information collected revealed that schools use Microsoft 365 as a learning medium, but the learning effectiveness is still categorized as low. The learning process is not optimal, and teachers usually send short materials without complex explanations. Students showed a lack of interest and understanding of the importance of studying occupational health and safety material.

To address these obstacles, efforts are needed to facilitate learning and teaching activities, which can save time and build students' awareness of the importance of teaching materials. This is where the development of learning media plays a vital role. Interactive and fun learning media can help students learn independently, while teachers can display teaching materials in attractive packaging by combining audio, video, and simulations in the application. This can help form an awareness of the importance of occupational health and safety.

Further investigations were conducted on 120 students from both schools to assess their level of awareness regarding occupational health and safety with questionnaires. The results were similar to the previous findings, indicating that the student's awareness of the importance of occupational health and safety remained very low. The data obtained from these observations has been summarized in the table below.

**Table 3.** Student's Awareness Responses

No	Description	Student's Response	
		Yes	No
1	Do you know what Occupational Health and Safety is?	40 %	60 %
2	Has the school provided optimal Occupational Health and Safety material?	35 %	65 %
3	Do you know the risks of not understanding Occupational Health and Safety optimally?	24 %	76 %
4	Do you feel studying Occupational Health and Safety is important to you?	50 %	50 %

The table data reveals that a large number of students lack adequate knowledge about occupational health and safety. Specifically, 60% of students seem to be lacking in this area. This could be due to a lack of educational resources provided by schools, as only 35% of students feel that their institution has adequately covered the topic. Furthermore, 76% of students aren't aware of the potential risks associated with inadequate knowledge of occupational health and safety, which suggests a lack of awareness. However, it's noteworthy that 50% of students still consider occupational health and safety an important subject, indicating that they recognize its value. This demonstrates that with proper education and awareness, students could greatly enhance their understanding of this crucial topic.

An analysis of needs was conducted with a group of students to determine the learning process and specific requirements for enhancing the quality of learning. The following data on student response results is displayed in Table 4.

**Table 4.** Needs Analysis Responses

No	Description	Student's Response	
		Yes	No
1	With the existing learning media, do you understand the material presented by the teacher?	28%	72%
2	Have teachers utilized innovative media in learning?	43%	57%
3	Do you have a smartphone for learning activity?	100%	0%
4	Do you agree if learning uses interactive media?	76%	24%
5	Do you agree with using mobile application-based learning media?	85%	15%

According to Table 4, the data reveals that 72% of students are unable to comprehend the material presented by their teacher, even though 43% of students believe that the teacher has used learning media that they haven't been able to access. Additionally, it is known that all students' own smartphones, making the development of mobile application-based media suitable for them. This is supported by 85% of students who agree with the use of mobile application-based learning media.

Based on the needs analysis, it was determined that teachers and students require diverse learning materials, such as interactive and engaging media. The development of learning media is hoped to assist teachers in delivering lesson content and create an active, innovative, creative, and fun learning atmosphere (33). The researchers have developed mobile application-based learning media to meet the needs of teachers and students and address problems related to occupational health and safety learning. The use of mobile application-based learning media is expected to raise students' awareness of the significance of Occupational Safety and Health.

### Designing Stage

When designing educational media, there are two key components to consider: the general media concept and the material concept. The media concept involves creating a flowchart that outlines the stages of the media development process. This flowchart helps to ensure that the design and functionality of the media product are easily understood during development (Figure 1). Once the flowchart is created, a storyboard is also needed to plan out the scenarios for mobile application development before creating a product prototype.

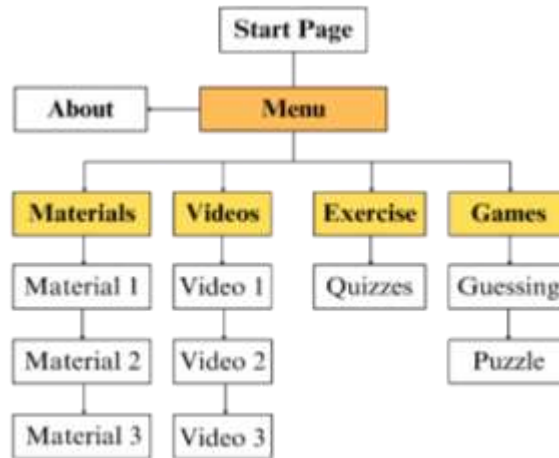


Figure 1. Flowchart

Furthermore, in the material design process, KEMNAKER SKKNI No. 38 of 2019 covers the basics of K3 (Occupational Health and Safety) and the potential and prevention of hazards in workshops as basic competencies and learning indicators.

Table 5. Basic Competences

Code Units	Indicators
M.71KKK01.005.1	Students are able to identify dangerous factors in the workplace
M.71KKK01.008.1	Students are able to identify Personal Protective Equipment (PPE)

### Development Stage

The development stage is an expression of the design stage and involves production tasks like programming on a computer and creating written content, images, audio, video, and product usage guides. Product development encompasses production, testing, modification, and product verification stages. The steps for creating mobile application-based learning media include the following stages:

#### Producing Prototype

During the early stages of media production, the emphasis is placed on creating educational content optimized for mobile devices. To accomplish this feat, content creators rely on Smart Apps Creator 3 software. This versatile desktop tool enables users to design mobile apps that can be accessed in multiple formats such as APK, .exe, and HTML5, ensuring seamless compatibility across a variety of devices including computers, laptops, and smartphones (34).

The mobile application developed can integrate learning media in various forms such as text, sound, images, videos, and simulations regarding Occupational Health and Safety as preparation before starting practicum activities. The page presented in the mobile application contains 5 main pages, namely the homepage, materials, videos, exercises, and games. The appearance of the application being developed can be seen in Figure 2.



Figure 2. Mobile Application Interface

**Alpha Test**

Alpha tests in development research are product or application tests carried out by experts to assess product feasibility. The experts involved in this testing are media experts, material experts, and practitioners: (1) Media experts have the authority to assess the feasibility of applications regarding visual communication, illustrations, and media benefits; (2) Material experts have the authority to assess the suitability of material content, material concepts, suitability of material illustrations, definitions and functions, basic work health and safety material, and the benefits of material for students; (3) Expert practitioners are also authorized to assess aspects of material, media and media benefits. The results obtained by the three experts for the mobile application developed were "very feasible". The assessment results can be seen in Table 6.

**Table 6.** Validation Achievement Conversion Rate

Expert Judgement	Percentage (%)	Interpretasi
Media	100	Very Worthy
Learning Material	90	Very Worthy
Practitioner 1	90.7	Very Worthy
Practitioner 2	93.5	Very Worthy
Practitioner 3	93.4	Very Worthy
<b>Final Score</b>	<b>93.52</b>	<b>Very Worthy</b>

**Beta Test**

Beta testing in the context of development research refers to the testing stage of a product or application that involves real users (students). This test was carried out after the alpha test involving 28 respondents. The outcomes of the survey of student feedback on the created media are presented in Table 7. Based on this test, a score of 89.92% was obtained in the "very feasible" category.

**Table 7.** User Test Result

Media Component	Question number	Percentage (%)
Understanding Teaching Material	1, 2, 3, 4, 5, 6	93%
Presentation of Teaching Materials	7, 8, 9, 10, 11, 12	90%
Presentation of Media	13, 14, 15, 16, 17, 18	87.5%
Ease of Use	19, 20, 21, 22, 23, 24	91.6%
Achievement of objectives	25, 26, 27, 28, 29, 30	87.5%
<b>Final Score</b>	<b>30 Questions</b>	<b>89.92</b>

**Testing the Effectiveness of Media to Build Awareness of the Importance of Occupational Health and Safety**

The researchers conducted a prerequisite test to determine if the distribution in the experimental and control classes was normal. The study was carried out at Surakarta Vocational High School, with TKP-A as the experimental class and TKP-B as the control class. The prerequisite test assessed the level of student awareness regarding the importance of occupational health and safety in both the experimental and control classes before the research began.

Assessing the efficiency of learning through mobile applications involves analyzing the post-test results of the experimental and control classes. The goal is to evaluate the average scores of classes utilizing mobile application-based learning media against those using traditional learning materials. Testing the difference in average scores between the experimental class and control class students used paired sample t-test and independent samples t-test with the help of SPSS 25 software. Before the t-test is carried out, the data must be normally distributed and homogeneous. Therefore, the post-test scores from both experimental and control classes were tested to determine normality and homogeneity.

The normality of the experimental class was examined in this study using the Kolmogorov-Smirnov technique through SPSS 25 software. If the significance level value exceeds 0.05, the data is deemed to be normally distributed. Conversely, if the significance level value is below 0.05, the data is considered to be non-normally distributed. Based on the test results, it was determined that the research data on students' awareness of the importance of occupational health and safety is normally distributed. This is because the post-test significance value of students' awareness of occupational health and safety is greater than 0.05 ( $0.200 > 0.05$ ), indicating normal distribution.

**Table 8.** Normality Test Results

		Unstandardized Residual
<b>N</b>		<b>60</b>
Normal Parameters <sup>a,b</sup>	Mean	.0000000
	Std. Deviation	637.5509405
Most Extreme Differences	Absolute	.098
	Positive	.077
	Negative	-.098
Test Statistic		.098
Asymp. Sig. (2-tailed)		.200 <sup>c,d</sup>

According to the analysis conducted using SPSS 25 software, the research data on students' awareness of the importance of K3 exhibits a similar or homogeneous variance. The significance value of students' K3 awareness is found to be greater than 0.05 ( $0.173 > 0.05$ ).



**Table 9.** Homogeneity Test Result

		Levene Statistic	df1	df2	Sig.
K3	Based on Mean	1.879	1	118	.173
	Based on Median	1.388	1	118	.241
	Based on Median and with adjusted df	1.388	1	112.614	.241
	Based on trimmed mean	1.860	1	118	.175

After undergoing a series of testing stages and being declared feasible, a mobile application has been developed to raise awareness about the importance of occupational health and safety among students studying construction and housing engineering at vocational high schools in Surakarta, Indonesia. The application is now ready to be implemented in learning activities. The results of the implementation can be seen in Figure 2. Based on the statistical testing results using SPSS 25 software, a significance level of 0.000 (less than 0.05) was obtained, indicating a significant influence on treatment or research.

The average score difference between the control class and the experimental class in understanding the importance of students' occupational health and safety is noticeable. A comparison of the conditions of the control and experimental classes can be seen in Table 8. According to the test conducted, the posttest score for awareness of the importance of work health and safety for students in the experimental class was higher, with a score of 86.73%, compared to the control class, which only scored 75.68% or an increase of 14.6%. The findings indicate that the use of mobile application-based learning media is more successful than traditional classes that do not incorporate mobile application-based learning media.

**Table 10.** Independent Sample Test Results

		Paired Differences			95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Post Eks– Post Control	1105.583	853.824	110.228	885.017	1326.149	10.030	59	.000

According to the development and testing results, this mobile application-based learning tool has been proven effective in raising students' awareness regarding occupational health and safety. This finding aligns with previous research (35). The research investigates how a mobile application can positively impact students' learning motivation. Additionally, this learning tool makes the learning process enjoyable and increases students' interest in the teaching material.

This research is significant because it aims to raise awareness about the importance of occupational health and safety, which is closely related to preparing students for success in the workforce. The study found that using interactive and contextual learning methods through mobile applications is more effective than traditional learning approaches (36). Mobile apps are advantageous because they can accommodate different learning styles and needs. This research provides evidence of the potential for educators to develop and improve mobile application-based learning materials.

## DISCUSSION

### Occupational Health and Safety Learning Process at Surakarta Vocational High School

According to the theory developed by (22), learning should be supported by using flexible learning materials that can be accessed at any time and from anywhere (17). However, the research revealed the limited capability of teachers to develop these learning materials. The current learning methods for Occupational Health and Safety (OHS) are not effectively engaging students. Teachers haven't developed interactive learning media and are not up

to date with technological advancements in learning. Observations and interviews with students show that they are less interested in studying OHS because the learning process is uninteresting and monotonous. It is crucial for teachers to continuously innovate to find suitable learning techniques and media. An ideal learning process should be student-centered, where the quality of learning depends on students' motivation. Efforts should be directed towards creating a suitable learning environment and guiding students to consistently engage in the learning process (37).

### **Results of Mobile Application Based Learning Media Development**

The mobile application-based learning media for Occupational Health and Safety was developed using Smart Apps Creator 3 as the development software. This learning media offers several advantages: 1) The application contains a variety of assets such as 3D, video, audio, and text explaining Occupational Health and Safety concepts; 2) It includes an exercise and game menu for user engagement and as a stress reliever during learning activities; 3) The application does not consume a lot of data and can be used offline; 4) It also features an e-module with comprehensive K3 material details. The media development process followed the Alessi & Trollip development procedure, consisting of planning, development, and testing. The planning phase involved a preliminary study to determine needs, followed by prototype creation, expert validation, and testing through limited and expanded trials.

Based on validation and field trials, it has been established that mobile application-based learning content is well-suited for use in the learning process, especially for occupational health and safety. Expert feedback has been thoroughly reviewed and will be utilized to enhance the mobile application. Extensive testing of the content has shown its feasibility for implementation in the occupational health and safety curriculum at Surakarta Vocational High School. The media development process followed the Alessi & Trollip development procedure, consisting of planning, development, and testing. The planning phase involved a preliminary study to determine needs, followed by prototype creation, expert validation, and testing through limited and expanded trials.

The development of this media is based on the understanding that each student absorbs knowledge and information in their unique way. Furthermore, achieving awareness of the importance of occupational health and safety as a development goal requires efforts to facilitate these learning activities. This is consistent with the contextual approach, which allows researchers to apply contextual learning strategies by connecting material to real-world situations. Students who grasp this concept can be better prepared to handle challenges in the professional world and can apply health and safety principles in various everyday contexts (38). Therefore, education on occupational health and safety should be an essential part of the school curriculum, teaching students not only the technical aspects but also fostering a proactive attitude toward their own and others' well-being.

### **Results of the Effectiveness of Mobile Application-Based Learning Media for Increasing Awareness of the Importance of Occupational Health and Safety**

The use of mobile application-based learning media has proven to be effective in increasing awareness of the importance of K3 among students at SMK Surakarta. The statistical test results analyzed using the SPSS 25 program showed a significance level of 0.000, which is less than 0.05 ( $0.000 < 0.05$ ). This indicates that the t-value (10.030) is higher than the critical t-value (2.000) for learning motivation, leading to the rejection of  $H_0$  and acceptance of  $H_a$ . This difference suggests a significant impact of the treatment in the experimental class compared to the control class.

Moreover, the average post-test score for K3 awareness in the experimental class was 86.73, compared to 75.68 in the control class. These results indicate that mobile application-based learning media is more effective than traditional learning media in increasing students' awareness of Occupational Health and Safety. This supports previous findings that emphasize the potential of mobile application-based learning media in enhancing students' learning experiences, particularly in raising awareness about Occupational Health and Safety.

A study by Kam Cheong Li et al. titled "Effects of Mobile Apps for Nursing Students: Learning Motivation, Social Interaction and Study Performance" looks into the impact of mobile application media on student learning

performance. The research found that using mobile applications can enhance performance, especially in practical fields (34). This shows a connection between the use of mobile applications and efforts to increase awareness of the importance of Occupational Health and Safety, which involves practical activities and performance. Additionally, research by Fajar Indra Kusuma, titled "Development of Mobile Application-Based Learning Media to Increase Student Learning Motivation on Roof Structure Material in Surakarta Vocational High Schools," highlights the influence of mobile application-based learning media on Vocational High School students, showing that it can boost student learning motivation (35). By combining the findings of these two studies, it can be concluded that mobile applications can increase students' awareness of the importance of Occupational Safety and Health compared to traditional learning methods. It also suggests that learning media users have the potential to be further developed to positively impact education.

## **CONCLUSION**

Technological advances in education offer various possibilities for improving the quality of learning, facilitating learning, and enhancing learning outcomes. One such development is renewable learning media that can address issues such as low student awareness of the importance of Occupational Health and Safety, especially among vocational high school students in Surakarta. Efforts have been made to develop a mobile application-based learning tool to increase student's awareness of the importance of occupational health and safety. The development stages include planning, design, and testing, resulting in a "very good" assessment or satisfaction score of 93.52 from media experts, material experts, and practitioners (teachers). Students also responded positively, with a satisfaction value of 89.92%.

The use of mobile learning applications has proven to be an efficient method for increasing students' understanding of occupational health and safety at Vocational High Schools in Surakarta, Indonesia. This finding was based on statistical analysis conducted using SPSS 25 software, which revealed a significance value of 0.000, signifying a substantial impact on the treatment or research. Additionally, the experimental class scored higher (86.73) on the posttest level of awareness of the importance of work health and safety compared to the control class (75.68). These results demonstrate that mobile applications have a significant impact on students' awareness of the importance of occupational health and safety. Therefore, learning using mobile applications is more effective than conventional learning methods can constantly improve this template to satisfy all authors' research needs.

Based on the results and conclusions above, the author recommends that further development be carried out on a larger scale, refining the application and expanding teaching materials are also very good inputs. Besides that, there is a need for training for teachers so they can implement this media in the classroom with the main aim of improving the quality of learning outcomes.

## **AUTHOR'S CONTRIBUTION STATEMENT**

In general, the first author is responsible for preparing concepts, instruments, writing, editing, visualization, application design, and reporting, while the second and third authors provide guidance and advice.

## **CONFLICTS OF INTEREST**

To the publisher's policy and my ethical obligations as a researcher, I confirm that I have no financial or business interest in any company that could be affected by the research presented in the accompanying paper.

## **ACKNOWLEDGMENTS**

The author expresses gratitude towards all those who supported this research, including the Master of Educational Technology Study Program at Sebelas Maret University and the student respondents from the Housing Construction Engineering Department Program at Surakarta Vocational High School.

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