

## DEVELOPMENT OF PBL-BASED INTERACTIVE CIVIC EDUCATION E-LEARNING VIA H5P BRANCHING SCENARIOS TO ENHANCE UNIVERSITY STUDENTS' NATIONAL VALUE COMPREHENSION

Khairani Djahara<sup>1</sup>, Eka Setia Novi<sup>2</sup>, Zahra Suci Maulilovia<sup>3</sup>

<sup>1,3</sup>Information Technology Education, <sup>2</sup>Business Law, Universitas Sains dan Teknologi Indonesia  
[khairanidjahara@usti.ac.id](mailto:khairanidjahara@usti.ac.id)

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### Abstrak

Penelitian ini mengembangkan media e-learning interaktif berbasis *Problem Based Learning* dengan memanfaatkan *H5P Branching Scenario* pada mata kuliah Pendidikan Kewarganegaraan. Media dikembangkan dalam platform *LMS Moodle* untuk meningkatkan pemahaman mahasiswa terhadap nilai-nilai kebangsaan melalui pendekatan kontekstual dan studi kasus. Materi mencakup Ideologi Pancasila, Demokrasi, dan Hak Asasi Manusia yang dikaitkan dengan dinamika Pemilu. Pembelajaran dikemas dalam narasi bercabang yang menempatkan mahasiswa pada situasi dilematik kebangsaan, seperti politik uang, golput, dan intimidasi Pemilu. Melalui alur ini, mahasiswa diarahkan untuk berpikir kritis, menganalisis konsekuensi setiap pilihan, serta membangun sikap kewarganegaraan yang bertanggung jawab. Evaluasi dilakukan melalui kuis interaktif dengan skenario bercabang menggunakan skor positif untuk jawaban tepat dan pengurangan skor untuk jawaban kurang tepat. Hasil kuis diinterpretasikan ke dalam kategori unggul, madya, dan pemula. Pengembangan media mengikuti model *ADDIE* meliputi tahapan analisis, perancangan, pengembangan, implementasi, dan evaluasi. Data dikumpulkan melalui analisis kebutuhan, *pre-test* dan *post-test*, angket kepuasan pengguna, serta validasi ahli materi dan media. Hasil penelitian menunjukkan media *e-learning* yang dikembangkan layak dan praktis digunakan serta mampu menciptakan pengalaman belajar Pendidikan Kewarganegaraan yang reflektif, kontekstual, dan mendukung penguatan pembelajaran kewarganegaraan berbasis digital di pendidikan tinggi.

**Kata Kunci:** *E-Learning* Interaktif; *H5P Branching Scenario*; Nilai-Nilai Kebangsaan; Pendidikan Kewarganegaraan (PKn); *Problem Based Learning*

### Abstract

*This research develops interactive e-learning media based on Problem Based Learning utilizing H5P Branching Scenario for Civic Education. The media was developed within Moodle LMS to enhance students' understanding of national values through contextual approaches and case studies. The materials cover Pancasila Ideology, Democracy, and Human Rights linked to electoral dynamics. Learning content is packaged in branching narratives that place students in dilemmatic national situations, such as money politics, voter abstention, and electoral intimidation. Through this flow, students are guided to think critically, analyze consequences of each choice, and develop responsible civic attitudes. Evaluation is conducted through interactive quizzes with branching scenarios, using positive scores for correct answers and score deductions for incorrect answers. Quiz results are interpreted into three categories: excellent, intermediate, and beginner. Media development follows the ADDIE model, encompassing analysis, design, development, implementation, and evaluation. Data were collected through needs analysis, learning tests, response questionnaires, and validation by subject matter and media experts. Findings indicate the developed e-learning media is feasible and practical, capable of creating reflective, contextual Civic Education learning experiences that support digital-based civic learning in higher education.*

**Keywords:** *Interactive E-Learning; H5P Branching Scenario; National Values; Civic Education; Problem Based Learning (PBL)*

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## INTRODUCTION

Grounded in the mandate of the Republic of Indonesia Law No. 12 of 2012 on Higher Education, Article 35(3) (Kusumawardani et al., 2024), Civic Education (Pendidikan Kewarganegaraan/PKn) is positioned as a compulsory course that underscores the importance of internalizing the values of Pancasila and the 1945 Constitution of the Republic of Indonesia (UUD 1945). Conceptually, PKn (Civic Education) is understood as a citizenship character education program oriented toward developing citizens who are both intellectually competent and morally grounded (“to be smart and good citizens”). From a legal standpoint, this status is affirmed by Law No. 20 of 2003 (Article 37), which requires Civic Education in curricula across all levels (primary, secondary, and higher education), and by Law No. 12 of 2012, which designates Citizenship Education as a compulsory university general course (MKWU) (Winarno, 2021). This policy direction aligns with the Asta Cita vision, which places the strengthening of Pancasila ideology, democracy, and human rights as the foundation for national character development.

Nevertheless, findings from a needs analysis (Khotimah et al., 2021) indicate that Civic Education (PKn) classroom instruction remains dominated by one-way lecturing with limited variation in instructional strategies. Reliance on conventional lecture-based approaches is associated with low levels of active participation, limited learning interest, and superficial understanding of national values among university students. At the same time, the acceleration of digital transformation, which was partly triggered by the COVID-19 pandemic, has driven educational institutions to adopt e-learning on a broad scale (Alhammad et al., 2025). Within the framework of the Fourth Industrial Revolution, e-learning functions not only as an alternative medium for content delivery (Daryanes et al., 2023) but also as a strategic means to strengthen 21st-century skills, such as information literacy, problem-solving, and critical thinking (Budiarto et al., 2024). These rapid dynamics require the education sector to adapt swiftly to leverage technology, both in learning processes and instructional media (Fauzi et al., 2025; Pangesti et al., 2025). Accordingly, educators play an increasingly important role in developing learners’ competencies to prepare them for the Society 5.0 era (Ichsan et al., 2023). Studies in the context of Civic Education further suggest that the use of e-learning yields tangible benefits, ranging from managerial efficiency and learning flexibility to improved effectiveness of the learning process (Muna et al., 2023; Widiyanto et al., 2023).

Within this framework, interactive teaching (Costa et al., 2023) occupies a pivotal position because it incorporates elements of active learning, in which learners are not merely recipients of information but are actively engaged in constructing knowledge. One relevant tool is H5P, an open-source interactive learning platform that enables educators to design, produce, share, and use interactive online content with ease. Its flagship feature, the Branching Scenario, allows educators to create learner-driven branching learning pathways, thereby enabling exploration of multiple learning routes that are more meaningful. This feature is particularly effective for simulations or scenario-based training that requires critical and rational decision-making (Tsauri, 2024).

In line with this, the use of a Learning Management System (LMS) in e-learning activities (Halimah et al., 2024) can encourage university students to learn independently, collaborate, and develop creative and critical thinking skills (Arimbawa et al., 2024) in planning, implementing, and evaluating learning activities. The web hosting infrastructure used to build and operate an LMS site also plays an important role by storing and securing all learning files and data, enabling access anytime and anywhere through a web browser. Accordingly, an e-learning system (Mahande, 2023) designed on an online hosting basis not only improves accessibility and cross-device availability but also ensures ease of maintenance and enables user scalability.

From a pedagogical perspective, the literature indicates that Problem-Based Learning (PBL) is effective in deepening conceptual understanding, fostering learner autonomy, and sharpening students' critical reasoning (Susiyanti et al., 2021). The essence of PBL lies in presenting meaningful, authentic problems as the starting point for inquiry and sustained investigation that culminates in evidence-based solutions (Fatirul, 2020). Several studies have even shown that implementing PBL in e-learning-based thematic learning (Dewi, 2020; Zaghur, 2023) can significantly improve students' academic achievement (Chamisijatin et al., 2022). In addition, the integration of interactive multimedia has been shown to increase the intensity of interaction and learner engagement, which ultimately contributes to stronger content understanding (Bariah et al., 2023). PBL is also consistently recognized as effective in developing critical thinking skills (Dermawan et al., 2023; Kartin et al., 2023). However, existing Civic Education (PKn) e-learning development to date still tends to be content-oriented (content-centric) and passive, and relatively few initiatives intentionally design learning media that integrates PBL principles into the learning experience (Astuti, 2021), which requires reflective decision-making. From a technological standpoint, although H5P has been widely used to develop interactive content, the application of its Branching Scenario feature, which places students in dilemmatic situations to reflect on national values, remains relatively limited, particularly in Civic Education (PKn) learning in Indonesia.

Building on these conditions, this study proposes a learning experience design that combines the strengths of PBL (Mustaqim et al., 2024; Sari et al., 2025) with interactive multimedia (Piyona et al., 2025) in the form of a non-linear and personalized H5P Branching Scenario, integrated with the Moodle LMS and hosted online. The proposed instructional scheme does not merely follow a linear sequence; rather, it facilitates branching pathways tailored to students' responses, thereby eliciting authentic reflection on values and the consequences of choices. This approach integrates technological, pedagogical, and affective dimensions (nationalism, diversity, and social concern) into an interactive narrative aimed at activating participation, deepening understanding, and contextualizing national values through an election (Pemilu) case study. Accordingly, this study not only responds to the challenges of educational digitalization but also aligns with the *Asta Cita* mission to strengthen national character and contributes to the achievement of the global SDG 4 target on quality education through branching scenario-based learning innovation.

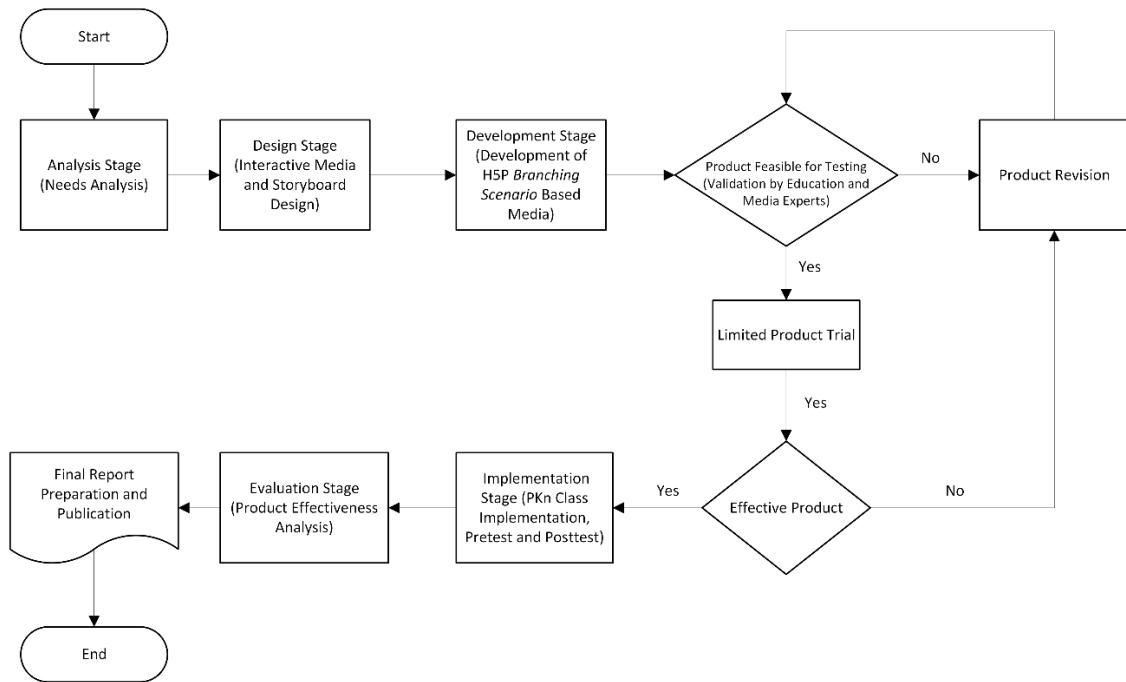
Based on this, the present study formulates the main research problem as follows: how can interactive e-learning be developed by integrating an H5P Branching Scenario design with a Problem Based Learning (PBL) approach in the Civic Education (Pendidikan Kewarganegaraan, PKn) course in order to improve students' understanding of national values? The study aims to design, validate, and examine the feasibility of implementing interactive e-learning that is integrated with the Moodle LMS and hosted online, as well as to assess user responses and the potential for improving the quality of Civic Education learning so that it becomes more active, reflective, and contextual.

## **METHOD**

This study employed a Research and Development (R&D) approach, utilizing the ADDIE model, which comprises five stages: Analysis, Design, Development, Implementation, and Evaluation. The model was adapted to suit the context of e-learning based on PBL, using H5P within the Moodle LMS. The research procedure is presented in Figure 1.

The first stage is analysis (needs analysis). This analysis was conducted to identify the learning needs of students and lecturers in the context of the Civic Education (PKn) course. Activities in this stage included curriculum analysis and the course learning outcomes and sub learning outcomes for the PKn course; analysis of Generation Z student characteristics, including digital learning

preferences and engagement in PBL; analysis of learning materials (Pancasila Ideology, Democracy, Human Rights, and National Values); and analysis of learning technology (the Moodle LMS and the H5P Branching Scenario plugin). The outputs of this stage were specifications for interactive media needs and learning achievement indicators.



**Figure 1. Research Procedure Flow**

The second stage is design (interactive media and storyboard design). At this stage, the initial design of the e-learning media was developed, including the development of a PBL based branching scenario flow that presents a national values dilemma through an election case study; the design of the interface, navigation, and media interactivity in Moodle; and the preparation of research instruments, including an expert validation sheet for subject matter experts and media experts, pretest and posttest items, and a student satisfaction questionnaire. The outputs of this stage were the storyboard and the initial prototype design of the e-learning media.

The third stage is development (media development and product validation). At this stage, the prototype was developed into an interactive media product using the H5P Branching Scenario in Moodle, followed by validity testing through subject matter expert validation and media expert validation. Subject matter expert validation was conducted by a Civic Education (PKn) lecturer, with assessed aspects including content relevance, depth and breadth of coverage, accuracy and currency, language clarity and comprehensibility, and suitability for learning. Media expert validation was conducted by an educational technology specialist, with assessed aspects including interface and navigation design, interactivity, media quality, accessibility and technical performance, and alignment with the PBL approach. The score interpretation criteria are presented in Table 1.

**Table 1. Score Interpretation Criteria**

No.	Achievement Level	Remarks (Validity)	Remarks (Satisfaction Questionnaire)
1	81 to 100%	Very Valid	Very Good
2	61 to 80%	Valid	Good
3	41 to 60%	Fairly Valid	Fairly Good
4	21 to 40%	Less Valid	Less Good
5	0 to 20%	Not Valid	Not Good

If the validation results fall into the “Fairly Valid” or “Less Valid” category, the product is revised based on feedback from the validators. Once the product is deemed feasible for testing, a limited trial is conducted with a small group of students (10 to 20 participants) to examine ease of navigation and interactivity, clarity of instructions and content, and the relevance of the PBL content and scenarios. Findings from the limited trial serve as the basis for revising the product prior to implementation at a larger scale.

The fourth stage is implementation in the Civic Education (PKn), Fundamental IT, and Information and Communication Technology Based Learning courses, with approximately 65 student participants. This implementation was conducted as a limited trial to examine the effectiveness and practicality of the media in an authentic learning context. The procedures included a pretest to measure students’ initial understanding of national values; learning activities using interactive e-learning based on the H5P Branching Scenario that presented dilemmas; an interactive reflective quiz using the H5P Branching Scenario; a posttest to measure improvement in understanding after the learning activities; and a satisfaction questionnaire to assess students’ learning experiences with the media.

The fifth stage is evaluation (product effectiveness analysis). Evaluation was conducted to measure the effectiveness and practicality of the media. Effectiveness was assessed by comparing pretest and posttest results, which were analyzed using the Normalized Gain (N Gain) formula (Hake, 1998). Practicality was measured through a student satisfaction questionnaire using the UEQ (User Experience Questionnaire) scale, with assessment indicators including usability and ease of use, clarity of branching and feedback, content quality and PBL alignment, engagement and motivation, accessibility and technical aspects, assessment and score transparency, overall satisfaction and recommendations, and open ended questions.

The product success criteria were determined based on validity scores obtained from media experts and subject matter expert assessments, as well as practicality results derived from the student satisfaction questionnaire. The research participants were 76 students from the Universitas Sains dan Teknologi Indonesia who participated in the small-group limited trial and the limited classroom trial.

## RESULT

The product developed in this study is an interactive learning medium that integrates text, images, videos, interactive videos, quizzes, and image hotspots within a branching scenario. Students are guided to experience a Problem-Based Learning (PBL) decision-making process through dilemmatic national values scenarios, such as vote buying, abstention from voting, and human rights issues. The media is designed to promote critical reflection, ethical decision-making, and a deeper understanding of the values of Pancasila, democracy, and human rights.

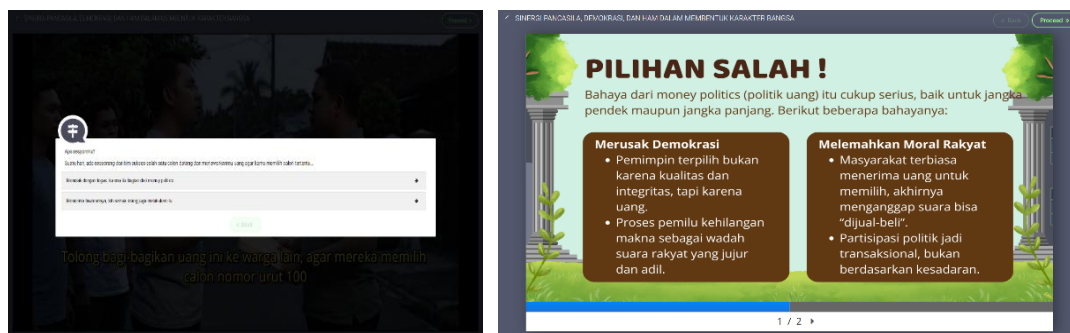
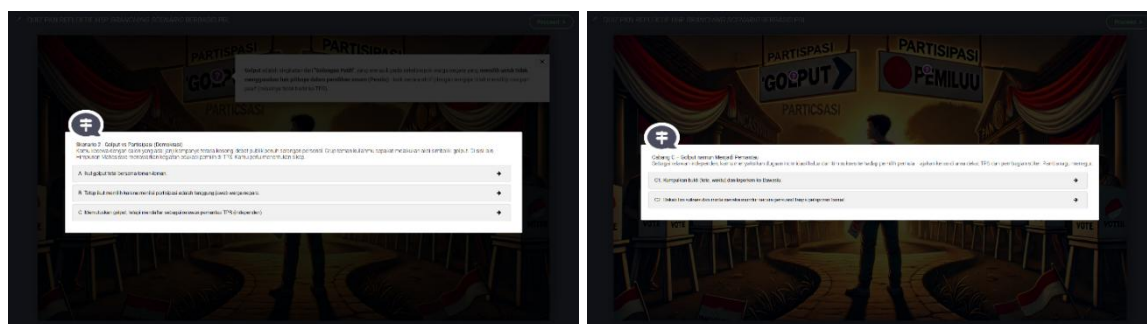


Figure 2. Branching Scenario for the Learning Materials and Feedback on the Vote Buying Topic

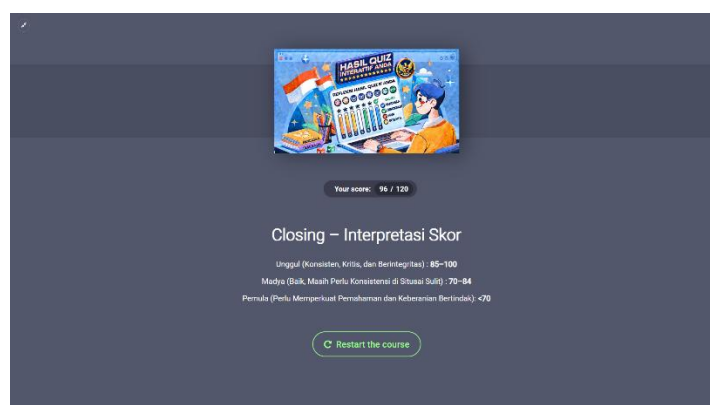
The structure and interface of the media consist of two learning components, namely learning materials on the synergy of Pancasila, democracy, and human rights using a general election case study, and an interactive reflective quiz. In the learning materials component, the media structure and interface generally include an opening page, a learning video, a branching scenario (Figure 2, left), and feedback delivered through the course presentation feature (Figure 2, right), as well as feedback using video and image features.

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**Figure 3. Branching Scenario Quiz and Response Outcomes Leading to Further Branching Scenarios**

The quiz scoring system assigns positive points for correct answers and negative points for incorrect answers. This mechanism allows students to explore multiple answer options because subsequent scenarios can only be unlocked when the correct answer is selected. As a result, students are still guided toward accurate understanding even if their scores decrease due to attempts with incorrect answers. Quiz results are interpreted into three categories: excellent (85 to 100), indicating students are consistent, critical, and demonstrate integrity; intermediate (80 to 84), indicating good understanding but a need for greater consistency in challenging situations; and beginner (below 70), indicating the need to strengthen understanding and the courage to take action, as shown in Figure 4.



**Figure 4. Interpretation of Quiz Score Results**

In Figure 4, the quiz score is 96 out of 120, which means that 96 divided by 120 and multiplied by 100 yields 80. A score of 80 falls into the intermediate category, indicating good understanding but a need for greater consistency in challenging situations. This score interpretation is intended to help students reflect on the national values they embody.

**Table 2. Analysis of Subject Matter Expert Validation Results**

No.	Assessed Aspects	Mean Score (1 to 5)	Percentage (%)	Category
1	Content Relevance	4.80	96%	Very Valid
2	Depth and Breadth of Content	4.67	93%	Very Valid
3	Accuracy and Currency	4.33	87%	Very Valid
4	Language Clarity and Comprehensibility	5.00	100%	Very Valid
5	Suitability for Learning	4.50	90%	Very Valid
<b>Overall Mean</b>		4.66	<b>93%</b>	<b>Very Valid</b>

The overall subject matter validity in Table 2 is 93 percent, which falls into the very valid category. The subject matter expert suggested adding the most recent laws and regulations to ensure the content is more up to date, and incorporating discussion of the Criminal Code (KUHP) to enrich the context of legal values and justice.

**Table 3. Analysis of Media Expert Validation Results**

No.	Assessed Aspects	Mean Score (1 to 5)	Percentage (%)	Category
1	Interface and Navigation Design	4.75	95%	Very Valid
2	Interactivity	4.00	80%	Valid
3	Media Quality	5.00	100%	Very Valid
4	Accessibility and Technical Aspects	4.75	95%	Very Valid
5	Alignment with PBL	5.00	100%	Very Valid
<b>Overall Mean</b>		4.7	<b>94%</b>	<b>Very Valid</b>

The overall media validity in Table 3 is 94 percent, which falls into the very valid category. This indicates that the product meets the standards for instructional design and visual aesthetics within a Problem Based Learning approach. The validator recommended standardizing the font type and size across all pages, adjusting image proportions to ensure precise and comfortable display across different devices, and reviewing the navigation button functions and branching flow in the H5P Branching Scenario. The product was revised in accordance with these recommendations prior to the limited trial.

Effectiveness testing was conducted twice, namely a pretest prior to using the media and a posttest after learning with the H5P media in the Moodle LMS. The comparison of pretest and posttest scores is presented in Table 4.

**Table 4. Descriptive Analysis Results of Pretest and Posttest Scores**

No.	Statistics	Pretest	Posttest
1	N	76	76
2	Mean	86.67	91.32
3	Standard Deviation	12.79	10.39
4	Median	93.33	93.33
5	Mode	93.33	100
6	Minimum	46.67	60
7	Maximum	100	100

Table 4 presents the descriptive analysis of students' pretest and posttest scores. The results show that the mean pretest score was 86.67 (Standard Deviation = 12.79), with a median of 93.33, a minimum score of 46.67, and a maximum score of 100. Meanwhile, the mean posttest score was 91.32 (Standard Deviation = 10.39), with a median of 93.33, a minimum score of 60, and a maximum score of 100. The mean increase of 4.65 indicates an improvement in students' understanding after using the H5P Branching Scenario-based e-learning media.

The effectiveness of the H5P Branching Scenario-based e-learning media was analyzed using the Normalized Gain (N-Gain) formula by comparing pretest and posttest scores (Hake, 1998). Based on the analysis of 76 participants, the N-Gain value was 0.35, which falls into the moderate

category ( $0.30 \leq g < 0.70$ ). This indicates that the developed e-learning media is sufficiently effective in improving students' understanding of national values in the Civic Education course.

In addition to the objective items in the pretest and posttest, three essay questions were used to assess students' reflective abilities and moral attitudes toward national issues. A qualitative analysis was conducted on students' responses before and after using the media, and an overall comparison is presented in Table 5.

**Table 5. Summary of General Comparison**

No.	Dimension	Pretest	Posttest
1	Cognitive	Descriptive and normative responses	Analytical and reasoned responses
2	Affective	Tended to be emotional (for example, "because it is important"; "not participating")	Rational and reflective
3	Pancasila Values	Rarely stated explicitly	Integrated into arguments
4	Civic Action	Passive	Active and solution oriented

Based on Table 5, the qualitative analysis of the essay responses indicates a transformation in students' civic thinking after participating in PBL based interactive learning using the H5P Branching Scenario. Students not only understand the concept of democracy and the values of Pancasila, but also demonstrate the ability to reason and make ethical decisions in the context of socio-political dilemmas.

Based on the evaluation of the interactive reflective quiz, the mean score was 98.47, with a highest score of 100 and a lowest score of 89.09. Most students achieved perfect scores, indicating that they were able to understand and apply national values appropriately through problem based learning scenarios. From a pedagogical perspective, the H5P Branching Scenario interactive reflective quiz provides immediate feedback, enabling students to independently improve their understanding. The Problem Based Learning (PBL) approach encourages students to think critically and reflectively when facing moral dilemmas related to national issues.

**Table 6. Quantitative Analysis of User Satisfaction Questionnaire**

No.	Assessed Aspects	Mean Score (1 to 5)	Percentage (%)	Category
1	Usefulness and Ease of Use ( <i>Usability</i> )	3.76	75.33	Good
2	Clarity of Branching and Feedback	3.74	74.87	Good
3	Content Quality and PBL	3.84	76.78	Good
4	Engagement and Motivation	3.81	76.12	Good
5	Accessibility and Technical Aspects	3.91	78.29	Good
6	Assessment and Score Transparency	3.46	69.30	Good
7	Overall Satisfaction and Recommendations	4.06	81.18	Very Good
<b>Overall Mean</b>		<b>3.80</b>	<b>75.98%</b>	<b>Good</b>

Based on Table 6, the overall mean score on the user satisfaction questionnaire was 3.80, or 75.98 percent, which falls into the good category, indicating that the e-learning media was perceived positively and as effective by students. The highest scoring aspect was item 7, Overall Satisfaction and Recommendations, with a mean of 4.06, or 81.18 percent, suggesting that students were satisfied and willing to use the media again. The lowest scoring aspect was item 6, Assessment and Score Transparency, with a mean of 3.46, or 69.30 percent, which was attributed to some difficulties in viewing quiz scores or results directly in the system.

Based on the analysis of the essay responses in the user satisfaction questionnaire, students provided positive feedback on the developed learning media. Most students stated that the content and interactive scenario flow were the most helpful elements for understanding because they

presented real-world situations that encouraged reflection on national values. The overall conclusions from the essay analysis are presented in Table 7.

**Table 7. Overall Conclusions from the Essay Analysis of the Satisfaction Questionnaire**

No	Dominant Aspect	Key Findings	Learning Implications
1.	Media Strengths	The content and scenario flow supported contextual understanding of national values.	The media was effective in integrating PBL and national values in a visual dan reflective manner.
2.	Aspects to Improve	Access issues, bugs, and AI voice features that require further refinement.	Improvements are needed in usability and user experience.
3.	Development Suggestions	Add more realistic voice features, slide guidance, and a USTI themed interface.	Further development toward immersive learning aligned with the university identity.

Based on Table 7, most respondents identified interactive visual content as the main factor that enhanced understanding, because context-based presentation and visualization of national values made Civic Education content feel relevant and easier to understand. This suggests that the media successfully supported the core PBL principle of learning by experiencing. Technical aspects were the primary focus for improvement, particularly network stability, the AI display, and navigation. In general, students were satisfied with the content and scenario flow, but they expected stronger technical stability and smoother, more realistic multimedia presentation. This highlights the need to improve usability and user experience (UX) to optimize interaction. Meanwhile, many development suggestions focused on adding more realistic voice features, providing slide-by-slide guidance, and adjusting interface colors to reflect the university identity. Most suggestions emphasized enhancing immersion, meaning an audiovisual learning experience that feels more authentic. Students wanted the media to feel more engaging through natural voice, clear visual guidance, and an institutional design. This indicates strong emotional engagement with the media, which is an important indicator of success in an interactive PBL approach. Overall, the essay findings show that students were actively and critically engaged, and they perceived the media as effective, engaging, and worthy of further development.

## DISCUSSION

This section discusses the findings from the development of interactive Civic Education (PKn) e-learning based on Problem-Based Learning (PBL) using the H5P Branching Scenario approach within the Moodle LMS, and relates them to relevant theories and similar studies. The discussion focuses on feasibility (expert validity), effectiveness (changes in cognitive outcomes and the quality of civic reasoning), practicality, and user experience (UX), as well as implications and future development directions. Overall, the results indicate that the media is feasible based on expert validation, produces meaningful improvements in learning outcomes (although moderate for some indicators), and receives positive evaluations from users with several areas for refinement. This pattern is consistent with the literature on integrating e-learning, PBL, and interactive multimedia, including studies that use H5P within the Moodle ecosystem (Bariah et al., 2023; Widiyanto and Istiqomah, 2023).

From the feasibility perspective, assessments by the subject matter and media experts indicate that the content design, instructional flow, and technical quality of the media have met the prerequisites for field implementation. This achievement can be interpreted as the result of fulfilling key principles of problem-based instructional design, including contextual authenticity, goal alignment, scaffolding, and feedback, combined with the technological affordances of H5P such as interactive video, branching quizzes, and image hotspots that promote multimodal engagement.

Similar trends have been reported in studies developing interactive multimedia for Information Technology content, for example Data Flow Diagrams, which demonstrated valid and practical quality after expert validation and limited trials (Costa et al., 2023). In vocational and secondary school contexts, Moodle and H5P based interactive multimedia has also been reported to be effective in delivering content and fostering richer learning interaction (Bariah et al., 2023; Widiyanto and Istiqomah, 2023). The fact that the product in this study achieved a feasible rating is therefore consistent with this broader evidence. When instructional design principles are maintained and technology is selected according to pedagogical function, product quality tends to meet standards of validity and practicality.

Learning effectiveness is reflected in the increase in mean pretest to posttest scores as well as in the shift in the quality of essay responses from descriptive and normative statements to reflective and argumentative reasoning that references Pancasila values and concrete civic actions, such as fact checking, documentation, and reporting. The relatively modest quantitative gains across individual items are a common phenomenon in development research when evaluation items are isomorphic but vary in difficulty level and discrimination power. The literature suggests that PBL tools packaged in an interactive format, such as branching narratives, can promote conceptual understanding and problem-solving skills, although the effects may vary across indicators depending on the balance of cognitive load, the clarity of scaffolding, and the relevance of the context (Sari et al., 2025; Dewi and Parwati, 2020; Astuti, 2021). In STEM domains, multimedia assisted PBL, using tools such as iSpring, Google Sheets, and Articulate Storyline, has also been shown to improve learning outcomes and 21st century competencies, particularly when learning tasks integrate authentic contexts, varied modalities, and immediate feedback (Piyona et al., 2025; Pangesti et al., 2025; Daryanes et al., 2023; Budiarto et al., 2024). Therefore, the observed gains in this study, both cognitively in test scores and affectively and ethically in essay arguments, are consistent with cross domain empirical evidence.

The practicality and user experience findings in this study, such as students' appreciation of the visuals and branching flow, as well as feedback regarding technical stability, typographic consistency, instructional clarity, and the need for more natural audio narration, reflect the fact that user experience quality is a key lever for long term effectiveness. The literature emphasizes that LMS adoption and acceptance, including perceived ease of use and perceived usefulness, are associated with self regulated learning, which in turn influences persistence and learning outcomes (Halimah et al., 2024; Mahande, 2023). This means that refining seemingly minor UX elements, such as icons, navigation affordances, responsive design, and consistency of brand identity, may improve system acceptance and student learning autonomy. In a broader context, integrating e-learning in primary to secondary education requires attention to user readiness among educators and students, infrastructure readiness, and content relevance, which are also mapped in studies of e-learning integration in primary education contexts in Saudi Arabia (Alhammad and Alonizi, 2025). In other words, technical success and user experience at the micro level are closely connected to ecosystem factors at the meso and macro levels.

The limitations of the study should be noted to interpret the findings proportionally. First, the moderate quantitative gains on some indicators suggest the need to recalibrate item difficulty and discrimination so that the measurement becomes more sensitive to progress among students with high initial ability (Astuti, 2021; Fatirul, 2020). Second, although the branching narrative stimulated civic reasoning, regular updates of legal references and current civic issues, such as digital ethics, misinformation, and electoral practices, are still necessary to maintain contextual relevance (Kusumawardani et al., 2024; Winarno, 2021). Third, several user experience related comments indicate the need for technical fine tuning, particularly typographic consistency, clarity of slide-level

instructions, audio quality, and cross-device performance. Improvements in these areas may strengthen user satisfaction and learning impact. Fourth, the sample size and contextual scope could be expanded in future studies to enhance the generalizability of the findings. Future work may also incorporate learning analytics, such as branching traces, time per node, and patterns of dead ends versus expert paths, as a basis for design decisions and iterative refinement, as suggested by development studies that use usage data to calibrate learning activities (Budiarto et al., 2024).

The practical implications can be summarized as follows. First, branch complexity should be balanced with students' readiness so that cognitive load remains proportional. Second, adaptive feedback should be enriched so that it not only corrects responses but also guides students through links to relevant legal articles or regulations, comparative case examples, and follow up reflective questions. Third, improving assessment transparency is important by providing a summary of decision paths, score rationales, and improvement recommendations to strengthen self-regulated learning (Halimah et al., 2024). Other aspects that require attention include consistency of visual and audio design and cross-device technical stability. Finally, classroom activity orchestration should combine isomorphic objective tests with reflective essays or civic action tasks, such as mini advocacy projects or reporting simulations, so that cognitive outcomes move toward concrete civic action.

Future development directions may include expanding trials across different study programs and cohorts, as well as strengthening learning analytics to identify branching nodes that are prone to failure and to map expert paths as best practices. In addition, future work should consider adjusting the granularity of feedback based on individual performance profiles, integrating structured civic action tasks to strengthen transfer to real-world contexts, and improving instructor support through micro training on branching scenario design, media selection, and fair and transparent assessment practices. In a broader framework, these findings align with the literature that positions PBL and multimedia as key drivers of 21st-century competencies, digital literacy, and learning engagement across educational levels (Budiarto et al., 2024; Chamisijatin et al., 2022; Muna et al., 2023).

## CONCLUSION

The study entitled "Development of PBL-Based Interactive Civic Education E-Learning via H5P Branching Scenarios to Enhance University Students' National Value Comprehension" successfully achieved its objective by designing, validating, and testing a learning media product that is feasible, effective, and practical in the context of Civic Education instruction. Expert validation results indicate that the product demonstrates a very high level of feasibility in both content and media aspects, with an overall mean of 93.5 percent. The effectiveness test results show an improvement in students' cognitive achievement from pretest to posttest, accompanied by a shift in thinking patterns from descriptive responses to reflective and argumentative reasoning that links civic actions to Pancasila values. In terms of practicality, user satisfaction was in the good category at 75.98 percent, with several suggestions for improvement related to interface consistency, clarity of instructions, assessment transparency, video quality, and cross-device stability. These findings confirm the hypothesis that implementing a PBL model combined with branching scenario technology within the Moodle LMS can facilitate Civic Education learning that is more contextual, interactive, and supportive of civic reasoning and civic action. For further development, it is recommended to refine instrument difficulty and discrimination so that learning outcome measurement becomes more sensitive, enhance adaptive feedback, update legal references and civic issues, and apply learning analytics to map decision patterns and improve user experience quality. Overall, the combination of the ADDIE approach, PBL, and interactivity through the H5P Branching

Scenario has proven effective in building a reflective, contextual, and ethical Civic Education learning experience, with the potential to strengthen democratic literacy and civic competencies relevant to current educational needs.

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