Development of interactive learning media using smart apps creator on electrical system of light vehicles in vocational high schools

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A R T I C L E   I N F O

Abstract

This study aims to develop and evaluate the feasibility and effectiveness of interactive learning media based on Smart Apps Creator for the topic of lighting and signaling systems in light vehicles, intended for Grade XI students of the Light Vehicle Engineering Program at SMK Negeri 2 Salatiga. The background of this research stems from low student achievement and the limited use of engaging instructional media at SMK N 2 Salatiga, which has resulted in students having difficulty understanding the electrical system material. This study employed a Research and Development (R&D) method using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The developed media underwent validation by subject matter experts and media experts, receiving "highly feasible" ratings with feasibility percentages of 90.25% from the media expert and 88% from the subject matter expert. The effectiveness was tested through pretest and posttest evaluations analyzed using the N-Gain test. The N-Gain score from 34 students yielded an average of 0.324, which falls into the "moderate" category. It can thus be concluded that the learning media based on Smart Apps Creator provided to students is moderately effective in improving their learning outcomes.

1. INTRODUCTION

The development of information and communication technology (ICT) has had a significant impact on the field of education, including in Vocational High Schools (SMK) (Hidayat et al., 2024; Malik et al., 2024; Septiyanto et al., 2024). However, the implementation of ICT in learning at SMKs particularly in the Light Vehicle Engineering (TKR) subject, which includes elements of electrical systems still faces various challenges.

One of the main obstacles is the lack of interactive and technology-based learning media that can improve students' understanding of complex and practical material. Vocational high schools (SMK) are educational institutions at the secondary level that focus on producing students with competencies, skills, and expertise in specific fields so that their graduates can directly enter the industrial workforce (Shawfani & Thamrin, 2024; Yulianto et al., 2025). As one of the levels of education in Indonesia, SMKs must

certainly have a distinct learning process aligned with industry needs and technological developments (Fatah et al., 2025; Ramadhani et al., 2025). Therefore, technological advancement should be a major consideration for SMKs, especially since their graduates must compete in an increasingly advanced industrial and technological job market (Susanto & Hadromi, 2020).

The Industrial 4.0 era, marked by rapid technological development, has had a significant impact on many aspects of life. (Hidayat et al., 2023) The ease of accessing information on science, news, and other subjects can now be experienced by everyone thanks to technology (Delfi & Hudaidah, 2021). With this rapid technological growth, teachers are required to be more creative and innovative in their approach to delivering material to students so that learning objectives can be achieved. Conventional methods such as lecturing make the learning process less interactive, causing students to become bored and distracted. This is because lectures are typically delivered by reading material from textbooks and reiterating it to students, limiting their role to merely listening to the teacher's explanations. To overcome this issue, many innovations have been introduced to capture students' interest and improve learning quality. One such innovation is the use of learning media (Abi & Sujatmiko, 2022).

Learning media refers to anything that can be used as a tool to assist in delivering material or messages to students so that the learning process becomes more effective and the objectives can be successfully achieved (Cokro & Iskandar, 2025). This media may include physical objects, technology, or a combination of both, designed to stimulate students' thoughts, emotions, and motivation, making the learning process more engaging and easier to understand (Daniyati et al., 2023). One type of learning media that can be selected for use in the classroom is media based on Smart Apps Creator. This platform is favored because Smart Apps Creator (SAC) is software for creating application-based learning media that can be installed on Android or iOS smartphones without requiring any programming language, and it can produce formats such as HTML5, .exe, and .apk (Mahuda et al., 2021). Its ease of use without programming makes Smart Apps Creator user-friendly, especially for beginners. Additionally, its many attractive features allow for the creation of more interactive learning media that can boost students' learning motivation.

This is supported by several previous studies that also used Smart Apps Creator as a learning medium. Aulia et al. (2024) stated that using SAC-based learning media helped students understand the material more easily due to engaging content like images and audio. Their study also showed increased student motivation and made the learning process more interactive. Abi & Sujatmiko (2022) in their study mentioned the positive impact on student learning outcomes after using SAC-based media. Mahuda et al. (2021) also noted that SAC-based learning media are practical in terms of media, content, and benefits, and they also reported that SAC-based media effectively improve students' mathematical problem-solving abilities. Based on these findings, it can be concluded that Smart Apps Creator-based learning media is a good and effective choice for classroom learning.

The lighting and signaling system is one of the topics in the electrical systems subject for Grade XI students in the Light Vehicle Engineering specialization under phase F of the Merdeka Curriculum. One of the learning objectives for this topic is that students are able to assemble lighting and signaling system circuits. To achieve this, students must understand wiring diagrams, component functions, and how the system works in order to construct these circuits.

During the School Environment Introduction Program (PLP) and concurrent observational research at SMK Negeri 2 Salatiga in the Grade XI Light Vehicle Engineering program, it was found that the average student score for the lighting and signaling system topic was below the minimum competency standard (KKM). The learning material was still being

delivered through lectures, making the class feel monotonous. The media used was not engaging, as it was limited to simple PowerPoint slides and textbooks, which caused students to lose focus easily. Additionally, many students reported difficulty understanding the electrical systems subject especially the lighting and signaling system topic. Although the teacher used PowerPoint presentations as learning media and allowed students to access them on their smartphones, the phones were only used to view the provided materials. This situation limited interaction between the teacher and students, making the learning process less dynamic.

Given these conditions, an innovative solution is needed to overcome the limitations of conventional teaching methods by utilizing an interactive learning media platform to increase student engagement and improve learning outcomes. Therefore, this study seeks to develop interactive learning media for the lighting and signaling system material based on Smart Apps Creator to improve the academic performance of Grade XI students in the Light Vehicle Engineering Program at SMK Negeri 2 Salatiga.

2. RESEARCH METHODS

The method used in this research is the Research and Development (R&D) method. This study employs the ADDIE development model, which consists of five stages: (a) Analysis, (b) Design, (c) Development, (d) Implementation, and (e) Evaluation (Khoiruddin & Iskandar, 2024; Pagarra & Syawaludin, 2022).

In the analysis stage, there are two sub-stages: performance analysis and needs analysis. Performance analysis aims to identify and clarify whether the problems encountered in the learning process require a solution in the form of learning media (Maulana et al., 2025; Pagarra & Syawaludin, 2022). Meanwhile, needs analysis aims to determine what is needed to improve the effectiveness of the learning process through the use of media (Pagarra & Syawaludin, 2022).

After conducting performance and needs analyses, the next step is the design stage. This stage consists of instructional design and media design. Instructional design aims to plan the learning content that will be presented in the media according to the learning needs. Media design includes creating a framework for the media using a storyboard.

The development stage is the third stage of the ADDIE model. In this stage, the researcher creates and develops the learning media from start to finish until it becomes a complete product (Raharjo et al., 2025; Pagarra & Syawaludin, 2022). Once the media is developed, it is validated by media and content experts and then revised according to their feedback.

After the media product is validated by experts, the next stage is implementation. The validated media is implemented for Grade XI students of the Light Vehicle Engineering program at SMK Negeri 2 Salatiga. This stage aims to collect data on students' learning outcomes before and after using the developed learning media.

The fifth stage in the ADDIE model is evaluation. In this stage, the success of the implemented learning media is assessed. This assessment is carried out by analyzing students' pretest and posttest results using quantitative methods to determine whether the developed media effectively improves student learning outcomes.

The subjects of this research were 34 students from Grade XI of the Light Vehicle Engineering Program at SMK Negeri 2 Salatiga. The data used in this study are quantitative. Data collection techniques used in this research include questionnaires and tests. Questionnaires were used to obtain validation data from media and content experts, while the tests were used to collect pretest and posttest data to determine improvements in student learning outcomes (Iskandar, 2019).

3. RESULTS AND DISCUSSION
Media Feasibility

Expert validation was conducted to determine the feasibility of the developed learning media based on the aspects of content

quality and media appearance. The following are the results of validation by content experts

Table 1. Result of Content Expert Validation

No	Material Experts	Score
1	Adhetya Kurniawan, M.Pd.	30
2	Dadit Kurniawan, S.Pd.	33
3	Djoko Muljono, S.Pd.	40
	Total Score	103
	Maximum Score	120
	Percentage	88%

Table 2. Result of Media Expert Validation

No	Media Experts	Score
1	Bapak Febrian Arif Budiman, S.Pd., M.Pd	66
2	Dadit Kurniawan, S.Pd.	66
3	Djoko Muljono, S.Pd.	71
	Total Score	203
	Maximum Score	216
	Percentage	90.2%

Based on the percentage calculations, the media feasibility score was 90.25%, and the content feasibility score was 88%. This means that, according to the learning media feasibility score table, the developed learning media is categorized as "Highly Feasible" for use in the learning process.

Students Learning Outcomes

a. Normality Test

The normality test was conducted to determine whether the data in this study followed a normal distribution or deviated significantly from it. In this research, the Shapiro-Wilk test was used, as it is appropriate for sample sizes of fewer than 50. Data is considered to be normally distributed if the significance value is ≥ 0.05. Conversely, if the significance value is < 0.05, the data is considered not normally distributed. The normality test analysis was carried out using IBM SPSS Statistics for Windows software. The results of the normality test analysis are presented in Table 3.

Table 3. Result of Normality Test

	Statistic	df	Sig.
Pretest	0,951	34	0,128
Posttest	0,957	34	0,199

Based on the results of the normality test using the Shapiro-Wilk method shown in Table 4.7, the pretest yielded a significance value of 0.128, and the posttest yielded a significance value of 0.199. Therefore, it can be concluded that both the pretest and posttest results are normally distributed, as the significance values of both datasets are greater than 0.05.

b. N-Gain Test

The N-gain test was used to determine the effectiveness of the learning media by analyzing the score improvement between the pretest and posttest results of the students. The N-gain analysis was carried out using IBM SPSS Statistics for Windows *software*. The results of the N-gain test are presented in Table 4.

Table 4. Result of N-Gain Test

	N	Min Score	Max Score	Average	Info
N-gain skor	34	-0.85	0.86	0.324	Middle.

Based on the N-gain score calculations using IBM SPSS Statistics for Windows, as shown in Table 4.8, there are three categories: high, medium, and low. A total of 12 students fell into the low category, 21 students were in the medium category, and 1 student was in the high category. The average N-gain score for 34 students was 0.324, which falls into the medium category. Therefore, it can be concluded that the Smart Apps Creator-based learning media provided to the students is moderately effective in improving their learning outcomes.

4. CONCLUSION

The development of interactive learning media based on Smart Apps Creator resulted in a final product called "Interactive Media for Lighting and Signaling Systems", which can be operated on Android based smartphones or tablets, with or without an internet connection. The validation conducted by content experts yielded a score of 88%, placing it in the "Highly Feasible" category. Furthermore, the validation

by media experts resulted in a score of 90.25%, which also falls into the "Highly Feasible" category. This indicates that the developed learning media is "Highly Feasible" for use in the learning process of lighting and signaling systems. Normality test analysis using the Shapiro-Wilk method showed a pretest significance value of 0.128 and a posttest significance value of 0.199. Therefore, it can be concluded that the pretest and posttest results are normally distributed, as both significance values are greater than 0.05. Based on the N-Gain test results, the average score was 0.324, which falls into the "moderate" category. Thus, it can be concluded that the interactive learning media based on Smart Apps Creator provided to the students is moderately effective in improving learning outcomes on the topic of lighting and signaling systems.

The developed learning media can only be operated on Android-based smartphones. Therefore, it is recommended that the author prepare a version of the media that can also run on iOS-based smartphones, as not all students use Android devices. This can be achieved using Smart Apps Creator so that the learning media can be accessible to all students. The validation results from experts categorized the media as highly feasible, which means teachers can utilize this media to support learning activities and avoid monotonous teaching methods.

5. DECLARATION/STATEMENT

5.1. Acknowledgment

Thank you to all parties who have helped with this research.

5.2. Author Contribution

Sofyan Al Farouqi wrote the article. Hadromi was involved in the planning and supervision of the research. Dwi Widjanarko contributed to supervision of the research

5.3. Conflict of Interest

We have no conflicts of interest to disclose.

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