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Transforming Vocational Learning with Interactive Multimedia: Creative Solutions for the Digital Era

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Abstract: The use of interactive multimedia in learning is expected to stimulate students' interest and encourage greater involvement in the learning process, given that some students often find the material difficult and abstract. This research aims to develop interactive multimedia in subjects in class X of SMK Negeri 6 Padang, which is focused on Computing Systems material. This research involves the stages of analysis, design, development, and evaluation to produce valid, practical, and effective learning media. The validation results showed that the interactive multimedia developed had a very high level of validity, with scores reaching 100% from media, material, and language experts. The practicality test on teachers and students also showed very positive results, with an average score of 95%, which indicates that this medium is very practical to use in learning. The effectiveness of the media was measured through the pretest and posttest, with results showing an increase in student understanding, with an average N-gain score of 67.58%, which was categorized as "moderate". In conclusion, the interactive multimedia developed can be used as a valid, practical, and effective learning medium to improve students' understanding of subjects at vocational schools. This research makes an important contribution to the development of technology-based learning media at the secondary education level.

Keywords: Effectiveness; Interactive multimedia; Practicality; Technology-based learning; Validity

Introduction

The Industrial Revolution 4.0 era has brought about major changes in various sectors of life, with rapid technological advances impacting nearly every aspect of human life, from economics and politics to socio-cultural aspects, even education. These changes have not only impacted the technology sector but have also transformed the way people work, communicate, and learn. Digital technology, with advances in automation, artificial intelligence (AI), and social media and communication applications, has permeated everyday life, shifting paradigms and the need for relevant skills (Abdallah et al., 2024). For example, in the workplace, the use of technologies such as Zoom, Microsoft Teams, and Slack has enabled more efficient remote work (Soga et al., 2022). Meanwhile, in the education sector, social media and video conferencing platforms provide opportunities for more flexible and inclusive learning (Barikzai et al., 2025). This demonstrates that technology plays a crucial role in creating global connectivity and supporting various sectors of life.

Amidst the rapid development of technology, the world of education is also facing the challenge of adapting to these changes. One of the biggest challenges in education is how to convey material that tends to be abstract and difficult to understand, such as academic subjects, in a way that is more accessible and engaging for students (Darling-Hammond et al., 2020). One innovation that has emerged to support improving the quality of learning is the use of interactive multimedia. Interactive multimedia combines various media elements, such as text, images, sound, video, and animation, designed to enable students not only to

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passively receive information but also to actively interact with the material being taught (Lee et al., 2024). This approach is expected to improve student understanding, particularly in learning that is known for its complex concepts (Kerimbayev et al., 2023). As a result, previously difficult-to-understand material can be presented in a format that is more accessible and understandable to students (Soeharto & Csapó, 2021).

The use of interactive multimedia in learning is expected to stimulate students' interest and encourage greater engagement in the learning process, given that some students often find the material difficult and abstract (Alten et al., 2019). Interactive elements, such as quizzes, practice problems, and computer-based assignments, allow students to assess their understanding of the material (Bond et al., 2020). Furthermore, advances in hardware and software technology, which have become increasingly accessible, have also become important drivers in the development of interactive multimedia. With the advent of mobile devices and web-based applications, the implementation of interactive learning media has become easier and more affordable at various levels of education (Irhamni & Ashari, 2023). This increasingly sophisticated technology enables more engaging and immersive learning media, which in turn enhances the student learning experience.

One educational institution implementing this learning is SMK Negeri 6 Padang, which plays a crucial role in preparing graduates ready to work in the information technology field (Rukoyah & Bektiningsih, 2024). Interviews with teachers on November 12, 2024, revealed that the school's current teaching methods still utilize traditional media such as visual PowerPoint presentations and printed or PDF textbooks. However, this learning tends to focus on lectures, resulting in less active student engagement (Inoue-Smith, 2016; Zemuy et al., 2024). This is reflected in the results of the odd semester summative assessment, where only 24% of the 36 students achieved a score above 78, according to the Learning Objective Achievement Criteria (KKTP). These results indicate that the current learning methods are less effective in maximizing student potential (Tong et al., 2022). Therefore, a more innovative and interactive approach is needed to improve the quality of learning at this school.

Based on the assessment results, it can be concluded that innovation in learning media is needed to increase student engagement in the learning process. The use of interactive multimedia as a solution to improve the quality of learning at SMK Negeri 6 Padang can address this challenge (Adawiyah et al., 2024). By implementing interactive multimedia-based learning media, students are expected to be more active in exploring the subject matter and gain a better understanding (Ningsi & Hartono, 2025). Furthermore, this learning media can create a more enjoyable, challenging atmosphere and motivate students to actively participate in learning activities (Al Shloul et al., 2024; Bergmark & Westman, 2018). The use of interactive media is also in line with government policy on learning, which prioritizes active student involvement and the use of technology in education (Hasanah & Sudira, 2021; Hanaysha et al., 2023).

Through the implementation of an interactive multimedia approach, learning will not only be more engaging but also more effective in preparing students for the world of work in the digital age. Therefore, the author is interested in developing interactive multimedia learning media for subjects that can be used at SMK Negeri 6 Padang. This media is expected to assist teachers in delivering material more effectively while increasing student engagement in the learning process. This research aims to develop and implement interactive multimedia learning media in learning at SMK Negeri 6 Padang, which in turn can improve student motivation and overall learning outcomes.

Method

The type of research used in this study is research and development (R&D), which focuses on creating and testing the effectiveness of learning products. According to Cash et al. (2023), research and development is a method used to produce a specific product and test its effectiveness in the context of community use. In this context, the product developed is an interactive multimedia-based learning media using the Canva application, aimed at improving the quality of learning at SMK Negeri 6 Padang. This research relies on needs analysis to design a relevant and valid product and product trials to ensure its effectiveness. During implementation, the developed product must undergo a validation stage by experts to ensure that the learning media meets standards for effectiveness and relevance. Therefore, this research aims to produce a product that is not only effective but also practical and ready for use in a broader educational environment.

In this research phase, the development model used was the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, developed by Dick and Carey. The ADDIE model was chosen due to its high flexibility and suitability for educational development research. This model consists of five stages: needs analysis, product design, product development, product implementation, and evaluation of implementation results. The ADDIE model is considered highly effective due to its simple and clear structure, which allows researchers to systematically

move through each stage of product development. This process also allows for regular evaluation and revision, which are crucial for refining and perfecting products to meet their intended goals. Thus, the ADDIE model ensures that every product developed undergoes a series of tests and refinements to achieve optimal educational outcomes. In the first stage, namely analysis, this study will identify student needs and learning conditions at SMK Negeri 6 Padang related to learning that still uses conventional media such as PowerPoint and printed textbooks or PDFs.

In the design stage, researchers will design Canva-based learning media, which can present learning materials in a more interactive and engaging way for students. The development stage will involve creating and testing a product prototype to determine the effectiveness and response of students and teachers to the developed media. Product implementation will be carried out by testing the learning media in the classroom to evaluate the extent to which it can increase student engagement in the learning process. The final stage is evaluation, which aims to assess the product's effectiveness, identify shortcomings, and make necessary improvements before the product is used more widely in learning.

Result and Discussion

Based on the research and development objectives, this study aims to develop interactive multimedia as a learning medium for subjects at SMK Negeri 6 Padang. The development process began with an in-depth analysis of the curriculum, teaching modules, students, and existing learning needs.

Analysis Results

In the first stage of the research, namely analysis, observations and interviews were conducted to identify problems and needs at SMK Negeri 6 Padang. The results of the curriculum analysis indicate that SMK Negeri 6 Padang uses the Independent Curriculum, which provides flexibility in designing learning. However, there are problems with the learning process, which still uses lecture methods and media aids such as PowerPoint and Student Worksheets (LKS), which are ineffective in engaging students. Based on interviews with teachers, the material to be developed for interactive multimedia is expected to increase student engagement in the learning process (Natharani et al., 2024; Festiyed et al., 2023). The analysis of the teaching modules revealed that although the teaching modules were well-designed by the teachers, the use of learning media was still limited to PowerPoint and LKS, which were not sufficiently engaging for students. Teachers also acknowledged the lack of variety in the available teaching materials, resulting in frequent student boredom. Furthermore, the material presented lacks depth and is not accompanied by supporting visual media, such as videos explaining the experimental steps in practice. Therefore, the development of interactive multimedia is a solution that is expected to help improve student understanding, especially in practical activities that require clear visual steps.

Analysis of student feedback indicates that most students find the subject enjoyable, but they complain about the limitations of the available learning media. An interview with one student, AN, stated that although the subject is enjoyable, inadequate laboratory facilities and teaching media are a major obstacle to achieving optimal learning outcomes. This highlights the importance of developing more interactive and engaging learning media to enable students to learn more effectively.

The needs analysis phase revealed that learning at SMK Negeri 6 Padang still relies on teaching materials consisting of text and images, which are deemed insufficient to help students fully understand the material. Therefore, interactive multimedia complemented by videos and other interactive elements, such as quizzes, is needed to enrich the student learning experience.

Design Stage

After conducting the analysis, the next stage was designing the interactive multimedia. This multimedia was designed using the Canva application with the aim of presenting material that was engaging and easy for students to understand. The first slide is the title slide, designed with a technology-themed background and a dominant green color scheme to attract students' attention. The second slide provides the background for the interactive multimedia, explaining the purpose of creating this media: increasing student engagement and understanding of the Computing Systems material. The main menu of this interactive multimedia consists of four options for students to choose from: learning objectives, user guide, materials, and quizzes. Each menu is designed to provide easy navigation for students in accessing the learning materials. The learning objectives in the materials are displayed on a clear and easy-to-read dark blue background. A user guide slide ensures students understand the functions of the buttons in the interactive multimedia, allowing them to operate the media easily.

The material presented in the interactive multimedia covers computer hardware and software. Each topic is accompanied by an explanatory video to help students grasp the concepts. Additionally, a quiz included in this media, derived from the Wordwall application, is used to test students' understanding of the material. After completing the material

development, students can access this interactive multimedia through the provided link. The final step is to download the content in video format for use on various learning platforms.

Development Stage

In the development stage, the primary focus is on realizing the learning design into a tangible product in the form of interactive multimedia that can be used in classroom learning. This development process refers to the plan developed in the design stage, with adjustments to the characteristics of SMK Negeri 6 Padang students and the specific learning needs of each subject. The interactive multimedia product developed aims to provide an engaging, interactive learning medium that meets the needs of students. After the initial product is developed, the next step is to evaluate its feasibility through a validation process. This validation is carried out to ensure that the resulting product meets the expected criteria and can be used effectively in a learning context. The validation process in this study consists of three types of validation: media validation by a media expert, material validation by a material expert, and language validation by a linguist. Media validation aims to assess the quality of the media design, material validation focuses on the appropriateness and accuracy of the material presented (Laksana, 2024), while language validation aims to assess the use of language in the product to ensure it is easily understood by students (Abdullah et al., 2024).

Instrument Validation

Instrument validation in this study was conducted using expert assessment methods, specifically construct validation, to assess the feasibility of the developed product. One of the validators involved in this study was Dr. Ramalis, M.Pd., who was responsible for assessing the instruments used in interactive multimedia. This validation process aims to confirm that every element of the product, including media design, materials, and language use, meets the desired standards. In this case, the validated instrument included elements within interactive multimedia, such as visual displays, learning content, and text. The data obtained from this instrument validation was quantitative, which was then converted into qualitative data to evaluate the product's feasibility. The results of this instrument validation will provide an overview of the effectiveness and feasibility of interactive multimedia as a learning tool. The results of this instrument validation indicate that the developed interactive multimedia meets excellent feasibility criteria, with validity and practicality scores reaching 100%, making it suitable for use in the learning process without further revision (Zaimah et al., 2024; Nurmiati et al., 2025).

Product Validation by Experts

The next step is to validate the developed interactive multimedia product (Abdulah et al., 2021; Handayani et al., 2024). Product validation was conducted by three experts: a media expert, a content expert, and a language expert. This validation aimed to evaluate whether the developed product met eligibility standards or whether revisions were needed. The following are the validation results from each expert.

Media Expert Validation Results

Media expert validation was conducted by Dr. Ulfia Rahmi, M.Pd., a lecturer in the Master of Educational Technology program at the UNP Graduate School. Her assessment showed that the developed interactive multimedia received an average score of 4.21, with a percentage of 84.16%, which falls into the "Very Suitable" category. This validation covered several aspects such as ease of use, visual appearance, media presentation, media benefits, and interactivity. Some suggestions provided by the media expert included improving the navigation on the final page of the material, which appeared incomplete, and improving the display of answer choices in the quizzes. After revisions, the navigation and quizzes were improved to provide a better user experience (Faudzi et al., 2024; Seutter et al., 2023).

Language Expert Validation Results

Language validation was conducted by Dr. Abdurrahman, M.Pd., a lecturer in Indonesian at the Faculty of Languages and Arts at UNP. Based on the evaluation results, the developed interactive multimedia received a score of 60, with a percentage of 100%. All language indicators, such as compliance with language rules, sentence appropriateness, and suitability for students, received maximum scores. These results indicate that the language used in the product is highly appropriate and suitable for use in the learning process.

Material Expert Validation Results

Material validation was conducted by a subject lecturer in the Department. The validation results showed that the developed interactive multimedia received a score of 54, with a percentage of 98.18%. Aspects assessed included material relevance, material presentation, and independent practice. This high score indicates that the material presented in the interactive multimedia is highly relevant to the learning objectives and is presented in a clear and easy-to-understand manner for students. Based on the expert validation results, the developed interactive multimedia meets the feasibility criteria with a "Very Suitable" category. These results indicate that the product can be used in the

learning process with several minor improvements implemented, such as improvements to navigation and quizzes. Overall, this product can be considered an effective learning medium and is ready to be implemented to improve the quality of learning at SMK Negeri 6 Padang.

Evaluation Stage

The evaluation was conducted to measure the practicality and effectiveness of the developed interactive multimedia (Saputri et al., 2025). Practicality tests were conducted on educators and students to determine the extent to which this media could be applied in classroom learning (Wisudariani & Wiraningsih, 2023). This evaluation used two instruments: student practicality and teacher practicality, and measured the media's effectiveness by comparing pretest and posttest results.

Practicality by Teachers

In the practicality test conducted by students, interactive multimedia received very high ratings from 30 student respondents. The assessment was conducted on several aspects: ease of use, material presentation, multimedia display, and impact on learning strategies (Wang et al., 2019). The results by Zhao et al. (2022) showed that ease of use received a score of 97%, material presentation 96%, multimedia display 95%, and impact on learning strategies 92%. Based on these results, the interactive multimedia was overall rated as "Very Practical" for use in the learning process, particularly in the subject of . Based on these results, it can be concluded that students found it very helpful and were familiar with the use of interactive multimedia in their learning.

Practicality by Teachers

Teachers also gave very high ratings to the practicality of the interactive multimedia developed. Practicality assessments by teachers showed an average score of 4.8 for ease of use, 4.7 for material presentation, and 4.7 for display. Overall, this product received a practicality rating of 95%, placing it in the very practical category. This assessment indicates that interactive multimedia significantly facilitates teachers' delivery of material and has a positive impact on the learning strategies implemented in the classroom (Ventista & Brown, 2023; Almoslamani, 2022).

Effectiveness

The effectiveness test was conducted using a pretest and posttest to monitor improvements in student understanding after using interactive multimedia (Topano et al., 2021; Sari & Mutiara, 2022). Based on the results of the effectiveness test conducted on 30 students, the average N-Gain percentage was 67.58%, which is categorized as "moderate." This N-Gain score indicates a significant increase in understanding after using interactive multimedia, although it remains in the moderate category. The N-Gain results are as follows. These results indicate that, in general, interactive multimedia is effective in improving student understanding, with more than half of the students showing significant improvements in understanding (categories "moderate" or "high") (Gray et al., 2022).

Conclusion

Based on the results of research conducted on the development of interactive multimedia for subjects in grade X at SMK N 6 Padang, it can be concluded that: The interactive multimedia developed for subjects in grade X at SMK N 6 Padang has proven valid and suitable for use in the learning process. This is reflected in the validation results conducted by expert validators and education practitioners, which showed that the developed media design was attractive, aligned with the research objectives, and the material presented was aligned with the Learning Outcomes and objectives. Thus, this multimedia facilitates students' understanding of the material being taught; The development of interactive multimedia for subjects in grade X at SMK N 6 Padang also demonstrated that this media is very practical to use. Based on the analysis of practicality questionnaires given to teachers and students, this interactive multimedia can be easily used by students independently in the learning process; The developed interactive multimedia has proven effective in improving students' understanding of the learning material. The results of effectiveness tests conducted through pretests and posttests indicate a significant increase in student understanding after using this media in learning.

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Author Contributions

Conceptualization, resources, writing—review and editing, E.E.; methodology, investigation, data curation, R.; validation, formal analysis, J.; writing—original draft preparation, visualization, J. and R. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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