

INTERACTIVE MULTIMEDIA BASED ON ACEH'S NATURAL RESOURCE LITERACY AND STUDENT'S PATRIOTISM IN GEOGRAPHY LEARNING

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ABSTRACT

Patriotism is an important component of character education that can be strengthened through contextual geography learning. Integrating local natural resource literacy into interactive multimedia offers opportunities to connect students' understanding of their local environment with national identity and civic responsibility. This study aimed to examine the relationship between interactive multimedia based on Aceh's natural resource literacy and students' patriotism in geography learning. A mixed-methods approach with a convergent parallel design was employed, combining a Systematic Literature Review (SLR) of studies published between 2016 and 2025 and an empirical quasi-experimental case study involving 63 senior high school students in Aceh Province. The SLR identified major themes related to local wisdom integration, environmental awareness, character education, and nationalism in multimedia-based learning. The empirical study compared an experimental group using locally developed interactive multimedia with a control group receiving conventional instruction. Data were collected through a patriotism scale covering cognitive, affective, and behavioral dimensions. The findings showed that students in the experimental group achieved a higher posttest mean score (86.97) than those in the control group (77.23), with a large effect size (Cohen's $d = 1.18$). The results also indicated improvements in students' understanding of natural resource management, emotional attachment to their homeland, and engagement in pro-environmental and civic behaviors. Overall, the integration of Aceh's natural resource literacy into interactive multimedia supports patriotism development, character education, and meaningful geography learning.

Keywords: *environmental education; geography learning; interactive multimedia; local wisdom*



INTRODUCTION

Education plays a significant role in building national character and fostering a love for the homeland among the younger generation (Chankseliani et al., 2021; Cholifah & Faelasup, 2024). Schools function not only as places for knowledge transfer but also as spaces for the formation of values and national identity (Rahmansyah, 2021). Through the learning process, students are guided to develop pride in their nation, respect cultural diversity, and behave in accordance with national noble values. Character strengthening has become a primary priority within the national education system, as reflected in various government policies, including the Profile of Pancasila Students (Risdiyana & Dewi, 2021). This concept emphasizes the development of students who are critical thinkers, collaborative, and culturally rooted in Indonesian traditions (Syahputra & Maida, 2021).

Patriotism, as a core character value, serves as a foundation for fostering national awareness and social responsibility among students. This value reflects loyalty, pride, and commitment to the nation, which must be instilled from an early age through educational activities (Irhasy & Habibah,

2024). Learning oriented toward patriotic character is expected to produce a generation that is intellectually capable while demonstrating loyalty and responsibility toward the nation's progress (Althafullayya, 2024). Patriotism can be integrated across various subjects, particularly in areas directly related to spatial and societal contexts, such as geography.

Geography education has great potential to nurture a sense of nationalism as it relates to Indonesia's territory, natural resources, and social life (Nurkhalisa et al., 2023). By introducing students to the natural conditions and regional potentials, they can understand their region's contribution to national development. This awareness can foster the understanding that preserving the environment and utilizing resources wisely is a concrete expression of love for the homeland. The deeper students' understanding of geographic characteristics and regional richness, the stronger their sense of belonging, pride, and responsibility toward the nation (Respatiadi et al., 2021).

Changes in learning patterns in the digital era urge teachers to adapt in creating engaging and meaningful



learning experiences (Bahri, 2021). Educational technology provides significant opportunities to enhance the effectiveness of learning through interactive and contextual media (Rejeki, 2023). One rapidly developing medium is interactive multimedia, which combines text, images, video, and audio to deliver a more vivid learning experience. When designed according to cognitive design principles, multimedia can help students process information more effectively (Saputra & Chaedoni, 2022).

Various studies have shown that interactive multimedia positively influences student engagement and learning attitudes. Syarif et al. (2023) found that interactive multimedia applications on environmental pollution materials effectively increased students' understanding of environmental issues and their involvement in the learning process. Similarly, Kartini et al. (2025) demonstrated that animation-based learning media integrating local wisdom strengthened character values such as responsibility, cooperation, and pride in local culture.

Although interactive multimedia has been widely studied in educational settings, previous research has primarily

focused on improving cognitive achievement, learning motivation, and student engagement. Studies examining the contribution of interactive multimedia to patriotism development remain limited, particularly in geography education. Existing research has also tended to investigate local wisdom, environmental literacy, and character education as separate constructs, with little attention given to how local natural resource literacy can be integrated into multimedia learning to strengthen students' patriotism. As a result, the relationship between local natural resource literacy, interactive multimedia, and patriotism remains insufficiently understood.

This issue is important because patriotism among younger generations is increasingly challenged by globalization, digital culture, and declining attachment to local identities. Geography education provides a strategic context for addressing this challenge because it connects students with their environmental, cultural, and territorial realities. However, empirical evidence regarding how multimedia-based geography learning can foster patriotism through local natural resource literacy is still scarce. Therefore, further



investigation is needed to clarify the educational value of integrating local resource literacy into interactive multimedia for character development.

Local natural resource literacy refers to the ability to recognize, understand, and appreciate the natural potential of one's surroundings as part of national life (Rohmawati & Gunansyah, 2021). This literacy promotes ecological awareness, environmental responsibility, and a stronger sense of regional and national identity (Huoponen, 2023; Tian et al., 2024; Taufiqurrahman et al., 2024). Aceh provides a relevant object for implementing such literacy because of its rich marine, agricultural, and energy resources, which can be integrated into geography learning materials

Aceh has significant potential as a model for implementing learning based on local natural resource literacy. The region is rich in marine products, agriculture, and energy resources, which can be integrated into geography learning materials (Habibullah & Rizal, 2024). Developing interactive multimedia that showcases regional potential can help students understand the strategic value of their area in national development. In addition to enhancing conceptual understanding, this approach fosters

pride and nationalism rooted in awareness of regional natural and cultural wealth.

The novelty of this study lies in its integration of three dimensions that are rarely examined together: interactive multimedia, local natural resource literacy, and students' patriotism in geography learning. In addition, this study combines evidence from a Systematic Literature Review (SLR) with empirical findings from a quasi-experimental case study in Aceh, providing both a broader research synthesis and contextual evidence regarding the role of local resource-based multimedia in strengthening patriotic values.

Therefore, this study aims to examine the role of interactive multimedia based on local natural resource literacy in fostering students' patriotism in geography learning. To achieve this objective, the study employs a mixed-methods approach that combines a Systematic Literature Review (SLR) of studies published between 2016 and 2025 with an empirical quasi-experimental case study conducted in Aceh Province. This approach enables a comprehensive understanding of both the broader research trends and the



practical impact of local resource-based multimedia on students' patriotic attitudes.

MATERIALS AND METHODS

1. Research Design

This study employs a mixed design that combines a Systematic Literature Review (SLR) with supporting quantitative case studies. This approach was chosen to present both a theoretical overview and global findings, supported by empirical evidence from local phenomena in Aceh, Indonesia.

The SLR was conducted to systematically examine studies investigating the influence of interactive multimedia and local resource literacy on patriotism, character education, and environmental awareness. Subsequently, the SLR findings were supplemented with empirical data from an experimental study in Aceh that tested the effect of multimedia-based learning on natural resource literacy on students' patriotism in geography learning.

2. Systematic Literature Review (SLR) Procedure

The literature review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)

guidelines. The SLR process consisted of four main stages, which included:

a. Identification

The databases used were Scopus, ScienceDirect, SpringerLink, Taylor & Francis Online, and Google Scholar. Keywords (with Boolean combinations) included "interactive multimedia," "digital learning," "multimedia learning," "patriotism," and "environmental literacy."

The publication range reviewed covered the years 2016 to 2025, and the types of documents included were peer-reviewed scientific journal articles in English and Indonesian.

b. Screening

From an initial pool of approximately 78 articles, a selection was made based on titles and abstracts. Duplicate articles as well as non-empirical writings were excluded from the list.

c. Eligibility

An article was considered eligible if it met the following criteria:

- 1) Investigated the influence of multimedia or digital media on patriotism, character, or environmental literacy.



2) Used formal education settings (Elementary School–Higher Education).

3) Contained empirical quantitative or qualitative data that could be synthesized.

After this selection process, 10 articles met the inclusion criteria and were further analyzed.

d. Data Extraction and Synthesis

Extracted data included author names, year, location, method, sample size, type of media, main findings, and relevance to the research topic.

Analysis was conducted using Braun & Clarke’s (2019) thematic synthesis to identify common themes such as the integration of local content, reinforcement of national values, and behavioral impact (Braun & Clarke, 2019). Quantitative data (e.g., effect size or gain score) were summarized descriptively when available.

The complete process for selecting and screening articles for this systematic review is shown in **Figure 1** (PRISMA Diagram).

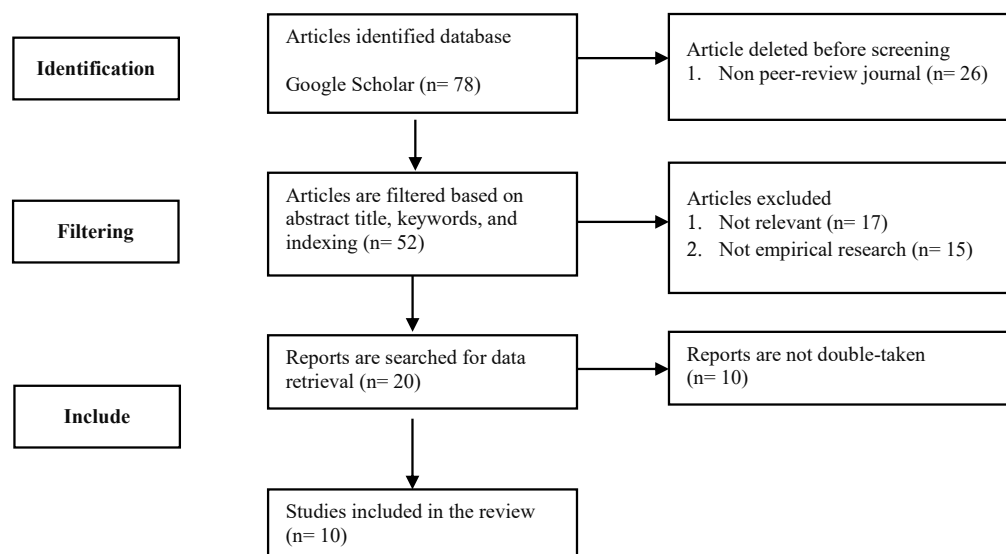


Figure 1. PRISMA diagram

Source: Adapted from PRISMA 2020 and developed by the authors.

3. Supporting Empirical Case Study

As a complement to the SLR findings, this study includes an empirical case study derived from a quasi-experimental study conducted in Aceh Province. The

study aimed to examine the effect of interactive multimedia-based local natural resource literacy on students’ patriotism in geography learning.

- a. The study employed a pretest–posttest control-group design with two treatment groups: the experimental and control groups. This design allows comparison between conditions before and after the intervention and distinguishes the effect of interactive multimedia learning from that of conventional learning.
- b. The sample consisted of 31 students in the experimental group and 32 students in the control group, with ages ranging from 16 to 17 years. Both groups had relatively similar academic backgrounds and were taught by the same geography teacher to ensure comparable instructional time, learning objectives, and classroom conditions throughout the study.
- c. The instrument used was a 25-item patriotism scale consisting of three dimensions: cognitive, affective, and behavioral. The cognitive dimension measured students' understanding of national identity, natural resource management, and the contribution of local resources to national development. The affective dimension assessed

feelings of pride, attachment, and appreciation toward the homeland and local heritage. The behavioral dimension evaluated students' willingness to participate in environmental conservation, support local products, and engage in civic activities reflecting patriotic values. All items were rated using a five-point Likert scale ranging from strongly disagree to strongly agree. Reliability testing yielded a Cronbach's Alpha value of 0.86, indicating high internal consistency.

- d. Data were analyzed using an independent-samples t-test to determine differences in scores between the experimental and control groups. Additionally, the effect size was calculated using Cohen's d to assess the magnitude of the intervention's impact on students' patriotism.

4. Data Integration and Analysis

The integration of results was conducted using a convergent parallel approach (Creswell & Clark, 2018). In this approach, the findings from the SLR and the empirical case study were analyzed



simultaneously (side-by-side) to identify points of convergence, divergence, and mutual reinforcement. Integration was carried out during the discussion stage, positioning empirical data as confirmatory evidence of trends observed in previous research.

5. Ethical Considerations

All secondary data in the SLR were obtained from publicly available scientific publications. The empirical data used were derived from previous studies that did not contain personal information and had undergone anonymization. This study adhered to educational research ethics, including the

protection of confidentiality, authenticity of data, and academic integrity.

RESULTS AND DISCUSSION

1. Results of the SLR Analysis

The SLR analysis was conducted on ten articles discussing the application of interactive multimedia in geography and environmental learning. Each article was analyzed according to the research method, the focus of study, and the findings related to the reinforcement of character values and nationalism. The literature search was conducted across national and international journals published between 2016 and 2025. The results of the review are presented in **Table 1** below.

Table 1. Results of the SLR Analysis

Title and Author	Method	Main Finding
Interactive Multimedia Inquiry Based on Local Wisdom: Alternative Media to Improve Students' Environmental Care Attitude (Ramdani et al., 2022)	4D model R&D development research	Interactive multimedia based on local wisdom can enhance environmental awareness and a sense of responsibility toward nature. This media also motivates students to apply environmentally friendly behaviors in their daily lives. Teachers reported that the media was easy to use and effective in integrating cultural values with environmental education.
Audiovisual Learning Media Based on Local Wisdom Values of the Baduy Tribe Community to Grow Student Character (Yulianto et al., 2023)	Design and development research	Audiovisual media highlighting the values of the Baduy community have proven effective in instilling moral values, simplicity, and respect for nature. Learning becomes more meaningful because students can understand the connection between local culture and environmental conservation.
The Feasibility of Interactive Multimedia Development in Children's Story of Character Education Based (Anggraeni et al., 2019)	Multimedia development and feasibility testing	Child-centered story-based multimedia was considered appropriate in terms of content and presentation. Stories containing character values such as responsibility and social care help children understand moral concepts contextually. The integration of local elements makes the material more relatable to students' experiences.
History Education to	Qualitative case	The use of interactive digital media in history



Title and Author	Method	Main Finding
Encourage Nationalism Interest Towards Young People Amidst Globalization (Surya & Fikriya, 2021)	study	learning can foster a sense of nationalism among adolescents. Students develop greater pride in their national identity and can relate local history to the role of the younger generation in maintaining national unity.
Optimizing Local Wisdom-Based Learning through Digital Media (Fadhilah et al., 2025)	Narrative literature review	This study emphasizes the urgency of digitizing local wisdom as a strategy to strengthen students' character. The use of digital media allows cultural values to be conveyed in an engaging, relevant, and contemporary manner without diminishing their traditional meaning.
Pengembangan Media Video Animasi Pembelajaran Berbasis Powtoon Pada Mata Pelajaran Geografi Materi Mitigasi Bencana Alam (Hidayat et al., 2023)	Development research (ADDIE model)	Learning animations incorporating local wisdom was considered valid and practical for use in geography classes. These animations help students understand the relationship between environmental phenomena and local culture, while also fostering a sense of responsibility for the preservation of their region's natural resources.
Virtual Animated Media with Local Wisdom for Learning (Samsiyah et al., 2024)	Borg and Gall model R&D and effectiveness testing	The use of virtual animations containing regional cultural values encourages students to be more active and motivated in learning. The study shows that animation technology can serve as an effective tool for raising cultural awareness and reinforcing respect for local wisdom.
Integrating Local Wisdom into Interactive Multimedia to Foster Digital Literacy (Hasanah & Kristanto, 2025)	Qualitative exploratory research	Integrating local values into interactive multimedia enhances students' digital literacy while fostering social empathy and environmental concern. Context-based learning grounded in local realities is considered capable of developing a generation that is both technologically literate and morally responsible.
Leveraging Local Historical Heritage to Strengthen Students' National Identity (Putri et al., 2025)	Field case study	Utilizing local historical heritage in learning activities enables students to better understand the relationship between regional and national identity. Field activities and digital documentation promote pride in one's culture and strengthen patriotism.
Media Education and the Limits of "Literacy" Ecological Perspectives on Pedagogy (Nichols & LeBlanc, 2021)	Theoretical and critical review	Ecopedagogy and media literacy approaches provide a foundation for environmentally based learning and the reinforcement of social responsibility.

Source: Results of SLR analysis of 10 national and international journal articles

Based on a systematic review of ten articles published between 2016 and 2025, it was found that the use of interactive multimedia based on local wisdom has gained increasing attention in geography and environmental education at the senior high school level.

Of all the articles analyzed, 60% employed a research and development (R&D) approach using various models such as 4D, ADDIE, and Borg and Gall. Meanwhile, 20% were qualitative studies, and the remaining were case studies and theoretical reviews. This



pattern indicates that the research trend has been more focused on the development and validation of digital learning products than on mere theoretical evaluations.

Thematically, 70% of the articles discussed integrating local wisdom values, such as Baduy culture, regional traditions, and community-based environmental practices, into learning media. This approach has been shown to strengthen students' cognitive understanding of geographical and ecological concepts and to foster character values such as social responsibility, nationalism, and environmental awareness. Studies by Ramdani et al. (2022) and Yulianto et al. (2023) reported significant improvements in students' ecological concern and character formation following the use of interactive media based on local culture.

In terms of learning outcomes, most studies reported an average increase in cognitive achievement of 15–30% after implementing multimedia-based learning compared with conventional methods. Additionally, student responses to digital learning media were highly positive, with more than 80% stating that interactive media made the material

easier to understand and more engaging. These findings align with quantitative data from Hidayat et al. (2023), who found that the use of Powtoon animation in disaster mitigation materials improved students' understanding of disaster response steps and enhanced their sense of environmental responsibility.

Beyond academic considerations, these studies also demonstrated that integrating local values strengthens patriotism and national identity. Research by Surya & Fikriya (2021) and Putri et al. (2025) affirmed that learning which incorporates local history and culture can foster pride in one's regional heritage and strengthen students' emotional attachment to their nation and environment. Therefore, innovations in digital media also serve as effective tools for contextual character and nationalism education.

2. The Effectiveness of Local Wisdom-Based Interactive Multimedia on the Enhancement of Patriotism

The research findings indicate that the implementation of interactive multimedia based on Acehnese local wisdom significantly increases high school students' patriotism.



Table 2. Comparison of Pretest and Posttest Patriotism Scores

Group	N	Pretest Mean	Posttest Mean	Gain Score
Experimental	31	72.35	86.97	14.62
Control	32	71.48	77.23	5.75

Source: Research data analysis (2025)

According **Table 2**, both groups experienced improvements in patriotism scores. However, the experimental group demonstrated a substantially greater increase than the control group. While the control group improved by 5.75 points, the experimental group achieved a gain of 14.62 points. The relatively similar pretest scores indicate comparable initial conditions between groups, suggesting that the observed

differences in posttest scores were associated with the implementation of local wisdom-based interactive multimedia. The local wisdom integrated into the multimedia reveals a strong relevance between geography content and patriotic values.

Figure 2 visually illustrates the greater improvement achieved by students in the experimental group compared with those in the control group.

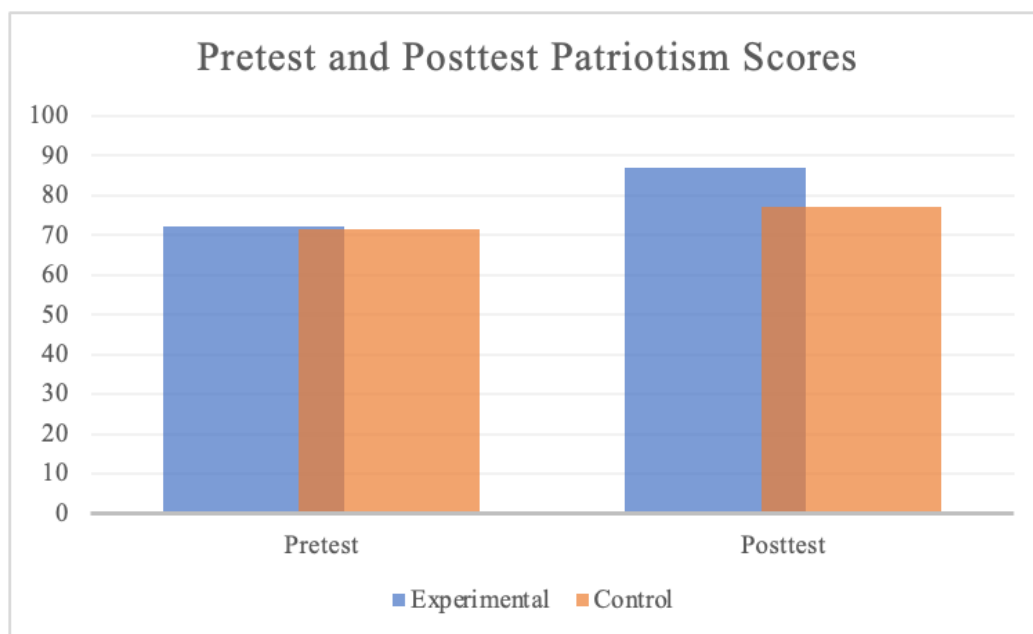


Figure 2. Comparison of Pretest and Posttest Patriotism Scores

Source: Research data analysis (2025)

Aceh's natural resources, such as forests, seas, and mining products, were

presented attractively through animations and short videos, enabling

students to recognize their region's role in national development. This understanding fosters pride in local identity and reinforces the idea that love for the nation begins with awareness of one's own regional potential. These results are consistent with the studies of Ramdani et al. (2022) and Yulianto et al. (2023), which proved that integrating local culture into learning media strengthens students' character and sense of responsibility toward their homeland. The enhancement of patriotism was also evident in students' ability to connect geographical phenomena with broader national issues. Materials that were previously perceived as abstract became more meaningful through the use of images, audio, videos, and interactive simulations. By exploring Aceh's natural resources digitally, students developed a deeper understanding of how environmental conservation contributes to national sustainability and economic resilience. This finding supports previous studies highlighting the effectiveness of multimedia in contextualizing learning content. However, unlike earlier studies that primarily reported improvements in environmental awareness or learning motivation, the present study

demonstrates that multimedia grounded in local natural resource literacy can also strengthen students' patriotic understanding by linking local realities with national development goals.

The affective dimension of patriotism was reflected in students' increased feelings of pride, belonging, and appreciation toward their homeland. Visual representations of Aceh's natural wealth and cultural heritage encouraged students to recognize the importance of preserving local resources as part of their national responsibility. These findings are consistent with Surya & Fikriya (2021), who found that locally themed digital media can strengthen national sentiment among students. Nevertheless, the current study extends this argument by showing that emotional attachment to the nation is reinforced through students' awareness of the strategic contribution of local natural resources to national prosperity.

The behavioral dimension exhibited the greatest improvement among the three dimensions of patriotism. Following the intervention, students showed a stronger willingness to participate in environmental conservation activities, support local products, and appreciate regional cultural values. This finding is



in line with Hidayat et al. (2023) who reported that local-based disaster mitigation animation media encouraged pro-environmental behavior and social participation. However, the larger improvement observed in the present study suggests that integrating local natural resource literacy into interactive multimedia may provide a stronger stimulus for behavioral change because students can directly relate learning content to their everyday experiences.

3. Enhancement of Cognitive, Affective, and Behavioral Dimensions

The findings revealed improvements across all dimensions of patriotism, namely cognitive, affective, and behavioral. The cognitive dimension increased by 12.5 points, indicating that students developed a better understanding of natural resources, environmental sustainability, and their contribution to national development. This result supports Nichols & LeBlanc (2021), who argued that contextual learning materials can enhance students' understanding of geographical concepts through real-life experiences.

The affective dimension increased by 15.2 points, reflecting stronger feelings

of pride, attachment, and appreciation toward the homeland. The integration of local values into multimedia learning helped students connect regional identity with national identity, consistent with the findings Hasanah & Kristanto (2025) regarding the role of local culture in fostering social and environmental awareness.

The behavioral dimension showed the greatest improvement, with an increase of 16.7 points. Students demonstrated greater willingness to engage in environmental conservation activities and support local products. This finding suggests that local wisdom-based multimedia not only improves knowledge and attitudes but also encourages concrete patriotic actions. Similar results were reported by Samsiyah et al. (2024), who emphasized that character-based learning is most effective when reflected in observable social responsibility. The stronger improvement in the behavioral dimension indicates that contextual multimedia learning can successfully translate patriotic values into everyday practices.



4. Integration of Local Wisdom and Its Implications for Geography Learning

The findings highlight the importance of integrating local wisdom into geography learning as a strategy for strengthening both national identity and character education. By connecting geographical concepts with local environmental, cultural, and social realities, students can better understand the relationship between natural resources, community life, and national development.

This contextual approach makes learning more meaningful and relevant to students' everyday experiences (Fadhilah et al., 2025; Yulianto et al., 2023). However, the present study further demonstrates that integrating local natural resource literacy into interactive multimedia contributes not only to conceptual understanding but also to patriotism development. Students become more aware of their responsibility to preserve local resources and cultural heritage as part of their contribution to the nation.

These findings suggest that geography education should be viewed not only as a subject for developing spatial knowledge but also as a medium for fostering civic responsibility, environmental

stewardship, and national identity. Through interactive multimedia grounded in local aspects, students are encouraged to connect scientific understanding with social and moral values, thereby supporting the broader goals of character education (Anggraeni et al., 2019; Putri et al., 2025; Ramdani et al. 2022).

Several limitations should be considered when interpreting the findings of this study. The empirical investigation was conducted with a relatively small sample of 63 Grade XI students from a single senior high school in Aceh Province, which may limit the transferability of the findings to different educational settings. In addition, patriotism was measured through a self-report questionnaire, making the results susceptible to potential response bias. The intervention was also implemented within a limited period, preventing an assessment of whether the observed improvements in patriotism can be sustained over the long term.

Although the mixed-methods approach provided a broader perspective by combining evidence from a Systematic Literature Review and a quasi-experimental study, the empirical findings remain context-specific. Future



research involving larger and more diverse samples, multiple schools, and longitudinal designs would provide a more comprehensive understanding of the long-term impact of local wisdom-based interactive multimedia on students' patriotism.

CONCLUSIONS

The findings indicate that interactive multimedia based on Aceh's local wisdom and natural resource literacy effectively enhances students' patriotism across cognitive, affective, and behavioral dimensions. By connecting geographical concepts with local environmental and cultural contexts, the learning process becomes more meaningful and encourages students to develop a stronger understanding of national identity, emotional attachment to the homeland, and responsible civic behavior. These findings contribute to geography and character education literature by demonstrating that local resource literacy integrated into interactive multimedia can serve as an effective pathway for strengthening patriotism beyond cognitive learning outcomes. Practically, the results provide evidence for teachers and curriculum developers to utilize local wisdom-based

multimedia as a strategy for supporting character education and the Pancasila Student Profile.

Future research should examine the long-term impact of local wisdom-based multimedia on students' patriotic attitudes and behaviors through longitudinal studies. Comparative studies across different regions of Indonesia are also needed to determine whether the relationship between local resource literacy and patriotism varies according to cultural and environmental contexts. Such investigations would provide a deeper understanding of how place-based learning contributes to national identity formation and civic responsibility among students

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