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Febby Rullya Rasyid, **Tubagus Ali Rachman Puja Kesuma**, **and Karsiwan**

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Research Article

Design and Development of Flash-Based Learning Media for Enhancing Students' Learning Interest

Febby Rullya Rasyid* and Karsiwan

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Abstract

This study aimed to design and develop Flash-based learning media to enhance student engagement in sociology education at SMK Negeri 4 Bandar Lampung. The media was developed using the Cooperative Learning model, and its effectiveness was evaluated through expert assessments and field trials, following the Borg and Gall development steps. The results showed that the Flash-based media significantly increased student interest in learning compared to traditional PowerPoint presentations. The multimedia tool, integrating visual, auditory, and interactive elements, helped students better understand abstract sociological concepts. The findings indicate that Flash-based learning media is a promising tool for improving student motivation and learning outcomes in vocational high school settings. The study contributes to the growing body of research on multimedia applications in social science education and emphasizes the importance of integrating digital tools in classroom teaching to foster engagement and enhance learning experiences. The study's limitations include a small sample size and the focus on short-term engagement. Future research should examine the long-term impact of such media on academic performance and explore its broader applicability across different educational contexts.

Keywords: Flash-Based Learning Media; Sociology Education; Student Engagement; Cooperative Learning; Multimedia Tools; Vocational High School; Educational Technology.

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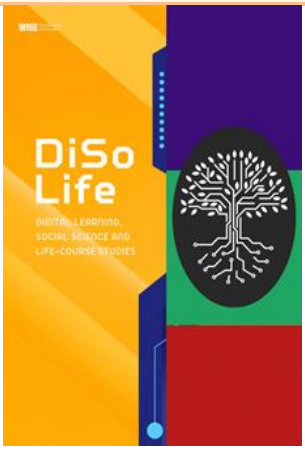

INTRODUCTION

Improving student engagement remains a pressing challenge in 21st-century education, particularly in social science subjects like sociology, which require not only conceptual understanding but also critical reflection on societal phenomena. Student disengagement, characterized by passive behavior, lack of motivation, and low academic performance, is a pervasive issue in Indonesian secondary schools, especially vocational institutions [1], [2], [3]. In the context of sociology education, students often perceive the subject as abstract and disconnected from real-life experiences, resulting in diminished interest and suboptimal learning outcomes [4], [5], [6].

Traditional instructional methods such as lecturing and textbook-based learning continue to dominate classroom practices in Indonesian vocational schools, despite being insufficient to foster active participation and higher-order thinking [7], [8], [9]. While some teachers have adopted digital presentations like PowerPoint, these tools are often used in static formats, merely substituting printed materials without leveraging the interactivity or multimodal features that digital technology can offer [10]. Consequently, the potential of technology-enhanced learning remains underutilized in cultivating students' curiosity, motivation, and critical engagement with the content [11], [12], [13].

To address these issues, there is growing interest in the integration of interactive multimedia, particularly Flash-based learning media, which can combine visual, auditory, and kinesthetic elements into a coherent and engaging learning experience [14]. Macromedia Flash, despite being a relatively mature platform, still provides relevant functionality for educational content development, particularly in contexts with limited access to newer tools. When designed properly, Flash-based media can stimulate students' attention, visualize abstract sociological concepts, and facilitate collaborative learning processes through gamification and simulation [15], [16], [17].

Research in digital pedagogy has emphasized that multimedia applications can significantly enhance student engagement, especially when aligned with instructional design models such as ASSURE or ARCS, which systematically address learner characteristics, media selection, and motivational factors [18]. Studies by Wong et al. [19] and Al - Amri et al. [20] demonstrate that multimedia-based interventions are particularly effective in vocational education settings where students often respond better to applied, visually supported, and problem-based learning.

In response to this pedagogical demand, the present study aims to design and develop Flash-based instructional media tailored for sociology learning in an Indonesian vocational high school. The study adopts a Research and Development (R&D) approach, integrating the Borg and Gall model with the ASSURE instructional framework to ensure pedagogical relevance, technical usability, and content validity. The effectiveness of the developed media is evaluated based on improvements in students' learning interest and qualitative feedback from both learners and subject experts. By addressing the gap in contextualized multimedia application for sociology education, this research contributes to the broader discourse on technology integration in social science instruction and offers practical implications for enhancing digital literacy and pedagogical innovation in developing educational systems.

METHODS

Research Design

This study employed a Research and Development (R&D) methodology grounded in the framework articulated by Borg and Gall [21], which is widely recognized for its systematic approach to the iterative creation and validation of educational products. Given the contextual constraints and scope of the present study, the comprehensive ten-stage model was judiciously streamlined into six principal phases: preliminary investigation, instructional planning, prototype development, expert validation, product revision, and limited field implementation. Within the development phase, the ASSURE instructional design model comprising learner analysis, objective specification, media selection and utilization, learner participation, and evaluation was embedded to inform pedagogical structuring and optimize media functionality. This integration ensured that the resulting instructional tool was not only technically feasible but also pedagogically grounded and learner-centered.

Participants and Sampling Procedure

The study was conducted at SMK Negeri 4 Bandar Lampung, a public vocational school in Indonesia. The population comprised all eleventh-grade students enrolled in the social sciences track. Employing a cluster random sampling technique, two intact classes were selected as the research sample to preserve naturalistic classroom dynamics and prevent instructional contamination. Class XI IPS 3 was designated as the experimental group and received instruction mediated by the Flash-based learning tool, while Class XI IPS 4 served as the control group and was taught using conventional PowerPoint presentations. Both classes covered identical instructional content derived from the national curriculum on the topic of "Social Structure," thereby ensuring content equivalence across treatment conditions.

Media Development Process

The development of the instructional media followed a rigorous, iterative process consistent with the Borg and Gall paradigm. The preliminary phase involved a needs assessment conducted through teacher interviews and classroom observations, revealing a pronounced lack of interactive learning materials and a persistent disengagement among students. In response, a media planning phase was initiated, during which instructional objectives were delineated and curricular alignment was ensured. A detailed storyboard and flowchart were constructed to guide the sequencing and logic of the media components. The initial prototype featured seven pedagogical modules: user guidelines, audiovisual social fact simulations, core instructional content, interactive discussion prompts, a game-based quiz module, assignment tasks, and reference materials. The media was also pedagogically aligned with the cooperative learning model, particularly the Team Games Tournament (TGT) format, to stimulate engagement through structured group competition.

Expert Validation and Media Revision

The prototype was subjected to systematic evaluation by three expert reviewers representing distinct domains: sociology education, instructional design, and applied linguistics. Each expert was provided with structured validation instruments that assessed content accuracy, interface functionality, language clarity, and instructional relevance. The sociologist evaluated conceptual coherence and contextual authenticity; the instructional designer appraised visual hierarchy,

navigation logic, and interactive integrity; and the linguist reviewed diction, syntax, and readability. Revisions were conducted accordingly, which included adapting visual elements to reflect the student demographic more authentically, embedding empirical examples in video format, and enhancing interactivity by automating quiz scoring and feedback mechanisms.

Field Implementation

Following expert-led refinements, the media was implemented over a three-session instructional period in the experimental group, while the control group underwent instruction using slide-based materials. The intervention was carefully synchronized in terms of time allocation, learning objectives, and teaching personnel to control for extraneous variables. Learners' interest in sociology before and after the intervention was measured using a validated instrument informed by Keller's ARCS Model of Motivation [22], assessing domains such as attention, relevance, confidence, and satisfaction.

Data Collection and Analysis

Multiple instruments were employed to capture both qualitative and quantitative dimensions of instructional effectiveness. Expert validation checklists yielded descriptive insights into the appropriateness and usability of the media, while student questionnaires assessed affective engagement and motivation. Classroom observations were conducted using structured rubrics to triangulate findings and examine behavioral engagement. Quantitative data were analyzed using descriptive statistics and gain score calculations to evaluate the differential impact of the intervention. Inferential statistical testing was considered but not applied due to the small sample size and quasi-experimental nature of the design.

Ethical Considerations

All research procedures adhered to ethical standards for educational research involving minors. Prior informed consent was obtained from all participants, their legal guardians, and institutional authorities. Participants were informed of their right to withdraw at any point, and data confidentiality was maintained throughout the research process. The study received institutional clearance and did not involve any form of deception, coercion, or undue influence.

RESULTS AND DISCUSSION

As described in the research method, to make Flash-based learning media products, researchers conducted several stages, namely (1) Initial research, (2) planning (3) initial product development, (4) preliminary trials, (5) product revision, (6) field trials.

Initial Research

The initial phase of this study involved a needs analysis to identify the core problems students face in learning sociology, particularly those that hinder engagement and concept mastery. Data were collected through classroom observations and semi-structured interviews with teachers and students in Grade XI at SMKN 4 Bandar Lampung. These preliminary findings revealed that many students struggled to grasp key sociological concepts and demonstrated low levels of motivation during class. According to the teachers, a significant number of students had not met the minimum

competency standards (KKM), and students themselves acknowledged difficulties in understanding the subject matter.

One of the most prominent issues identified was the lack of engaging and interactive learning media. Teachers noted that while cooperative learning models had been introduced in some classes, they were not consistently or effectively implemented. Most classroom instruction still relied heavily on traditional methods such as lectures and printed textbooks. Students reported feeling bored and unmotivated, often becoming distracted by mobile devices or engaging in off-task behavior during lessons. Both teachers and students expressed the need for more dynamic and visually engaging learning tools that could make sociology lessons more interesting and easier to understand.

Notably, neither teachers nor students had prior experience using Flash-based instructional media in the classroom. However, they viewed it positively when introduced to the concept. Teachers believed such media could help students remain focused and grasp abstract sociological topics more effectively, while students were enthusiastic about the idea of learning through interactive visuals and game-based activities.

These findings support the argument that the development of Flash-based instructional media is not only relevant but necessary to address the gap in student motivation and instructional engagement. A media format that integrates visual, auditory, and interactive elements has the potential to foster student autonomy, creativity, and responsibility key factors in achieving sustained learning interest in social science education.

The urgency of improving student engagement through media innovation has been echoed in previous studies. For example, Kassa et al. [14] highlighted that Flash-based media improved students' critical thinking and interest in social studies by providing dynamic visualizations. Similarly, Pan et al. [23] emphasized that interactive media enhances student focus and motivation, particularly when the subject matter is perceived as abstract or distant from daily experience. These insights further underscore the importance of developing digital instructional tools that align with students' learning preferences and technological familiarity.

Informed by this needs assessment, the next phase of the study focused on designing a Flash-based instructional media prototype tailored to students' academic and motivational needs, with the goal of transforming the sociology learning experience into one that is meaningful, enjoyable, and pedagogically effective.

Planning

Based on the findings from the initial needs assessment, it became evident that students require more engaging and interactive learning media to enhance their interest in studying sociology. In response, the planning phase of this research focused on the design of Flash-based instructional media specifically tailored to address this need. The primary objective was to create a digital learning environment that could foster motivation, facilitate understanding, and improve the overall learning experience in sociology classrooms.

The instructional design began with the selection of appropriate content that aligned with the national curriculum. The topic chosen for this study was "Social Structure," a fundamental concept in sociology that students often find abstract and challenging. To ensure pedagogical coherence, the instructional objectives, learning outcomes, and activity sequences were carefully

mapped out in accordance with the ASSURE model, emphasizing learner characteristics and media suitability.

A critical component of this phase was the development of a program flowchart that outlined the logic and structure of the digital media. This flowchart served as the blueprint for organizing content delivery, navigation, and user interaction within the Flash-based application. It detailed how students would access different learning components, such as animations, materials, quizzes, and discussion prompts, ensuring a seamless and pedagogically sound learning path.

This systematic planning process was essential to ensure that the resulting media would not only be technically functional but also educationally effective, aligning with both learner needs and curriculum standards. Through this integration of instructional design and media development principles, the groundwork was laid for a digital learning tool that supports active, meaningful, and student-centered learning in sociology.

Initial Product Development

The development of the Flash-based instructional media was informed by the preliminary design and content planning previously established. At this stage, the researchers began translating pedagogical objectives into interactive digital components that would align with students' cognitive needs and motivational profiles. The instructional materials developed within the Flash-based platform were designed to support the topic of "Social Structure" and reflect a balance between theoretical concepts and real-life applications. The media consists of seven main components, each designed to facilitate a specific aspect of the learning process. First, the Guide serves as an instructional manual, outlining both the technical usage of the media and the sequence of learning activities. This feature ensures that both students and teachers can navigate the tool effectively, minimizing cognitive overload associated with unfamiliar interfaces [24], [25], [26].

Second, the Facts section includes short animated videos that depict real-world social dynamics related to the structure of society. These audiovisual materials aim to contextualize abstract concepts, supporting learners in forming mental models through visual analogy and simulation an approach endorsed by Pietroni and Ferdani [27], who emphasize the role of visualized context in enhancing conceptual transfer. Third, the Material section presents the core sociological content, structured into modular units that follow a logical progression from foundational definitions to complex relational analyses. The material is supplemented with illustrations, examples, and concise explanations designed to reinforce understanding and scaffold student learning. Fourth, the Discussion component features an interactive "spin game" that randomly selects discussion prompts or problem scenarios. This gamified element is intended to increase student engagement and facilitate peer-to-peer interaction, particularly within cooperative learning environments. The inclusion of game-based learning aligns with studies by Jaramillo-Mediavilla et al. [28], which suggest that gamification can significantly enhance motivation, participation, and knowledge retention in educational settings. Fifth, the Evaluation module offers self-paced quizzes with immediate feedback and score tracking. The quizzes are visually appealing and structured to promote a sense of competition among students through group-based scoring. This component is grounded in the principles of formative assessment and motivational reinforcement, as highlighted by Morrison and Jacobsen [29], who argue that timely feedback is a key driver of student self-regulation and engagement. Sixth, the Tasks section presents students with extended activities aimed at deepening their understanding of the lesson content. These tasks require students to

analyze sociological scenarios, conduct brief investigations, or develop reflective responses. Such activities are crucial for developing higher-order thinking skills, a key goal of competency-based learning models [30].

Finally, the References section includes curated resources and bibliographic entries used in the development of the media content. This section not only reinforces academic integrity but also encourages students to explore further reading, thereby promoting independent learning and information literacy. Overall, the integration of these components reflects a comprehensive instructional design that combines cognitive, behavioral, and affective dimensions of learning. The media was deliberately structured to ensure that students move through a sequence of exposure, interaction, reflection, and evaluation an instructional flow that has been shown to foster deeper learning outcomes [31]. As the next phase of the study, the media would be subjected to expert validation and refinement based on qualitative and quantitative feedback from relevant stakeholders.

Preliminary Trial

The initial product validation was conducted through an expert review process, focusing on the instructional content, linguistic clarity, and design integrity of the Flash-based learning media. Serving as the subject-matter expert was Dr. Risma Margareta Sinaga, M.S., a senior lecturer in the Master of Social Studies Education program at the University of Lampung. Her selection was based on her recognized expertise in sociology education and curriculum development, ensuring that the content review was both academically rigorous and contextually relevant. The validation process employed a standardized rubric comprising five qualitative criteria: very good, good, fair, poor, and very poor. Across all assessed dimensions, the instructional media was rated as generally "good" to "very good," indicating a high level of feasibility for classroom implementation. In the domain of instructional alignment, the expert noted that the formulation of competency standards (Standar Kompetensi) and basic competencies (Kompetensi Dasar) was accurate and appropriate, with particular commendation for the logical sequencing and relevance of the learning objectives. The clarity and specificity of the learning indicators also received very good evaluations.

In terms of content quality, the material was judged to be well-structured, technically accurate, and aligned with the intended instructional goals. The sociological concepts were presented systematically, and the test items embedded in the media were found to be relevant, clearly formulated, and consistent with the stated learning outcomes. The quiz components, which included interactive elements and automated feedback, were considered engaging and pedagogically sound. However, the expert suggested that the conceptual material could be further enriched by integrating empirical examples or case studies drawn from real-world contexts, a recommendation that aligns with Gebre and Polman [32] emphasis on the value of contextualization in instructional design. Language and linguistic aspects were also evaluated by a linguist specializing in educational media. The use of general and domain-specific vocabulary was deemed appropriate, with terms accurately reflecting standard usage in sociology education. The integration of borrowed or technical terms was handled with precision, and the text exhibited consistency in tone, clarity, and grammatical correctness. The structural composition of the text, including affixation, compounding, and sentence construction, was considered dense yet coherent an indication of mature academic writing suitable for senior secondary learners. Spelling and punctuation conformed to standard Indonesian language conventions.

Overall, the preliminary validation confirmed that the Flash-based learning media was pedagogically appropriate, linguistically accurate, and technically sound. The expert comments provided valuable guidance for refinement, particularly in enhancing the richness of content through real-life applications. These insights were subsequently incorporated into the product revision phase to improve the instructional effectiveness and learner engagement of the media. The expert trial thus served as a critical checkpoint in ensuring that the developed media met both academic and practical standards for use in formal educational settings.

Product Revision

Following the expert validation phase, the Flash-based instructional media underwent a series of targeted revisions to enhance its pedagogical effectiveness, visual appeal, and relevance to learners. Revisions were guided by feedback from three independent experts in the domains of instructional content, media design, and linguistics. The purpose of this refinement process was to ensure that the final product was both theoretically grounded and practically engaging, facilitating deeper student interaction with sociological content.

One of the primary revisions focused on the visual and aesthetic aspects of the media interface. Initially, the media included generic caricature-style illustrations depicting middle school students, which were considered less appropriate for the target audience of senior high school learners. In response, these images were replaced with photographic representations of high school students wearing typical uniforms. Although informal in tone, these updated visuals were intended to reflect the actual appearance and social context of the intended users, thereby fostering a stronger sense of identification and relevance. This adjustment is supported by the work of Kanellopoulou et al. [33], who emphasize that the personalization and contextual alignment of visual elements can significantly enhance learner engagement and reduce cognitive distance between the material and the learner.

Additionally, material experts recommended the incorporation of empirical content and real-life examples to enrich the conceptual material. In line with this suggestion, the revised media included short video clips portraying authentic sociological phenomena, such as social stratification and cultural diversity in local communities. These videos were accompanied by concise audio-narrated explanations to scaffold students' understanding of abstract concepts. This revision draws upon the findings of Kanellopoulou et al. [33], who highlights the importance of dual-channel processing in multimedia learning combining visual and auditory elements to optimize cognitive integration and retention.

To further support content clarity and conceptual reinforcement, several modules were enhanced with supplementary explanations presented in both text and audio formats. These additions aimed to address diverse learning preferences and to ensure that key sociological principles were accessible to learners with varying levels of prior knowledge. Research by AlShaikh et al. [34] affirms that well-designed explanatory content, particularly when delivered through multimedia channels, contributes to improved comprehension and learner satisfaction.

Overall, the product revision phase served as a critical step in refining the instructional media to better reflect the needs and expectations of both educators and students. The changes made not only enhanced the technical and visual design of the media but also improved the depth and authenticity of its pedagogical content. These refinements align with best practices in digital

instructional design, which emphasize iterative development cycles informed by user feedback and grounded in evidence-based learning theories.

Field Trial Results

A limited field trial was conducted to evaluate the practicality and instructional effectiveness of the Flash-based learning media. Two classes at SMKN 4 Bandar Lampung Class XI IPS 3 and Class XI IPS 4 were purposively selected based on comparable academic performance data from the previous semester. Classroom observations and teachers' assessments confirmed that both groups had relatively balanced cognitive profiles, thereby justifying their assignment as the experimental and control groups, respectively. The experimental group (XI IPS 3) received instruction using the newly developed Flash-based media, while the control group (XI IPS 4) was taught using conventional PowerPoint presentations. The intervention was carried out over the course of three instructional sessions, each lasting 90 minutes.

The implementation design of the field trial followed a refined R&D framework, integrating the developmental steps of Borg and Gall with the ASSURE instructional design model. These included needs analysis, media planning and development, expert validation, product revision, and limited testing. Prior to the classroom intervention, formative evaluations were conducted at three levels individual, small-group, and full-class trials to ensure usability, clarity, and pedagogical alignment. Feedback from these stages informed key refinements to the final media product.

During classroom implementation, the Flash-based media provided a structured yet interactive learning environment. It incorporated cooperative learning strategies, particularly the TGT model, where students worked in groups to engage with interactive quizzes and discussion games. This format not only stimulated competitive motivation but also encouraged collaborative meaning-making among peers. Students were actively involved in reading digital content, watching animated social phenomena, responding to quiz questions, and presenting discussion results in front of their peers. This active learning structure was designed to build foundational knowledge, foster critical thinking, and improve communication skills objectives consistent with constructivist pedagogy [35], [36], [37].

The pedagogical rationale for integrating rich media content was grounded in Dale's Cone of Experience, which emphasizes that learners retain more information when they see, hear, and do rather than just read or listen [38]. The Flash-based media utilized visual simulations, audio narration, and interactive assessments to optimize multisensory engagement. This approach aligns with Mayer [39] multimedia learning theory, which advocates for the integration of verbal and visual channels to enhance cognitive processing.

Additionally, the media included complete instructional components such as Competency Standards (SK), Basic Competencies (KD), learning indicators, and evaluation tools designed to meet the demands of the 2013 Indonesian national curriculum. Unlike traditional methods that often isolate content delivery from learner interactivity, the Flash-based media provided an integrated learning path from conceptual exposure to application and assessment.

The field trial revealed several practical advantages. First, the sequential structure of the media encouraged students to stay focused and follow each step in the learning process. Second, the embedded discussion prompts and competitive quizzes significantly enhanced student participation. Third, the modular nature of the media allowed for teacher adaptability, enabling modifications based on class context, student characteristics, and learning goals. These findings are

consistent with research by Li et al. [40], which demonstrated that gamified educational environments increase student motivation, task completion rates, and perceived enjoyment.

In summary, the field trial confirmed that the Flash-based learning media was not only technically functional but also pedagogically impactful. It supported the development of student engagement, critical reflection, peer collaboration, and learner autonomy. The trial outcomes suggest that this media holds considerable potential for broader application in sociology education, especially in contexts where students require more dynamic and interactive instructional support.

Discussion

The results of the field trial indicate that the Flash-based learning media significantly enhanced student engagement, interest, and participation in the sociology classroom. These outcomes align with the broader body of literature emphasizing the impact of interactive multimedia in facilitating meaningful learning experiences. In particular, the structured integration of visual, auditory, and interactive elements within the Flash-based platform supported active learning and allowed students to engage with sociological content beyond surface-level memorization.

One of the most notable outcomes of the intervention was the observed increase in students' motivation to participate in class activities. The use of gamified features such as spin games and team-based quizzes introduced a sense of challenge and competition that helped sustain attention throughout the lessons. This aligns with Sailer and Homner [41], who argue that gamification in educational settings fosters behavioral engagement, goal-directed learning, and social interaction. The cooperative learning format embedded in the media specifically the Team Games Tournament model further promoted collaborative knowledge construction, consistent with Kwangmuang et al. [42] findings on the effectiveness of structured group learning in developing higher-order thinking and interpersonal skills.

In terms of conceptual understanding, the Flash-based media helped demystify complex sociological concepts such as social structure, stratification, and cultural pluralism. By presenting abstract ideas through animated simulations and real-life case videos, the media facilitated the formation of cognitive models and improved retention. This finding is supported by Mayer [39] cognitive theory of multimedia learning, which posits that learners benefit most when verbal and visual inputs are integrated in ways that minimize extraneous cognitive load and promote generative processing.

Another significant implication of this study lies in the flexibility and adaptability of the media. Teachers reported that the media components especially the quiz, reference, and assignment modules were easy to integrate into existing lesson plans and could be modified to match student profiles and classroom contexts. This is consistent with findings by Mesutoglu et al. [43], who emphasize the importance of modular and customizable instructional design in improving implementation feasibility at the classroom level.

Moreover, the increase in student autonomy and confidence observed in the experimental group is particularly noteworthy. The Flash-based environment encouraged students to read independently, explore the content at their own pace, and present their understanding in group settings. These elements support the principles of self-regulated learning [44], indicating that well-designed digital media can serve not only as content delivery tools but also as enablers of metacognitive growth.

While the study demonstrated clear benefits, it also highlighted challenges, such as the need for sufficient infrastructure (projectors, speakers, and internet access) and teacher training to maximize the instructional impact of the media. As Gouseti et al. [45] observed, the effectiveness of technology-enhanced learning is often contingent upon institutional readiness and teacher digital literacy. Therefore, any attempt to scale up the implementation of such media must be accompanied by systemic support and professional development initiatives.

In conclusion, the findings suggest that Flash-based instructional media, when designed based on instructional theory and validated through iterative trials, can transform traditionally passive learning environments into interactive, student-centered spaces. The media's alignment with national curriculum standards, combined with its usability and pedagogical depth, positions it as a viable solution for enhancing the quality of social science education in secondary schools.

CONCLUSION

This study developed Flash-based learning media using the Cooperative Learning model to improve student engagement and motivation in sociology education at SMK Negeri 4 Bandar Lampung. The evaluation of the media's effectiveness was conducted through expert assessments and field trials, which confirmed the tool's pedagogical and technical suitability. The results indicate that the Flash-based learning media is highly effective in fostering students' interest in learning, as evidenced by significant improvements in engagement compared to conventional PowerPoint-based instruction. The multimedia nature of the tool integrating visual, auditory, and interactive elements enhanced students' understanding of abstract sociological concepts, facilitating a deeper and more engaging learning experience. Thus, the Flash-based learning media developed in this study offers a promising solution for enhancing student motivation and learning outcomes in vocational education settings. Its potential for broader application in sociology and other social science disciplines warrants further exploration and adaptation to diverse educational contexts.

LIMITATIONS

While this study provides valuable insights into the development and effectiveness of Flash-based learning media, several limitations should be considered. First, the study was conducted at a single vocational high school (SMK Negeri 4 Bandar Lampung), which may limit the generalizability of the findings to other educational contexts or institutions with different student demographics or resources. Second, the sample size was relatively small, consisting of only two classes, which may not fully represent the broader student population. Future research should include larger, more diverse samples to validate the findings across different educational settings. Additionally, the effectiveness of the Flash-based media was primarily assessed through student engagement and interest, while its long-term impact on academic performance and conceptual understanding remains unexplored. Future studies should consider longitudinal assessments to measure sustained learning outcomes. Lastly, the study did not examine the potential challenges teachers might face in integrating such technology into their teaching practices, including technical constraints and the need for teacher training. These factors should be addressed in future research to ensure successful implementation on a larger scale.

AUTHOR INFORMATION

Corresponding Author

Febby Rullya Rasyid – Sekolah Menengah Atas Negeri 4 Bandar Lampung, Lampung (Indonesia).
orcid.org/0009-0006-0913-0807
Email: rully.febby_r@gmail.com

Authors

Febby Rullya Rasyid – Sekolah Menengah Atas Negeri 4 Bandar Lampung, Lampung (Indonesia).
orcid.org/0009-0006-0913-0807
Email: rully.febby_r@gmail.com

Tubagus Ali Rachman Puja Kesuma – Department of Social Studies Education, Universitas Islam Negeri Jurai Siwo Lampung (Indonesia).
orcid.org/0009-0004-2683-8933
Email: tubagus.ali.rachman@metrouniv.ac.id

Karsiwan – Department of Social Studies Education, Universitas Islam Negeri Jurai Siwo Lampung (Indonesia).
orcid.org/0009-0004-2683-8933
Email: karsiwan@metrouniv.ac.id

AUTHOR CONTRIBUTION

The author used several generative AI tools in the process. ChatGPT was used to help organise complex concepts, while Grammarly was employed to enhance the grammar, style, readability of the text and improve the overall clarity of the writing. Although these tools provided valuable support, the researcher wrote all the content and conclusions.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DECLARATION OF USE OF AI IN SCIENTIFIC WRITING

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REFERENCES

[1] M. Ssenyonga, "Imperatives for post COVID-19 recovery of Indonesia's education, labor, and SME sectors," *Cogent Econ. Financ.*, vol. 9, no. 1, Jan. 2021. https://doi.org/10.1080/23322039.2021.1911439

[2] T. Zhao, J. Zhu, Z. Jian, X. Zhou, S. Yang, and P. Zhang, "Developing an Effective System for Engineering Management Education: A Teaching Practice and Evaluation Perspective," *Educ. Sci.*, vol. 14, no. 12, p. 1412, Dec. 2024. https://doi.org/10.3390/educsci14121412

[3] L. Cao, "A study of project-based learning to intermediate EFL learners in reading class:

enhancing self-regulated learning of post-secondary students in Macao," *Asian-Pacific J. Second Foreign Lang. Educ.*, vol. 9, no. 1, p. 71, Oct. 2024. https://doi.org/10.1186/s40862-024-00298-6

[4] Kupferberg and G. Hasler, "The social cost of depression: Investigating the impact of impaired social emotion regulation, social cognition, and interpersonal behavior on social functioning," *J. Affect. Disord. Reports*, vol. 14, p. 100631, Dec. 2023. https://doi.org/10.1016/j.jadr.2023.100631

[5] J. Li and E. Xue, "Dynamic Interaction between Student Learning Behaviour and Learning Environment: Meta-Analysis of Student Engagement and Its Influencing Factors," *Behav. Sci. (Basel).*, vol. 13, no. 1, p. 59, Jan. 2023. https://doi.org/10.3390/bs13010059

[6] R. Tarlov and M. P. Debbink, Eds., *Investing in Early Childhood Development*. New York: Palgrave Macmillan US, 2008. https://doi.org/10.1057/9780230610415

[7] M. Chen, Z. Wang, L. Liang, Z. Ma, and Y. Liu, "Typical Practical Cases in Blended Learning," in *Handbook of Educational Reform Through Blended Learning*, Singapore: Springer Nature Singapore, 2024, pp. 231-378. https://doi.org/10.1007/978-981-99-6269-3_6

[8] C. B. De Lima, S. Walton, and T. Owen, "A critical outlook at augmented reality and its adoption in education," *Comput. Educ. Open*, vol. 3, p. 100103, Dec. 2022. https://doi.org/10.1016/j.caeo.2022.100103

[9] F. Dahalan, N. Alias, and M. S. N. Shaharom, "Gamification and Game Based Learning for Vocational Education and Training: A Systematic Literature Review," *Educ. Inf. Technol.*, vol. 29, no. 2, pp. 1279-1317, Feb. 2024. https://doi.org/10.1007/s10639-022-11548-w

[10] B. L. Moorhouse and L. Yan, "Use of Digital Tools by English Language Schoolteachers," *Educ. Sci.*, vol. 13, no. 3, p. 226, Feb. 2023. https://doi.org/10.3390/educsci13030226

[11] D. R. Joshi, J. Khanal, K. P. S. Chapai, and K. P. Adhikari, "The impact of digital resource utilization on student learning outcomes and self-efficacy across different economic contexts: A comparative analysis of PISA, 2022," *Int. J. Educ. Res. Open*, vol. 8, p. 100443, Jun. 2025. https://doi.org/10.1016/j.ijedro.2025.100443

[12] Z. ur Rehman, "Trends and Challenges of Technology-Enhanced Learning in Geotechnical Engineering Education," *Sustainability*, vol. 15, no. 10, p. 7972, May 2023. https://doi.org/10.3390/su15107972

[13] Almufarreh and M. Arshad, "Promising Emerging Technologies for Teaching and Learning: Recent Developments and Future Challenges," *Sustainability*, vol. 15, no. 8, p. 6917, Apr. 2023. https://doi.org/10.3390/su15086917

[14] M. M. Kassa, M. K. Azene, S. M. Mengstie, and M. W. Ferede, "Effect of using multimedia and dynamic classroom integrated instruction on grade 11 students' biology academic achievement," *Heliyon*, vol. 10, no. 18, p. e37315, Sep. 2024. https://doi.org/10.1016/j.heliyon.2024.e37315

[15] C.-H. Lai and P.-Y. Hu, "The Gaming Revolution in History Education: The Practice and Challenges of Integrating Game-Based Learning into Formal Education," *Information*, vol. 16, no. 6, p. 490, Jun. 2025. https://doi.org/10.3390/info16060490

[16] S. Ö. Şanal, T. D. Güler, and F. Torun, "Supporting learning difficulties with e-book based on context-based teaching strategy from social perspective: design and experience," *Educ. Inf. Technol.*, vol. 30, no. 11, pp. 14661-14702, Jul. 2025. https://doi.org/10.1007/s10639-024-13314-6

[17] M. Won et al., "Diverse approaches to learning with immersive Virtual Reality identified from a systematic review," *Comput. Educ.*, vol. 195, p. 104701, Apr. 2023. https://doi.org/10.1016/j.compedu.2022.104701
[18] M. Nadeem, M. Oroszlanyova, and W. Farag, "Effect of Digital Game-Based Learning on Student Engagement and Motivation," *Computers*, vol. 12, no. 9, p. 177, Sep. 2023. https://doi.org/10.3390/computers12090177
[19] J. T. Wong, E. Chen, N. Au-Yeung, B. S. Lerner, and L. E. Richland, "Fostering engaging online learning experiences: Investigating situational interest and mind-wandering as mediators through learning experience design," *Educ. Inf. Technol.*, vol. 29, no. 14, pp. 18789-18815, Oct. 2024. https://doi.org/10.1007/s10639-024-12524-2
[20] S. Al-Amri, S. Hamid, N. F. M. Noor, and A. Gani, "A framework for designing interactive mobile training course content using augmented reality," *Multimed. Tools Appl.*, vol. 82, no. 20, pp. 30491-30541, Aug. 2023. https://doi.org/10.1007/s11042-023-14561-4
[21] N. Mizan, M. Aridan, M. Akmansyah, S. Adelia, I. N. Asiyah, and L. M. Sholikha, "The Development of Arabic Learning Media Based on Android for Senior High School Students," *LISANIA J. Arab. Educ. Lit.*, vol. 6, no. 2, pp. 178-189, Dec. 2022. https://doi.org/10.18326/lisania.v6i2.178-189
[22] X. Fang, D. T. K. Ng, J. K. L. Leung, and H. Xu, "The applications of the ARCS model in instructional design, theoretical framework, and measurement tool: a systematic review of empirical studies," *Interact. Learn. Environ.*, vol. 32, no. 10, pp. 5919-5946, Nov. 2024. https://doi.org/10.1080/10494820.2023.2240867
[23] J. Pan, N. A. Ishak, and Y. Qin, "The application of Moore's online learning interactions model in learning outcomes: The SOR (stimulus-organism-response) paradigm perspective," *Heliyon*, vol. 10, no. 7, p. e28505, Apr. 2024. https://doi.org/10.1016/j.heliyon.2024.e28505
[24] L. Shahrzadi, A. Mansouri, M. Alavi, and A. Shabani, "Causes, consequences, and strategies to deal with information overload: A scoping review," *Int. J. Inf. Manag. Data Insights*, vol. 4, no. 2, p. 100261, Nov. 2024. https://doi.org/10.1016/j.jjimei.2024.100261
[25] J. A. Delello, W. Sung, K. Mokhtari, J. Hebert, A. Bronson, and T. De Giuseppe, "AI in the Classroom: Insights from Educators on Usage, Challenges, and Mental Health," *Educ. Sci.*, vol. 15, no. 2, p. 113, Jan. 2025. https://doi.org/10.3390/educsci15020113
[26] S. W. Wong and P. Crowe, "Cognitive ergonomics and robotic surgery," *J. Robot. Surg.*, vol. 18, no. 1, p. 110, Mar. 2024. https://doi.org/10.1007/s11701-024-01852-7
[27] E. Pietroni and D. Ferdani, "Virtual Restoration and Virtual Reconstruction in Cultural Heritage: Terminology, Methodologies, Visual Representation Techniques and Cognitive Models," *Information*, vol. 12, no. 4, p. 167, Apr. 2021. https://doi.org/10.3390/info12040167
[28] L. Jaramillo-Mediavilla, A. Basantes-Andrade, M. Cabezas-González, and S. Casillas-Martín, "Impact of Gamification on Motivation and Academic Performance: A Systematic Review," *Educ. Sci.*, vol. 14, no. 6, p. 639, Jun. 2024. https://doi.org/10.3390/educsci14060639
[29] L. Morrison and M. Jacobsen, "The role of feedback in building teaching presence and student self-regulation in online learning," *Soc. Sci. Humanit. Open*, vol. 7, no. 1, p. 100503, 2023. https://doi.org/10.1016/j.ssaho.2023.100503
[30] D. Leiss, T. Ehmke, and L. Heine, "Reality-based tasks for competency-based education: The need for an integrated analysis of subject-specific, linguistic, and contextual task features," *Learn. Individ. Differ.*, vol. 114, p. 102518, Aug. 2024.

https://doi.org/10.1016/j.lindif.2024.102518
[31] E. Schafer, "Trauma in Schools: A Review of the Impact of Childhood Trauma and Assessment of a Potential Intervention," *OBM Integr. Complement. Med.*, vol. 09, no. 02, pp. 1-40, May 2024. https://doi.org/10.21926/obm.icm.2402030
[32] E. H. Gebre and J. L. Polman, "From 'context' to 'active contextualization': Fostering learner agency in contextualizing learning through science news reporting," *Learn. Cult. Soc. Interact.*, vol. 24, p. 100374, Mar. 2020. https://doi.org/10.1016/j.lcsi.2019.100374
[33] C. Kanellopoulou, K. L. Kermanidis, and A. Giannakoulopoulos, "The Dual-Coding and Multimedia Learning Theories: Film Subtitles as a Vocabulary Teaching Tool," *Educ. Sci.*, vol. 9, no. 3, p. 210, Aug. 2019. https://doi.org/10.3390/educsci9030210
[34] R. AlShaikh, N. Al-Malki, and M. Almasre, "The implementation of the cognitive theory of multimedia learning in the design and evaluation of an AI educational video assistant utilizing large language models," *Heliyon*, vol. 10, no. 3, p. e25361, Feb. 2024. https://doi.org/10.1016/j.heliyon.2024.e25361
[35] Hanif, . H., A. Mudinillah, and P. W. L. Rahmi, "Development of the QUIZIZZ Platform as an Interactive Quiz-Based Learning Media for Arabic Language Lessons at Madrasah IBTIDAIYAH," *Int. J. Membr. Sci. Technol.*, vol. 10, no. 2, pp. 372-384, Jun. 2023. https://doi.org/10.15379/ijmst.v10i2.1207
[36] F. W. R. Kembaren, A. K. Hasibuan, and A. Natasya, "Technology trends in translation: A comparative analysis of machine and human translation," *Absorbent Mind J. Psychol. Child Dev.*, vol. 3, no. 2, pp. 169-183, 2023. https://doi.org/10.37680/absorbent_mind.v3i2.4486
[37] M. J. C. Caramay, R. V. Maningas, A. D. Yazon, K. A. Manaig, and J. F. B. Tesoro, "Lived Experiences of English Literature Teachers in A Digitalized Classroom: A Phenomenological Study," *J. English as A Foreign Lang. Teach. Res.*, vol. 3, no. 2, pp. 1-13, Sep. 2023. https://doi.org/10.31098/jefltr.v3i2.1695
[38] L. Sun, "Cultivating critical global citizens through secondary EFL education: a case study of mainland China," *Literacy*, vol. 57, no. 3, pp. 249-261, Sep. 2023. https://doi.org/10.1111/lit.12314
[39] R. E. Mayer, "The Past, Present, and Future of the Cognitive Theory of Multimedia Learning," *Educ. Psychol. Rev.*, vol. 36, no. 1, p. 8, Mar. 2024. https://doi.org/10.1007/s10648-023-09842-1
[40] L. Li, K. F. Hew, and J. Du, "Gamification enhances student intrinsic motivation, perceptions of autonomy and relatedness, but minimal impact on competency: a meta-analysis and systematic review," *Educ. Technol. Res. Dev.*, vol. 72, no. 2, pp. 765-796, Apr. 2024. https://doi.org/10.1007/s11423-023-10337-7
[41] M. Sailer and L. Homner, "The Gamification of Learning: a Meta-analysis," *Educ. Psychol. Rev.*, vol. 32, no. 1, pp. 77-112, Mar. 2020. https://doi.org/10.1007/s10648-019-09498-w
[42] P. Kwangmuang, S. Jarutkamolpong, W. Sangboonraung, and S. Daungtod, "The development of learning innovation to enhance higher order thinking skills for students in Thailand junior high schools," *Heliyon*, vol. 7, no. 6, p. e07309, Jun. 2021. https://doi.org/10.1016/j.heliyon.2021.e07309
[43] C. Mesutoglu, S. Stollman, and I. Lopez Arteaga, "Principles and practices of modular course design in higher engineering education," *Int. J. Inf. Learn. Technol.*, vol. 41, no. 2, pp. 153-165, Apr. 2024. https://doi.org/10.1108/IJILT-05-2023-0061

[44] H. Yaseen, A. S. Mohammad, N. Ashal, H. Abusaimeh, A. Ali, and A.-A. A. Sharabati, "The Impact of Adaptive Learning Technologies, Personalized Feedback, and Interactive AI Tools on Student Engagement: The Moderating Role of Digital Literacy," *Sustainability*, vol. 17, no. 3, p. 1133, Jan. 2025. https://doi.org/10.3390/su17031133

[45] Gouseti, M. Lakkala, J. Raffaghelli, M. Ranieri, A. Roffi, and L. Ilomäki, "Exploring teachers' perceptions of critical digital literacies and how these are manifested in their teaching practices," *Educ. Rev.*, vol. 76, no. 7, pp. 1751-1785, Nov. 2024. https://doi.org/10.1080/00131911.2022.2159933