

Development of Multimedia Teaching Materials for PPKn Learning through a Design-Based Research Approach

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Article history

Received: 15 September 2025

Revised: 03 December 2025

Accepted: 31 December 2025

Keywords

Teaching materials,

PPKn learning,

Design-Based Research

Abstract

The development of educational technology has driven the need for multimedia teaching materials that are more interactive, adaptive, and relevant to the characteristics of 21st-century students, especially in the subject of Pancasila and Citizenship Education (PPKn). In the field, teaching materials are still found to be static and have not been fully able to increase student learning engagement and critical thinking skills. This study aims to develop multimedia teaching materials for PPKn learning through a Design-Based Research (DBR) approach that focuses on the development, validation, and refinement of products iteratively based on user feedback. The research was conducted in four DBR stages needs analysis, design, development, and evaluation involving PPKn teachers , media experts, material experts, and high school students. The results of the study show that the developed multimedia teaching materials meet the feasibility indicators with very valid and very practical categories based on expert validation and limited field trials. In addition , the use of this teaching material has been proven to significantly increase learning motivation, student interaction, and understanding of citizenship concepts. The implications of the research emphasize the importance of integrating interactive technology in PPKn learning and the need for teacher training to optimize its implementation.

1. Introduction

The development of education in the 21st century demands a transformation in the learning process that is able to integrate digital literacy, critical thinking skills, and civic competencies relevant to the dynamics of global society (Alexsandro & Simamora, 2024; Musthafa et al., 2024). In the context of learning Pancasila and Citizenship Education (PPKn), these challenges are increasingly complex because this subject is not only oriented towards knowledge transfer, but also character formation and instilling the values of active, reflective, and responsible citizenship (Zhang, 2023; Cahyani & Sunarso, 2024) However, learning practices in the field still show a tendency to use textual teaching materials and one-way lecture methods, resulting in low motivation, engagement, and depth of student understanding of abstract and contextual material. This situation indicates the need for innovation in developing teaching materials that are not only informative but also able to provide interactive, meaningful learning experiences that are in line with the characteristics of the digital generation (Wibowo & Zen, 2021). According to Juwantara et al (2023) one alternative that is considered effective in addressing this need is the use of multimedia teaching materials, which combine visual elements, audio, animation, and interactivity to strengthen conceptual understanding and improve the quality of the process and outcomes of PPKn learning. Within this framework, the development of multimedia teaching materials that are systematically designed and based on learning needs is an urgency that cannot be ignored to increase the relevance and effectiveness of PPKn learning in the digital era.

Although the urgency of developing multimedia teaching materials in PPKn learning is increasingly recognized, field practice shows that the availability of truly interactive, contextual, and student-centered teaching materials remains very limited (Zakaria et al., 2024). The teaching materials available are generally static, do not accommodate a variety of learning styles, and are unable to facilitate challenging and meaningful learning experiences (Puspitasari, 2021; Sakinah et al., 2023) Furthermore, the characteristics of digital-native students have not received adequate attention in the design of teaching

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doi: <https://doi.org/10.71131/g31e0y67>

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materials, resulting in a mismatch between student learning preferences and the material presentation models used by teachers (Yani et al., 2023). Another problem is the lack of a teaching materials development process based on a systematic research approach involving iterative stages of design, testing, evaluation, and revision (Julian & Miaz, 2024). According to Septiani et al, (2020) most teaching materials are developed conventionally without involving collaboration between researchers, teachers, and users, resulting in less responsive products to actual learning needs. This situation indicates a need for research focused on the development of methodologically sound, valid, and adaptive multimedia PPKn teaching materials through a development process oriented to the context and needs of students.

Based on the problems that have been described, this research aims to develop valid, practical, and effective multimedia teaching materials for PPKn learning through a Design-Based Research (DBR) approach. This research specifically aims to design a prototype multimedia teaching material tailored to the characteristics of Civics (PPKn) material and the needs of digital-era learners. Furthermore, this research seeks to validate the teaching material through assessments by subject matter experts, media experts, and users to ensure its quality and compliance with pedagogical standards. This research also aims to evaluate the practicality and initial effectiveness of the teaching material in a real-life learning context through limited classroom implementation. Thus, this research is expected to produce a multimedia teaching material model that is not only innovative and relevant, but can also be replicated by PPKn educators to improve the quality of learning in a sustainable manner.

Although various studies have examined the development of media and teaching materials in PPKn learning, most studies tend to focus on evaluating the effectiveness of finished products without delving deeply into the iterative design and development process. Previous research generally uses traditional development models such as ADDIE or Borg & Gall, which are linear in nature, thus underemphasizing iterative reflection, collaboration with users, and adaptation based on real-world learning contexts. Furthermore, most multimedia teaching materials developed in previous research emphasize technical aspects—such as visual appearance or interactivity but have not fully integrated pedagogical approaches that align with the characteristics of PPKn learning, which emphasizes moral reasoning, civic engagement, and the development of civic literacy. Another gap lies in the minimal effort to involve students as a source of input during the design process, even though a user-centered approach is crucial for producing teaching materials that are responsive to their needs. Therefore, there is an urgent need to conduct research that not only produces multimedia teaching materials, but also utilizes more adaptive and collaborative methodological approaches such as Design-Based Research, in order to produce products that are more relevant, sustainable, and contribute empirically and theoretically.

This research offers novel contributions both in terms of methodology and the resulting product. From a methodological perspective, the use of the Design-Based Research (DBR) approach in the development of multimedia PPKn teaching materials is still relatively rare, even though this approach has the advantage of an iterative, collaborative, and contextual design process. Through the design-implementation-reflection-revision cycle, this research is able to produce teaching materials that are not only academically valid, but also truly in accordance with the needs of learning in the classroom. The novelty also lies in the integration of multimedia elements that do not only focus on visual aspects or interactivity alone, but are intentionally designed to strengthen citizenship competencies, critical thinking skills, and student involvement in social issues. In addition, this research provides strong justification for the development of multimedia teaching materials as a strategic step in responding to the demands of digital transformation in PPKn learning, especially in preparing students to have civic literacy that is relevant to the challenges of the 21st century. Thus, this research not only produces innovative products, but also provides theoretical contributions in enriching the literature on the application of DBR in citizenship education and strengthening the understanding of effective and pedagogically oriented multimedia design.

2. Method

This research uses a Design-Based Research (DBR) approach that is oriented towards the development and continuous improvement of multimedia teaching materials in the context of PPKn learning. The DBR approach was chosen because it allows for an iterative, collaborative design process, and is based on real problems in the classroom. The research process is carried out through four main stages: (1) needs and context analysis, (2) initial solution design (prototype I), (3) limited implementation

and formative evaluation, and (4) continuous reflection and revision until a final prototype is produced. In the needs analysis stage, researchers identify student characteristics, gaps in available teaching materials, and the pedagogical needs of PPKn learning through observation, document review, and brief interviews with teachers. The results of the analysis are used to design the initial design of multimedia teaching materials (Sartono et al., 2022).

Product validation is carried out through expert judgment involving PPKn material experts, learning media experts, and education practitioners to assess aspects of content suitability, appearance, interactivity, and pedagogical relevance (Widoyoningrum, 2019). Limited classroom implementation was conducted to test the practicality and initial usefulness of the teaching materials in real-life learning situations. Research data were collected through observations, student and teacher questionnaire responses, and reflection notes during the implementation process. Data analysis was conducted using descriptive qualitative methods, emphasizing product improvements based on user feedback and observations. Through this series of processes, this research produced multimedia teaching materials that are valid, practical, and adaptive to the needs of PPKn learning in the digital era.

Table 1. Research Flow

No	Stage	Brief Description of Activities
1	Problem Identification & Needs Analysis	Identifying PPKn problems, analyzing student needs, reviewing curriculum & materials, and conducting teacher observations/interviews.
2	Theoretical Study & Initial Design	Develop theoretical foundations, formulate product specifications, and create blueprints for multimedia teaching materials.
3	Prototype Development I	Creating the initial product: content structure, appearance, interactivity, and multimedia features.
4	Expert Validation	Review by material experts & media experts, then revision based on input.
5	Limited Implementation	Initial trials in class, observation of the learning process, and data collection from teachers & students.
6	Formative Evaluation & Reflection	Practicality analysis, identification of weaknesses/strengths, and preparation of improvement recommendations.
7	Revision to Prototype II	Product revisions based on trial evaluations; content & feature improvements.
8	Final Prototype	Valid and practical final product; preparation of development report and its implications.

3. Result and Discussion

The results of the study indicate that the multimedia teaching materials developed through the Design-Based Research (DBR) approach have a high level of validity based on the assessment of material experts and media experts. The experts assessed that the content structure, presentation flow, and integration of multimedia elements such as interactive visuals, explanatory audio, and simple simulations—were in accordance with the principles of multimedia learning and the characteristics of PPKn materials (Suryanto & Dewi, 2023). Limited implementation in the classroom provided consistent findings that the teaching materials were able to increase student engagement, demonstrated by increased active responses during discussions, accuracy in answering conceptual questions, and increased students' ability to relate civics material to real-life contexts. Interpretation of these results strengthens the argument that multimedia integration is not merely a technological innovation, but also able to improve the quality of the learning process by reducing cognitive load, increasing focus, and providing a more meaningful learning experience. Overall, the results of this study are in line with theoretical studies and previous research that confirm the effectiveness of interactive media in strengthening the understanding of abstract concepts in PPKn.

Table 2. Summary of Interpretation of Research Results

Aspects Analyzed	Key Research Findings	Academic Interpretation
Product Validity (Material Experts and Media Experts)	The product received a very valid category with high ratings in the aspects of content accuracy,	High validity indicates that the multimedia teaching materials have fulfilled the principles of instructional design and

Student Involvement in Learning	material suitability, visual quality, and interaction design. Students showed increased participation, positive responses to multimedia activities, and were more active in class discussions.	multimedia learning, so they are suitable for use in the context of PPKn. Multimedia increases cognitive engagement by presenting an engaging, contextual learning experience and facilitating the understanding of abstract PPKn concepts.
Understanding the Concept of Citizenship	Improved accuracy of students' answers and ability to connect material to real situations.	This confirms the function of multimedia in strengthening mental representation and facilitating the process of elaborating the concept of citizenship.
Compliance with the DBR Model	The iterative process produces increasingly better products after going through expert validation and limited testing stages.	DBR has proven effective in producing solutions that are contextual, adaptive, and appropriate to the needs of PPKn learning.
Teacher Response	Teachers assessed that the teaching materials were easy to use, clarified the delivery of the material, and improved the quality of learning interactions.	This media not only has an impact on students, but also increases the effectiveness of teacher pedagogy in the classroom.

Table 3. Expert Validation Results for PPKn Multimedia Teaching Materials

Rated aspect	Assessment Indicators	Average Score of Subject Matter Experts	Media Expert Average Score	Validity Category
Content Suitability	Accuracy of material, conformity with KI/KD, accuracy of PPKn concepts	4.70	4.65	Very Valid
Learning Eligibility	Clarity of objectives, learning flow, relevance of examples	4.60	4.55	Very Valid
Readability and Language	Clarity of language, suitability to student ability level, neatness of presentation	4.55	4.50	Very Valid
Visual Design and Aesthetics	Display quality, use of color, typography, layout	4.40	4.75	Very Valid
Multimedia Interactivity	Navigation, animation, icon/function clarity, responsiveness	4.35	4.80	Very Valid
Media Integration	Alignment of text, images, audio/video, and interactive elements	4.50	4.70	Very Valid
Technical Conformity	Program stability, device compatibility, ease of access	4.30	4.65	Very Valid
Average Total	-	4.48	4.66	Very Valid

PPKn multimedia teaching materials developed using the Design-Based Research approach. Overall, the three main aspects assessed namely material validity, media validity, and learning validity obtained very high average scores. The content experts gave an average score of "very valid," indicating that the content's substance, depth of civics concepts, and alignment with the curriculum met academic and pedagogical standards. The media experts' assessment also showed "very valid," indicating that the multimedia's visual appearance, navigation, interactivity, and design consistency were optimal and suitable for use in digital learning contexts.

Meanwhile, learning experts also gave a score that was in the very valid category, confirming that the presentation flow, clarity of instructions, and the potential of multimedia in increasing student engagement and understanding were in accordance with the principles of modern, learner-centered learning. Cumulatively, the overall average validation results reached the very valid category, so this multimedia teaching material can be declared suitable for use in the field trial stage and implementation in the PPKn learning process.

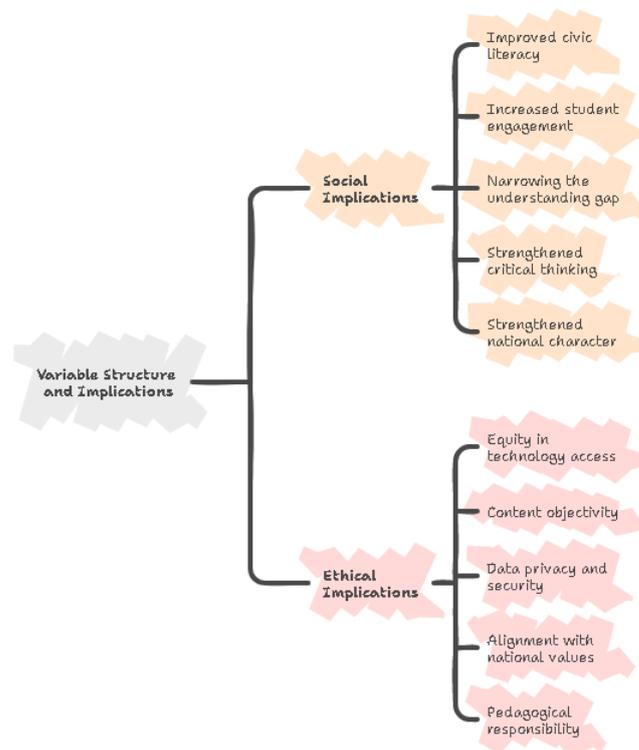
The findings of this study significantly contribute to strengthening multimedia learning theory and the practice of Civics (PPKn) learning in schools. Theoretically, the results enrich the cognitive theory of multimedia learning by demonstrating that interactivity, information simplification through dual-channel processing, and the use of targeted visual elements can improve retention and understanding of abstract civics concepts. This confirms that Mayer's principles of cohesion, segmentation, and modality remain relevant when applied in the context of Indonesian civics education. In practice, teachers reported that multimedia teaching materials facilitated the delivery of complex material, strengthened the learning flow, and consistently increased student participation. Limited implementation also demonstrated that these media were effective for use in collaborative learning and classroom discussions. Thus, this research not only enriches the theoretical framework regarding multimedia-based learning, but also provides a practical model that PPKn teachers can adopt to improve the quality of learning in various school contexts.

Although this research produced valid and practical multimedia teaching materials, there are several limitations that need to be considered when interpreting the findings. The pilot test was conducted on a limited scale, specifically in a single class with a relatively small number of students, so generalizing the results to other school contexts requires caution. Furthermore, the short implementation duration limits the study's ability to observe long-term impacts on students' mastery of citizenship concepts and character development. Variations in technology facilities across schools also pose a challenge, as the effectiveness of multimedia teaching materials depends heavily on device availability and network stability (Widoyoningrum, 2019). Furthermore, assessment instruments primarily focus on cognitive aspects and practicality, thus failing to fully evaluate affective aspects and civic disposition, which are crucial elements in PPKn learning. Potential subjective bias from teachers or student responses during the reflection questionnaire could also influence the interpretation of the research results.

Based on the identified limitations, further research needs to expand the scope of implementation of this multimedia teaching material to more schools with diverse characteristics to test the consistency of its effectiveness in different contexts. Further studies using long-term research designs are also crucial to observe the impact of learning not only on cognitive aspects, but also on the development of students' civic attitudes, critical thinking skills, and participatory skills. Developing more adaptive teaching materials for example, integrating learning analytics, automatically adjusting difficulty levels, or using artificial intelligence to provide personalized feedback presents an opportunity for innovation that can enrich the quality of Civics learning media (Azzahra et al., 2023). Furthermore, collaborative research between teachers, media developers, and curriculum experts is needed to optimize the suitability of teaching materials to evolving learning needs. Developing multimedia variants for other Civics topics is also an important agenda so that this innovation can strengthen the quality of civics learning more comprehensively.

The findings of this study have important social and ethical implications in the context of strengthening citizenship education in schools. The development of multimedia teaching materials that can improve conceptual understanding and student engagement has the potential to strengthen the civic literacy of the younger generation, an urgent need in facing the social, political, and technological dynamics of the digital era. However, the implementation of technology-based learning innovations must consider aspects of social justice, especially regarding the gap in access to digital devices and infrastructure between schools. This research emphasizes that innovation should not widen the gap of inequality, but rather should promote the fulfillment of equal educational rights for all students. Ethically, the development of civics (PPKn) materials in multimedia format must maintain objectivity, accuracy, and value independence to avoid political or ideological bias. Thus, the resulting multimedia teaching materials not only support effective learning but also contribute to the development of critical, inclusive, and socially responsible citizens.

Variable Structure and Implications



4. Conclusion

This research successfully developed multimedia teaching materials for PPKn learning through a Design-Based Research (DBR) approach involving an iterative process starting from problem identification, initial design, expert validation, limited implementation, and product revision. The results showed that the developed multimedia product has a very high level of validity in both material and media aspects, making it suitable for use as a primary or supporting learning resource. Field implementation proves that this teaching material is able to increase student engagement, strengthen understanding of citizenship concepts, and help teachers in delivering complex material more efficiently and interestingly. In addition, this research strengthens the relevance of multimedia learning theory and makes a real contribution to the practice of PPKn learning in schools. Thus, this research produces learning media innovations that are not only pedagogically and technologically high quality, but also relevant to the needs of 21st century learning.

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