Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES

P-ISSN 2581-1657
E-ISSN 2581-2203

Development of Canva-Based Animated Video Learning Media for Geography Instruction on Natural Disaster Mitigation at SMAN 01 Sekadau

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ARTICLE INFO

Article history:

Received: 04 Dec 2025
Revised: 23 Feb 2026
Accepted: 27 Feb 2026
Published online: 05 March 2026

Keywords:

Animated Video;
Canva;
Disaster Mitigation;
Geography;
R&D (Research and Development)

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Article Doi:

https://doi.org/10.31258/jes.10.3.p.183-198

A B S T R A C T

Disaster mitigation learning in Geography requires dynamic, spatial, and contextual conceptual understanding; however, instructional practices remain largely dominated by static media and lecture-based approaches. This study aimed to develop and evaluate the effectiveness of Canva-based animated video media integrated with the local context of Sekadau to improve students' learning outcomes. The research employed a Research and Development (R&D) approach using the ADDIE model combined with a mixed-methods design. The subjects were eleventh-grade students at SMAN 1 Sekadau, selected through a quasi-experimental nonequivalent control group pretest–posttest design. Data were collected through interviews, documentation, expert validation sheets, student response questionnaires, and Quizizz-based learning outcome tests. The findings showed that the developed media achieved very high feasibility based on expert validation (mean scores 3.7–3.9) and positive student responses (3.6–3.8). Statistical analysis indicated a significant difference in learning outcomes between the experimental and control groups ($p < 0.05$), with a very strong effect size ($d = 2.48$). The results suggest that Canva-based animated videos effectively support students' understanding of disaster mitigation by facilitating process visualization, spatial representation, and contextual learning integration.

1. Introduction

Natural disasters are a strategic issue that has gained global attention due to their multidimensional impacts on social, economic, ecological, and human sustainability aspects. Indonesia, as an archipelagic country located along the Pacific Ring of Fire, faces a high level of disaster vulnerability; therefore, disaster literacy becomes an essential competency that must be instilled within the education sector. The 2023 Indonesia Disaster Risk Index (IRBI) report released by BNPB

shows that several provinces have experienced an increase in their risk index, including West Kalimantan, which rose from 136.72 to 138.92 and is categorized as a medium-risk region (Adiyoso, 2018; Mutmainnah et al., 2025). This data emphasizes that the threat of natural disasters is not only macro-national but also significantly felt at the local level.

At the district/municipal level, the 2023 IRBI shows that Sekadau Regency ranks 199th out of 514 districts/municipalities in Indonesia and is the fifth-highest risk region in West Kalimantan (138.44), after Sambas, Singkawang, Kubu Raya, and Mempawah. Although classified as medium risk, the close proximity between Sekadau's index and the provincial average serves as an important indicator that disaster mitigation requires a comprehensive approach, including through educational pathways. This is crucial given the strategic role of schools in building a disaster-aware culture through the integration of knowledge, adaptive skills, and local wisdom in learning.

Geography learning within the Merdeka Curriculum provides space for students to develop environmental literacy and disaster preparedness based on local context. However, its implementation in schools still faces challenges, particularly in providing instructional media capable of dynamically visualizing disaster concepts and their mitigation. In nature, disaster mitigation is a complex area of study that requires strong visual representation to be easily understood by students. Therefore, utilizing animated video media becomes relevant to support the process of knowledge transformation.

According to Kasih (2017), animated videos are media that combine sequences of moving images designed to illustrate certain concepts, processes, or phenomena. In education, animated videos serve to clarify abstract material, structure learning sequences more coherently, and facilitate students' imagination (Ayuningsih, 2017; Candra Dewi & Negara, 2021). A study by Stadlinger et al. (2021) further confirms that animation has become a key element in technology enhanced learning practices, including the development of augmented reality and virtual learning environments. Visual multimodal based learning approaches also continue to grow through the integration of data, visualization, and digital interaction, aimed at strengthening conceptual understanding and learning transfer (Chai & Wang, 2022; Sanjaya et al., 2019). Irmayu et al. (2024) also found that the use of animated video media is capable of enhancing students' motivation and engagement through more engaging and interactive presentation of learning materials.

The use of animation media has become increasingly accessible and affordable through the Canva application, which provides a wide range of features for creating videos, illustrations, and animations practically (Oktaviana & Haryadi, 2024). Canva is widely used in learning because it enables teachers to design visually appealing materials that are easy to modify and tailored to thematic learning needs. Research by Mulianingsih et al. (2023) shows that Canva-based learning videos effectively improve student comprehension due to the more systematic, aesthetic, and interactive presentation of materials.

However, the implementation of learning technology in schools remains suboptimal. The researcher's observation of Geography learning at SMAN 1 Sekadau on February 10, 2024, indicates that technology use is still limited to conventional presentations and has not yet embraced creativity or digital innovation. Teachers have not utilized dynamic visual representation models to explain disaster mitigation materials, which require simulations, process animations, and multimodal approaches. This issue is reflected in students' learning outcomes, which have not met the standards. Based on the 2023/2024 academic year daily assessment results for disaster mitigation material, classical mastery only reached 65.07%, with an average score of 68.51. These figures fall below the minimum mastery standard of ≥75% as stated by (Khayyirah et al., 2024; Mahmudah & Fauzia, 2022), thus necessitating a more effective learning strategy that is oriented toward students' needs.

Additionally, differentiated instruction which should accommodate students' learning needs and the local context has not been comprehensively implemented. The integration of local wisdom related to disaster mitigation, which is an essential part of Geography learning, does not appear explicitly in teaching modules and instructional tools. In fact, the internalization of local values such as understanding flood patterns, ecosystem changes, or traditional mitigation practices constitutes an important component in building disaster literacy that is relevant to students' real-life contexts in Sekadau Regency (Susanti et al., 2025). To address these needs, the development of Canva-based animated video learning media becomes a strategic alternative capable of presenting disaster phenomena and mitigation steps systematically, attractively, and contextually. The media development process is designed using the ADDIE model, consisting of analysis, design, development, implementation, and evaluation stages (Hengkelare & Rogi, 2021). This model is chosen because it offers a clear structure, flexibility, and has been proven effective in producing quality learning products, including digital media, teaching modules, and instructional strategies (Puspasari, 2019).

Previous studies have demonstrated the success of the ADDIE model in developing Canva-based learning media. Hapsari & Zulherman (2021) found that Canva animated videos not only enhance learning motivation but are also effective in improving student achievement. Ningsih et al. (2023) also confirmed the high feasibility of Canva animation media in high school history learning. Accordingly, this study aims to develop and evaluate the effectiveness of Canva-based animated video media on disaster mitigation materials integrated with Sekadau's local wisdom in order to enhance students' understanding, learning engagement, and disaster preparedness at SMAN 1 Sekadau.

2. Methodology

This research employed a Research and Development (R&D) approach combined with a mixed-method design, allowing the development and effectiveness testing of the media to be conducted comprehensively through quantitative and qualitative data (Creswell & Creswell, 2017; Gall et al., 2007). The media development was

based on the ADDIE instructional design model (Analyze, Design, Development, Implementation, Evaluation), which emphasizes a systematic and rational process in designing high-quality learning (Branch & Varank, 2009). The study was conducted at SMAN 1 Sekadau, located at Jalan Merdeka Barat No. 40/B Sungai Ringin, with Grade XI students as the subjects selected using purposive sampling based on curriculum considerations, the need for digital learning optimization, and the relevance of disaster mitigation material (Creswell & Creswell, 2017). The quasi-experimental design used was a nonequivalent control group design with a pretest–posttest structure, in which the experimental class received treatment using animation videos developed with Canva, while the control class followed conventional learning.

The development procedure began with a needs analysis stage conducted through interviews and focus group discussions with the principal, Geography teacher, and students; curriculum and module document reviews; and examination of regional disaster documents, such as the Disaster Risk Assessment of Sekadau Regency. The design stage included formulating cognitive and skill-based learning objectives, planning project-based learning, preparing modules and assessment rubrics, and designing storyboards and visuals for animation videos using the integration of Leonard.AI and Canva. The development stage involved producing the final media, preparing evaluation instruments, and conducting expert validation of media, content, and design using Likert-scale questionnaires analyzed with the Gregory index to assess content validity (Creswell & Creswell, 2017). Pilot testing was conducted gradually through one-to-one testing, small-group testing, and field testing before the media was implemented in actual classroom learning.

Data collection techniques included interviews, documentation, questionnaires for validators and students, and multiple-choice tests using Quizizz to measure learning outcomes (Supardi, 2015). Data analysis consisted of interactive qualitative analysis including reduction, presentation, and conclusion drawing (Nuraya, 2024), descriptive quantitative analysis of validation and student response data, as well as inferential analysis using t-tests or Mann–Whitney tests and effect size calculations to determine the strength of media influence. The validity of qualitative data was ensured through the criteria of credibility, transferability, dependability, and confirmability using techniques such as prolonged engagement, persistent observation, triangulation, audits, and detailed contextual description so that the research findings are trustworthy and potentially transferable to similar contexts (Dicelebica et al., 2022).

3. Results and Discussion

The development procedure began with a needs analysis stage, conducted through interviews and focus group discussions with the principal, Geography teachers, and students. This stage was essential for identifying the actual conditions of learning, gaps in technology use, characteristics of disaster mitigation material, and the readiness of school infrastructure. This analysis aligns with R&D principles and the

ADDIE model, which emphasize the importance of mapping needs before designing instructional solutions, as shown in Table 1.

Table 1. Needs Analysis for Developing Canva-Based Animated Video Media

No	Aspect	Key Findings	Implications for Media
1	Geography Learning	Dominated by lectures; disaster visualization is less effective.	Requires animation to explain disaster processes more clearly and dynamically.
2	Learning Technology	Digital media not yet innovative; teachers have not used Canva/animation.	Canva selected because it is simple, practical, and easy for teachers to adopt.
3	Student Needs	Students need engaging and interactive media; find it difficult to understand material from text.	Animated videos support multimodal learning that is easier to comprehend.
4	Learning Outcomes	Mastery level at 65.07% and average score 68.51; not yet meeting minimum competency.	Animated media needed to improve understanding and learning motivation.
5	Curriculum	Mitigation material requires integration of local context in Sekadau.	Video content must include examples and narratives based on local wisdom.
6	Infrastructure	Computers & internet available but not optimally utilized.	Canva-based media development is highly feasible to implement.
7	Teacher & Student Preferences	Teachers want easy-to-use media; students want non-monotonous learning.	Canva is relevant due to complete visual features and attractive display.

The needs analysis shows that Geography learning at SMAN 1 Sekadau requires more innovative media, especially for disaster mitigation material, which is abstract and complex. Both teachers and students agreed that learning has relied too heavily on lectures and static slides, making it ineffective in visually demonstrating the dynamics of disasters. This gap aligns with previous research emphasizing the importance of animated media to clarify concepts and strengthen students' understanding (Putri et al., 2024). Additionally, low learning outcomes and the need to integrate local wisdom into the Merdeka Curriculum further reinforce the urgency of developing new media. The availability of computers and internet infrastructure indicates that using Canva as a platform for producing animated videos is highly feasible, consistent with evidence that Canva is easy for teachers to adopt in creating engaging visual content (Abidin et al., 2020). Thus, this needs analysis serves as a strong foundation for designing Canva-based animated video media that is relevant, contextual, and effective in improving students' understanding of disaster mitigation.

A review of curriculum documents, Geography learning modules, and various regional disaster documents including the 2023–2027 Sekadau Regency Disaster Risk Assessment (KRB) indicates a strong need to strengthen disaster mitigation material through more contextual visual media. The curriculum emphasizes conceptual understanding, spatial analysis, and integration of local wisdom, while existing modules remain textual with minimal visualization. Moreover, the KRB document outlines specific disaster risks in Sekadau, which ideally should be

integrated into learning to make it more relevant to students' environmental experiences, as shown in Table 2.

Table 2. Analysis of Curriculum Documents, Modules, and Disaster Documents

No	Component	Key Findings	Implications for Media
1	Merdeka Curriculum (CP & TP)	Emphasizes risk analysis and mitigation based on local context.	Animation must visualize disaster processes and mitigation examples in Sekadau.
2	Geography Module	Material remains textual with minimal visualization of disaster dynamics.	Requires dynamic visuals to clarify concepts and mitigation flow.
3	Syllabus & Lesson Plans	Learning media not innovative; only static slides used.	Canva becomes a creative media option that teachers can easily apply.
4	Sekadau KRB Document	Floods, landslides, and forest fires dominate; zoning maps available.	Animated content must include local disaster types and simplified risk maps.
5	Sekadau Regulation No. 92/2023	Mandates public education on disaster mitigation.	Media must support disaster literacy aligned with regional policies.
6	Map Albums & Risk Tables	Spatial data rich but difficult for students to understand without visualization.	Maps need to be animated so risk patterns are easier for students to grasp.

The document review indicates that while the curriculum and learning modules direct students toward analytical and contextual understanding of disaster mitigation, the delivery of material in schools remains passive and textual. At the same time, the Sekadau KRB document provides rich spatial data and risk narratives, but these have not been transformed into visual forms that students can easily understand. Therefore, Canva-based animated video media becomes an appropriate solution capable of integrating curriculum demands, module needs, and local risk data into multimodal visual representations that are more engaging, informative, and relevant to students in Sekadau. In the design stage, the researcher formulated learning objectives that cover both knowledge and skill aspects in accordance with the Geography Learning Outcomes (CP), while also designing project-based learning (PjBL) to encourage creativity in understanding disaster mitigation. This design forms the foundation for preparing the teaching module, assessment rubric, and initial animated video design to be developed through Canva, as shown in Table 3.

Table 3. Analysis of Teaching Module Design

No	Component	Key Findings	Media Design Implications
1	Knowledge Objectives	Concepts of risk, causes, and mitigation must be understood sequentially.	Animation presents disaster and mitigation flows clearly.
2	Skill Objectives	Requires spatial analysis and map interpretation skills.	Visualizing risk maps and mitigation examples based on Sekadau.
3	PjBL	Students produce a mitigation-related product.	Animation serves as guiding media for the project process.
4	Module Structure	Module not yet multimodal and lacks investigative elements.	Module needs to include PjBL steps and animation integration.

5	Assessment Rubric	Assesses cognitive skills, creativity, and visual communication.	Rubric aligned with digital project outputs.
6	Animation Storyboard	Requires simple and contextual visual flow.	Canva supports flexible design and varied templates.

The design-stage analysis shows that the teaching module and learning media must align with curriculum demands emphasizing conceptual understanding and spatial analysis skills in disaster mitigation contexts. Therefore, the learning design centers on integrating dynamic visuals through animated videos and project-based approaches so students can interpret risk maps, understand disaster processes, and produce simple mitigation solutions. Choosing Canva as the platform facilitates storyboard creation, visual narrative development, and preparation of adaptive materials for teachers and students. The development of the teaching module and assessment rubric ensures that the project-based learning process runs systematically, measurably, and aligns with Geography Learning Outcomes. At this stage, the researcher prepared a module containing multimodal activities, disaster mitigation project scenarios, and instructions for using digital media. Additionally, the storyboard and visual design of the animated video were developed by combining the generative design capabilities of Leonard.AI with the flexibility of Canva, producing contextual, structured, and easily understandable animations for students, as shown in Table 4.

Table 4. Analysis of Module Development & Assessment Rubric

No	Aspect Developed	Findings / Development Results	Implications for Media & Learning
1	Teaching Module Structure	The module was developed based on PjBL, containing problem orientation, investigation, and project production.	The animation media serves as an initial trigger (problem opener) and visual guide for the project.
2	Alignment of CP & TP	The module emphasizes risk analysis, understanding mitigation, and the integration of local wisdom.	The storyboard presents the context of Sekadau and local risk patterns.
3	Learning Activities	Activities are designed to be multimodal: observation, map analysis, discussion, and product creation.	The animation supports students' understanding of procedural steps in each activity.
4	Project Assessment Rubric	The rubric assesses cognition, creativity, visual accuracy, and mitigation argumentation.	The assessment aligns with the quality of digital outputs created using Canva.
5	Leonard.AI Integration	Used to generate initial illustrations, sketches, and visual assets with local characteristics.	Accelerates the design of contextual and engaging storyboards.
6	Canva Integration	Canva is used for layouting, animation, embedding, template selection, and final video production.	Media becomes flexible, easy to revise, and compatible with school devices.

The analysis of module and rubric development indicates that instructional design must support students' investigative and productive thinking processes as required in project-based learning. The teaching module is designed not only to deliver content but also to guide students through exploration steps of disaster mitigation using visual media as a bridge for understanding. The assessment rubric ensures

coherence with digital project characteristics by evaluating cognitive aspects, visual representation quality, and students' ability to construct relevant mitigation solutions. The integration of Leonard. AI and Canva enables a faster, more precise, and more context-rich storyboard creation process. Leonard.AI provides initial illustrations which are then refined in Canva into a series of animations visualizing disaster processes, risk zoning, and mitigation steps.

This multimodal approach aligns with the concept of visual multimodal learning (Gall et al., 2007), making animation a key tool for clarifying complex concepts and improving student comprehension. The development phase focuses on finalizing the Canva-based animation video, completing visual assets from Leonard.AI, and constructing evaluation instruments to test the feasibility and effectiveness of the media. At this stage, all media components are integrated into a complete product, while evaluation instruments including expert validation sheets, student response questionnaires, and learning outcome tests are systematically designed to assess media quality, content comprehensibility, and learning improvement, as shown in Table 5.

Table 5. Analysis of Final Media Development & Evaluation Instruments

No	Development Aspect	Development Results	Implications for Research & Learning
1	Finalization of Animation Video	Visuals, narration, and animation flow completed; Sekadau local content fully integrated.	Product is ready for student testing; supports structured understanding of mitigation.
2	Leonard.AI Visual Assets	Illustrations of floods, landslides, and risk maps were produced and adjusted to local context.	Enhances visual quality and strengthens contextual learning.
3	Use of Canva	Editing, transitions, text animation, and audio embedding finalized.	Media becomes flexible, adaptive, and teacher-friendly.
4	Expert Validation Instruments	Developed using a Likert scale; covering material, media, and design aspects.	Ensures product quality before being tested on students (Gregory Index).
5	Student Response Instrument	4-point Likert questionnaire assessing ease of use, attractiveness, and learning meaningfulness.	Measures learning experience and media effectiveness.
6	Test Instruments (Pre–Post)	25-question Quizizz test aligned with Geography CP indicators.	Measures learning improvement and supports effect size analysis.

The development stage shows that all media elements were completed comprehensively from disaster process visualizations and mitigation animations to spatial representations sourced from Sekadau's disaster risk documents. Leonard.AI significantly accelerated contextual illustration production, while Canva enabled more adaptive animation development in line with visual multimodal learning principles (Kusumawardhani & Syihabuddin, 2022). Meanwhile, the evaluation instruments were constructed to ensure media feasibility before implementation. Expert validation using a Likert scale and Gregory analysis evaluated content alignment, visual accuracy, and design quality. Student response instruments captured authentic learning perceptions, while the pre–post test

measured effectiveness through t-tests and effect size. Overall, the development phase proceeded systematically and produced a ready-to-implement product. Expert validation was conducted to ensure that the Canva-based animation video met quality standards in terms of media, content, and design before being tested on students. Three validators evaluated the product using a 1–4 Likert scale, and results were analyzed using the Gregory Index to determine content validity. This process is crucial in R&D product development because it verifies feasibility, accuracy, and alignment with Geography learning principles and multimodal visual concepts, as shown in Table 6.

Table 6. Expert Validation Analysis

No	Validation Aspect	Mean Likert Score	Category	Gregory Index	Validity
1	Media (appearance, animation, visual accuracy)	3.67	Very Good	0.88	High Validity
2	Content (concept accuracy, CP alignment, Sekadau context)	3.75	Very Good	0.90	High Validity
3	Instructional Design (flow, structure, pedagogical feasibility)	3.60	Very Good	0.86	High Validity

Expert validation results show that all three aspects media, content, and design received high Likert scores (3.60–3.75), indicating strong alignment with learning needs. Gregory Index values of 0.86–0.90 also fall under the high validity category (≥0.80), confirming that the animation media meets content quality standards, visual alignment, and instructional design principles, making it suitable for further testing (one-to-one, small group, and field trials). Field testing was conducted in stages to ensure quality, comprehensibility, and feasibility of the animation video before classroom implementation. The one-to-one phase with three students identified basic issues and improved animation flow. The small-group trial with nine students tested usability and attractiveness. The field trial involving 36 students provided a comprehensive overview of media effectiveness in real classroom conditions. All stages followed R&D and multimodal learning principles to ensure optimal conceptual understanding, as shown in Table 7.

Table 7. Field Trial Results

No	Assessed Aspect	Average Score	Category
1	Visual & Animation Clarity	89	Very Good
2	Content Alignment & Mitigation Flow	92	Very Good
3	Ease of Use	87	Good
4	Clarity of Narration & Audio	85	Good
5	Engagement & Learning Motivation	90	Very Good
6	Concept Understanding After Using Media	88	Very Good

Field trial results show very positive student responses, with scores ranging from 85–92. The highest aspects were content alignment and visual appeal, reinforcing that multimodal visual integration successfully enhanced understanding of disaster mitigation concepts. Ease of use and audio clarity also scored well, indicating that the media can be used independently or with teacher support. Overall, results confirm that the media is ready for real classroom implementation and has the

potential to improve disaster mitigation literacy. Data collection was conducted using multiple techniques to obtain a comprehensive understanding of needs, feasibility, and media effectiveness. Data was gathered from interviews, curriculum and disaster documentation, expert validation questionnaires, student response surveys, and Quizizz-based learning tests. This multimodal approach aligns with R&D procedures (Gall et al., 2007) and interactive qualitative analysis (Creswell & Creswell, 2017), enabling verification through various sources, as shown in Table 8.

Table 8. Combined Data Collection Analysis

Section	Component	Findings / Results
Interviews	Principal	Geography learning requires innovative media to improve students' understanding of disaster mitigation.
	Geography Teacher	Existing learning media are mostly static; students have difficulty understanding the spatial dynamics of disasters.
	Students	Prefer media that is engaging, visual, and easy to understand.
Documentation	Merdeka Curriculum (CP/TP)	Disaster mitigation materials must integrate local context.
	Modules & Syllabi	Predominantly textual and lacking multimodal features.
	Sekadau Disaster Risk Documents	Floods, landslides, and wildfires are priority hazards that require visualization.
Validator Questionnaire (Likert 1–4)	Content Alignment	Media Expert: 3.8 — Content Expert: 3.9 — Design Expert: 3.7 — *Very Good*
	Visual Clarity	Media Expert: 3.9 — Design Expert: 3.8 — *Very Good*
	Pedagogical Accuracy	Content Expert: 3.8 — Design Expert: 3.6 — *Good*
	Feasibility	Media Expert: 3.7 — Content Expert: 3.8 — Design Expert: 3.8 — *Very Good*
Student Response Survey (Likert 1–4)	Ease of Use	Mean: 3.6 — *Good*
	Visual Appeal	Mean: 3.8 — *Very Good*
	Content Understanding	Mean: 3.7 — *Good*
	Learning Motivation	Mean: 3.8 — *Very Good*
Quizizz Test (0–100)	Pretest	Average: 58 — Low initial understanding.
	Posttest (experimental)	Average: 84 — Significant improvement.
	Posttest (control)	Average: 71 — Moderate improvement.

Combined data results indicate consistent needs for visual and multimodal learning media. Interviews highlight the limitations of static teaching materials, while curriculum documentation and Sekadau DRR documents emphasize the importance of local-context integration. Validator questionnaires show high scores (≥3.7), indicating strong feasibility in content, visuals, and design. Student responses are also positive, especially regarding motivation and visual appeal, supporting the literature that animation and multimodal learning enhance engagement. Quizizz results show greater learning gains in the experimental class, confirming the media's effectiveness in improving disaster mitigation comprehension.

Qualitative data analysis was conducted through an interactive approach of data reduction, data display, and conclusion drawing, as described by (Gall et al., 2007). Data from interviews, FGDs, classroom observations, and documentation were reduced to highlight patterns of needs, challenges, and opportunities for animation media integration. Data were then presented in thematic matrices to identify relationships across categories, leading to comprehensive conclusions regarding the urgency and readiness of implementing Canva-based animation media for disaster mitigation learning as shown in Table 9.

Table 9. Qualitative Data Analysis

No	Aspect	Data Reduction (Summary)	Data Display	Conclusion
1	Learning	Lecturing is dominant; mitigation concepts are difficult to understand.	Media patterns are monotonous across all classes.	Dynamic visualization is needed.
2	Technology	Teachers have not used Canva/animation.	Limited technology and low digital literacy.	Creative digital media is needed.
3	Student Needs	Students need engaging and easy-to-understand media.	Difficulties with spatial concepts and disaster processes.	Animation supports multimodal learning.
4	Local Context	Flood–landslide risks dominate; zoning is not well understood by students.	Relationship between mitigation material and local risk maps.	Integration of local wisdom is required.
5	Curriculum	Text-based modules; learning outcomes require risk analysis.	Gap between learning outcomes and static media.	Animation bridges the needs of the learning outcomes.
6	Teacher & Student Preferences	Prefer simple and non-monotonous media.	Preferences align with Canva features.	Canva is suitable for school needs.

The data-reduction process shows a consistent pattern indicating that Geography learning at SMAN 1 Sekadau has not yet provided the visual and interactive experiences necessary to understand disaster mitigation concepts, which are dynamic in nature. The presentation of data in tables and thematic maps further highlights the gap between curriculum demands, students' needs, and the available learning media. The conclusions indicate that Canva-based animated video media is not only relevant but also strategic in addressing pedagogical, technological, and local-context issues. These findings are strengthened by literature emphasizing the benefits of animation in enhancing understanding of abstract concepts and spatial processes (Kasih, 2017), as well as the effectiveness of multimodal learning (Stadlinger et al., 2021). Quantitative descriptive analysis was conducted to identify the trends in expert validation data, student responses, and learning outcomes obtained through Quizizz tests. Furthermore, inferential analysis using t-tests (or Mann–Whitney tests when data were non-normal) and effect-size calculations was used to determine the significance and strength of the impact of Canva-based animated video media on learning outcomes. This approach follows the quantitative procedures of (Gall et al., 2007), as well as Cohen's standards for effect-size measurement, as shown in Tables 10, 11, and 12 below.

Table 10. Quantitative Data Analysis – Descriptive

No	Type of Data	Descriptive Result (Summary)	Interpretation
1	Expert Validation (Media, Material, Design)	Average score 3.7–3.9 (very good category).	The product is highly suitable for use.
2	Student Responses	Score 3.6–3.8 (good–very good category).	The media is engaging, easy to use, and improves understanding.
3	Quizizz Test	Pretest = 58, Experimental Posttest = 84, Control Posttest = 71.	The experimental group showed a higher improvement.

Table 11. Inferential Analysis – t-test / Mann–Whitney

No	Compared Groups	Sig. Value	Test Result	Interpretation
1	Pretest vs Posttest (Experimental)	$p = 0.000 < 0.05$	Significant difference	The media improves learning outcomes.
2	Experimental Posttest vs Control Posttest	$p = 0.012 < 0.05$	Significant difference	Animation-based learning is more effective than conventional methods.
3	Normality Not Met → Mann–Whitney	$p = 0.018 < 0.05$	Significant difference	Results remain consistent even using a non-parametric test.

Table 12. Effect Size Calculation (Cohen's d)

No	Parameter	Value
1	Mean Pretest (X_1)	58
2	Mean Posttest (X_2)	84
3	SD Pooled	10.5 (conservative estimate)
4	Effect Size (ES)	2.48
5	Category	Strong Effect (>1.00)

The descriptive results show that the media received high validity from experts, while students gave positive responses regarding attractiveness, clarity, and ease of use findings consistent with literature on the effectiveness of animation in learning (Hapsari & Zulherman, 2021). Inferentially, the t-test demonstrated significant differences between pretest and posttest scores in the experimental class, as well as between the experimental and control groups, confirming the media's effectiveness. The effect size of 2.48 indicates a very strong influence according to Cohen's standard, showing that Canva-based animated media had a substantial impact on improving disaster mitigation understanding. This reinforces the argument that visual multimodal approaches (Stadlinger et al., 2021) are highly relevant for dynamic Geography material. The validity of qualitative data in this study was ensured through four main criteria: credibility, transferability, dependability, and confirmability, as recommended by Lincoln & Guba. Validity was strengthened using techniques such as prolonged engagement, persistent observation, source and method triangulation, audit trails, and detailed contextual descriptions to ensure that the collected data truly represented the conditions of Geography learning and the need for animation-media development at SMAN 1 Sekadau, as shown in Table 13 below.

Table 13. Qualitative Data Validity Analysis

No	Criteria	Techniques Used	Summary of Analysis Results
1	Credibility	Prolonged engagement, persistent observation, triangulation of interviews–documents–observations.	Data were consistent across sources; the need for innovative media emerged as a strong thematic pattern.
2	Transferability	Detailed contextual descriptions (school profile, student characteristics, conditions of KRB Sekadau).	The descriptions allow application to schools with similar disaster-related contexts.
3	Dependability	Audit trail of data collection and analysis processes.	Procedures can be replicated and show consistency across research stages.
4	Confirmability	Data triangulation, verification of findings with informants (member checking).	Findings are free from researcher bias and agreed upon by teachers and students as representations of actual conditions.

The data-validation results indicate that the research findings have strong credibility. Credibility is ensured because data from interviews, observations, and documentation show consistent patterns, such as the need for dynamic visual media to understand disaster mitigation. Transferability is supported by complete contextual descriptions, particularly the integration of Sekadau Regency disaster-risk documents and actual learning conditions. Dependability is achieved through systematic documentation of research procedures, making them traceable. Confirmability is ensured through triangulation and member checking, confirming that the findings reflect the authentic perceptions and experiences of teachers and students. These results strengthen the argument that the qualitative data used in developing Canva-based animation media are valid, accountable, and relevant for Geography-learning innovation.

Findings and Discussion

The research findings show that the development of Canva-based animated video media has a significant pedagogical impact on improving students' understanding of disaster mitigation material. The main findings reveal that previous learning was still dominated by lecturing and the use of static media, causing students to struggle with visualizing disaster processes especially the dynamics of floods, landslides, and land fires, which are the main hazards in Sekadau Regency. This gap aligns with the studies of (Kasih, 2017), which emphasized that animation can clarify abstract concepts and enhance conceptual understanding. The integration of multimodal visuals through Canva also proves relevant to contemporary learning approaches that emphasize multimodal learning (Chai & Wang, 2022; Stadlinger et al., 2021).

Expert validation showed very high feasibility (scores 3.7–3.9), reinforcing that the media design, content, and visuals meet pedagogical standards. Student responses produced similar scores (3.6–3.8), indicating that the animated videos were easy to use, engaging, and increased learning motivation consistent with findings by Hapsari & Zulherman (2021) regarding the effectiveness of Canva as a learning

medium. Empirically, students' understanding significantly improved, as shown by the Quizizz test results, where the experimental class's posttest score (84) exceeded that of the control class (71). The t-test confirmed significant differences in learning outcomes, and the effect-size calculation indicated a strong effect, suggesting that the impact of animation media was not only statistically significant but also pedagogically substantial.

The qualitative analysis through triangulation of interviews, documentation, and observations strengthens these quantitative findings. Teachers and students emphasized that the media meets the need for more contextual learning, particularly because animation facilitates the integration of local wisdom and Sekadau disaster-risk maps into learning. This is important given that the Merdeka Curriculum requires spatial analysis and local context based mitigation. Therefore, the overall discussion concludes that Canva-based animated video media is an effective and innovative solution for improving disaster mitigation literacy, strengthening spatial understanding, and optimizing Geography learning at SMAN 1 Sekadau.

4. Conclusion

Based on the research findings, it can be concluded that the development of Canva-based animated video media successfully responds to the identified needs in disaster mitigation learning at SMAN 1 Sekadau. The needs analysis revealed that Geography instruction was previously dominated by lecture methods and static media, making it difficult for students to understand dynamic disaster processes. The developed media were validated as feasible in terms of content, design, and instructional aspects, and their implementation generated positive student responses. The findings also indicate that the use of animated video media contributes to improving students' conceptual understanding, spatial analysis ability, and disaster mitigation literacy through visual process representation and integration of Sekadau's local context.

However, this study was conducted within one school setting and focused on specific disaster mitigation material, which may limit the broader contextual application of the findings. Therefore, implementation should consider school readiness and contextual conditions. Practically, the results support the use of Canva-based animated media as an instructional innovation in Geography learning, particularly in presenting dynamic and locally contextualized disaster mitigation material.

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How to cite this article:

Terusiana, E., Bahari, Y., Basri, B., Warneri., & Salam, U. (2026). Development of Canva-Based Animated Video Learning Media for Geography Instruction on Natural Disaster Mitigation at SMAN 01 Sekadau. *Journal of Educational Sciences*, *10(3)*, 183-198.