
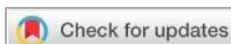


Enhancing Students' Literacy with the Transformation of Local History and Culture Materials into Whiteboard Animation Based on the Bengkulu Provincial Museum Collection

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Abstract

Background: Effective pedagogy requires innovative media to enhance student literacy and contextual understanding, particularly in local history and culture. This community service project addresses the need for engaging teaching methods by utilizing whiteboard animation to transform collections from the Bengkulu Provincial Museum into accessible learning resources.

Aims: This study aims to enhance student literacy in local history and culture and simultaneously strengthen teachers' digital media development competence through the implementation of whiteboard animation-based learning media.

Method: The activity was conducted at SMP Negeri 02 Kota Bengkulu, employing three key stages: observation, socialization, and evaluation. The socialization included hands-on training for teachers on creating digital media (using Canva and SpeedPaint) and presenting the new historical content to students. The effectiveness of the learning intervention was quantitatively assessed using the Normalized Gain (N-Gain) method.

Results: The intervention yielded significant positive outcomes. Teachers' professional competence in digital animation increased by 60 percentage points, and their satisfaction was 4.6/5. For students, the average literacy score increased by 31.7%, resulting in an N-Gain value of 0.53 (moderate effectiveness). Furthermore, student participation and satisfaction were very high (4.7/5).

Conclusion: Whiteboard animation has proven to be an effective and engaging learning model that successfully enhances student literacy while simultaneously supporting the preservation of local history and cultural values in a manner relevant to the digital era.

A. Introduction

The level of community literacy in Indonesia shows a gap between regions. Based on the 2025 Indonesian Statistical Book data, the value of the Community Literacy Development Index (IPLM) for Bengkulu Province in 2024 was recorded at 65.96, while the national average reached 73.52 (BPS Indonesia, 2025). This index is influenced by several component elements of the index, including library service equalization with a value of 0.6097, collection adequacy at 0.2859, and library staff adequacy at 0.4734 in Bengkulu Province (BPS Indonesia, 2025). These values indicate that the availability of literacy-supporting facilities

in Bengkulu is still suboptimal. This condition illustrates that efforts to improve community literacy through the education sector need to be strengthened to encourage equitable access to information and the development of the quality of human resources that are adaptive to technological and scientific advancements (Turiman et al., 2017).

The low level of literacy in Bengkulu Province, as reflected by the IPLM value, indicates that the problem of literacy is not only related to the availability of facilities but also to the quality of the learning process (Van Deursen & Van Dijk, 2016). Literacy can be defined as an individual's ability to utilize their potential and skills to process, understand, and use information through reading and writing activities (Noak et al., 2022). Literacy skills are an essential foundation in the learning process because they play a role in shaping critical, creative, and communicative mindsets in students. However, in reality, the literacy level of students in Indonesia, including Bengkulu, is still considered low. One of the causes is that the learning methods tend to be monotonous and have not yet utilized engaging and interactive learning media (Pebriana & Nurhaswinda, 2025). This also occurs at the Junior High School (SMP) level.

The improvement of literacy at the Junior High School (SMP) level needs to be directed toward utilizing innovative learning media that can foster students' interest in learning. Integrating technology into learning can be an effective alternative for creating a more active, enjoyable, and meaningful learning atmosphere. Technology-based learning media such as interactive animations, educational videos, and digital learning applications have the potential to help students understand the material more deeply while simultaneously enhancing their literacy skills.

One interactive medium that can be used is whiteboard animation. Whiteboard animation is a type of animation that displays images on a whiteboard using hand-drawn illustrations (Kharissidqi & Firmansyah, 2022; Mulawarman et al., 2023). Whiteboard animation creates an effect where images and text appear gradually, making it seem as if the illustrator or presenter is drawing the pictures live (Taufiq et al., 2022; Xing, 2011). This animation is often used in educational videos. The elements contained within this animation are combined with images, sound, and design that support the learning material for students. When these two concepts are combined, whiteboard animation becomes an animation method that simulates the gradual process of writing or drawing on a whiteboard (Ani et al., 2025; Maranatha et al., 2024).

Whiteboard animation is a step that teachers can use to deliver learning material easily. This is because whiteboard animation videos are simple and easy for students to understand. According to a community service activity (Nurrahmah et al., 2021), the presence of whiteboard animation as interactive learning can attract students' interest in learning. Through whiteboard animation, teachers can deliver learning material in a more creative and interactive way using images drawn digitally on a virtual whiteboard (Taufiq et al., 2022). Therefore, whiteboard animation can be used as an effective alternative learning medium to enhance students' understanding and interest.

Besides encouraging the enhancement of literacy, the development of whiteboard animation can also be a means of preserving historical values and local culture. Bengkulu Province possesses a wealth of cultural heritage stored in the Bengkulu Provincial Museum, such as historical relics, traditional artifacts, and ancient manuscripts that have high educational value. These materials have not been fully utilized as contextual learning resources in schools. The transformation of museum collections into digital learning media allows students to learn about their regional history and culture in a more engaging and interactive way (Hayashi et al., 2022; Meng et al., 2022; Tsiviltidou, 2015). This approach not only strengthens students' literacy but also fosters a sense of love for the identity and local cultural heritage of Bengkulu (Lee et al., 2013). Therefore, this research is important to conduct as an effort to improve student literacy while simultaneously preserving historical values and local culture through the development of whiteboard animation learning media based on the Bengkulu Provincial Museum collection (Noak et al., 2022). This innovation is expected to be able to create a learning process that is more contextual, interactive, and relevant to the development of the digital era.

B. Methods

The implementation of the activity was carried out through three main stages: observation, socialization, and evaluation, with the following descriptions (Figure 1).



Figure 1. Community Service Implementation Method

1. The Observation Stage

This stage was carried out as an initial step to determine the baseline condition of students' literacy levels and the learning methods implemented in the school. The community service team conducted direct observation at SMP Negeri 02 Kota Bengkulu and discussed with teachers to identify challenges in the learning process, especially those related to the understanding of local history and culture materials. The observation results served as the basis for preparing the socialization material and strategy to ensure it aligns with the needs and characteristics of the participants (Zamahsari et al., 2020).

2. The Socialization Stage

The socialization for teachers focused on presenting the concept of whiteboard animation as an interactive learning medium that can be utilized to increase students' interest and understanding. The implementing team provided an explanation of the simple steps for creating whiteboard animation (Zhang, 2023), ranging from script development to audio and visual synchronization, so that teachers can adapt it in teaching and learning activities using Canva and SpeedPaint applications, along with other supporting tools. Teachers were also provided with a premium SpeedPaint account so they could immediately create the learning videos they desire.

The socialization for students was carried out by presenting local history and culture materials from Bengkulu that had been developed in the form of whiteboard animation based on the Bengkulu Provincial Museum collection. Through this activity, students were invited to understand the historical and cultural values of their region in a more contextual, engaging, and enjoyable way. The activity concluded with an interactive question-and-answer session between the implementing team and the students to deepen their understanding of the material presented (Nasution, 2021).

3. Evaluation Stage

This stage was carried out to review the results of the socialization activity and the responses from participants, both teachers and students. Through a brief discussion and question-and-answer session, the implementing team gained insight into the effectiveness of using whiteboard animation as a learning medium and the potential for its sustainable application in schools (Ghosh et al., 2024; Wang et al., 2022). This stage served as the basis for the team to formulate recommendations and plan for the development of similar activities in the future.

The effectiveness of the learning media was measured using the Normalized Gain (N-Gain) score. The formula for calculating N-Gain is shown in Equation 1:

$$g = \frac{(\text{Post Test Score} - \text{Pre Test Score})}{(\text{Ideal Maximum Score} - \text{Pre Test Score})} \quad (1)$$

The N-Gain value ranges from 0 to 1, with the commonly used interpretation criteria being: low ($0.00 \leq g \leq 0.30$), moderate ($0.31 \leq g \leq 0.70$), and high ($0.71 \leq g \leq 1.00$).

C. Results and Discussion

1. Results

The community service activity was carried out at SMP Negeri 02 Kota Bengkulu, located at Jl. Cendana 1 Sawah Lebar Kota Bengkulu, Padang Jati, Kec. Ratu Samban, Kota Bengkulu, Bengkulu. The activity took place on Friday, September 12, 2025. The event was led by three lecturers and two students. The selection of this location was based on initial observation results, which indicated the need to enhance student literacy, particularly in understanding local history and culture material through a more engaging and interactive learning media-based approach (Li & Wang, 2019; Otsuka, 2021; Shi et al., 2022). Therefore, this activity was designed to introduce a more appealing and interactive learning approach by utilizing whiteboard animation media based on the Bengkulu Provincial Museum collection.

The series of activities was divided into two sessions: the first session focused on the socialization of how to create learning media using whiteboard animation for the teachers, and the second session, attended by

the students, focused on the transformation of local history and culture material based on the Bengkulu Provincial Museum collection. Both sessions aimed to enhance the teachers' ability to develop innovative learning media and to foster students' interest and literacy through the presentation of more engaging and contextual material. The entire series of activities was interactive, where participants not only received theoretical material but also had the opportunity to discuss and provide feedback related to the implementation of the learning media within their school environment.

The activity began with an opening session led by Mr. Andang Wijanarko, as the representative of the community service team. Following that, Ms. Aprianti Weda Densi gave a welcoming speech as the Vice Principal of SMP Negeri 02 Kota Bengkulu, fully supporting the community service event. This opening activity became a moment to provide an overview of the service's objectives and to generate participant enthusiasm before moving into the material presentation session.

The socialization for the teachers of SMP Negeri 02 Kota Bengkulu was conducted using the lecture method. The material was presented by the Head of Community Service, Mr. Yudi Setiawan, regarding the steps for creating learning media using whiteboard animation. The teachers were exposed to a detailed process of making whiteboard animation, starting from material preparation using the Canva application to the use of the SpeedPaint application, accompanied by supporting tools such as the remove.bg website and Pinterest for image asset searching.



Figure 2. Presentation of Whiteboard Animation Creation Material

During the socialization session, the teachers showed high enthusiasm in following every stage of whiteboard animation creation, as shown in Figure 2. They actively asked questions regarding the steps presented by the speaker. This activity provided not only conceptual understanding of digital learning media but also practical experience that can be applied in classroom teaching and learning activities.

To help the teachers better understand the learning material presented, the community service team provided a module book detailing the procedures for creating whiteboard animation, which discusses in detail every step that was explained by the speaker. The teachers could use this module when they intended to create a learning video using whiteboard animation. The community service team also provided a premium SpeedPaint account to the teachers so they could immediately apply the whiteboard animation creation methods that were previously explained.



Figure 3. Symbolic Handover of the Whiteboard Animation Module to a Teacher at SMP Negeri 02 Kota Bengkulu

The purpose of providing this module and premium SpeedPaint account was to enable teachers to develop creativity in presenting learning materials independently. This support is expected not only to enrich

teaching methods but also to be the initial step in creating technology-based learning innovations at SMP Negeri 02 Kota Bengkulu. With this access and guidance, teachers have the opportunity to create learning media that are more engaging, effective, and relevant to the needs of students in the digital era. As a symbolic gesture, the handover of the whiteboard animation module was performed to one of the teachers at SMP Negeri 02 Kota Bengkulu, which can be seen in Figure 3. This step is an important part of the effort to improve the quality of learning in the school.

The socialization session for the teachers of SMP Negeri 02 Kota Bengkulu proceeded smoothly and with great enthusiasm. The teachers gained new insight into the use of whiteboard animation as a learning medium, as well as practical resources in the form of a guide module and premium SpeedPaint account access. This support is expected to encourage teachers to develop learning methods relevant to the needs of students in the digital era. The socialization session for the teachers concluded with a group photo as a form of documentation, as shown in Figure 4, and appreciation for their active participation in this community service activity.



Figure 4. Group Photo with Teachers of SMP Negeri 02 Kota Bengkulu

The second session of the community service was held specifically for the students of SMP Negeri 02 Kota Bengkulu. This activity aimed to introduce the concept of transforming local history and culture material into whiteboard animation based on the Bengkulu Provincial Museum collection. The material was delivered using an engaging and interactive approach so that students could understand the historical values and culture of their region more deeply. The material presentation was also supplemented with visual examples of whiteboard animation as a learning medium, allowing students to see firsthand how the concept was implemented.



Figure 5. Material Presentation to the Students

Student participation in this session was very active. Many students asked questions related to the local history and culture material as well as the process of creating the whiteboard animation. This enthusiasm demonstrated their interest in interactive and contextual learning methods.



Figure 6. Group Photo with the Students of SMP Negeri 02 Kota Bengkulu

The second session concluded with a group photo as a form of documentation and appreciation for the students' enthusiasm in participating in this community service activity, as shown in Figure 6. This activity is expected to foster students' interest in learning local history and culture material while also motivating them to utilize digital learning media creatively in the future. The students' active participation serves as an indicator of the success of this activity in creating an interactive and meaningful learning atmosphere.

The evaluation of this community service program was directed at measuring the achievement and effectiveness of the program in realizing the specific goals set, namely the improvement of local history and culture literacy through the implementation of whiteboard animation-based digital learning media. The evaluation method used is a quantitative approach, focusing on the measurement of empirical outcomes in two main target groups: students and educators at SMP Negeri 02 Kota Bengkulu. This quantitative measurement was carried out using test and questionnaire instruments to collect empirical data regarding the increase in student literacy and the improvement of educators' professional competence in developing digital learning media. The selection of this approach aims to ensure an objective, measurable, and comparative interpretation of the evaluation results between the pre-activity (pre-test) and post-activity (post-test) conditions. Therefore, the quantitative evaluation provides a strong scientific basis for assessing the effectiveness of the service intervention as well as the potential for adaptation or replication in similar educational contexts.

The analysis of relative improvement, known as Normalized Gain (N-Gain), is an inferential method used to evaluate the effectiveness of a learning intervention. This method works by comparing the actual increase in learning outcomes with the maximum increase that can theoretically be achieved (Hystad et al., 2021).

The results of the pre-test and post-test analysis are presented in Table 1. The data shows that the average student score increased from 62.5 to 82.3. Based on the calculation using Equation 1, the N-Gain value is 0.53, which indicates a moderate level of effectiveness in improving student literacy, yet it tends to approach the high category. This indicates that the implementation of the whiteboard animation-based learning method proved to be quite effective in facilitating the improvement of student comprehension of local history and culture materials. The main advantage of the N-Gain analysis lies in its ability to normalize the score gain by accounting for the initial potential for increase (pre-test score), thereby producing a measure of intervention effectiveness that is more objective and comparatively valid than merely assessing the absolute score difference.

The evaluation of this community service program was carried out with the aim of assessing the level of achievement and the effectiveness of the intervention in reaching the main objective, namely the enhancement of local history and culture literacy through the application of whiteboard animation-based digital learning media. The evaluation process utilized a quantitative approach, focused on measuring the empirical outcomes of students and educators at SMP Negeri 02 Kota Bengkulu. Data collection was performed using test and questionnaire instruments as measuring tools that allowed for an objective, measurable, and comparative assessment between the conditions before the activity (pre-test) and after the activity (post-test). This approach was chosen to ensure that the evaluation results scientifically reflect the program's effectiveness and can serve as a basis for developing similar learning models in the future. The quantitative calculation results of the community service activity are shown in Table 1.

Table 1. Quantitative Analysis of Community Service Activity Results

No.	Aspect Assessed	Quantitative Result
1	Average student pre-test score	62.5
2	Average student post-test score	82.3

No.	Aspect Assessed	Quantitative Result
3	Average score increase	31.7%
4	Teachers understanding of digital animation before training	25%
5	Teachers understanding of digital animation after training	85%
6	Increase in teacher competence	60%
7	Students actively asking questions and discussing	78%
8	Students interested in local history and culture material	85%
9	Students state learning is more enjoyable	92%
10	Teacher satisfaction with the activity (scale 1–5)	4.6 (Very satisfied)
11	Student satisfaction with the activity (scale 1–5)	4.7 (Very satisfied)

The results from the indicators of success for the community service activity are shown in Table 2.

Table 2. Success Indicators for Community Service Activity Results

Success Indicator	Quantitative Result	Interpretation
Increase in average student literacy score	62.5 → 82.3 (+31.7%)	Students show a better understanding of local history and culture material.
Increase in teacher competence in digital media creation	25% → 85% (+60 percentage points)	The training successfully transferred practical skills for creating whiteboard animation.
Student enthusiasm and participation	78% actively discussing and 85% interested	Visual media triggers curiosity and student involvement.
Level of teacher satisfaction	4.6/5 (very satisfied)	Teachers feel the activity is relevant to the learning needs of the digital era.
Level of student satisfaction	4.7/5 (very satisfied)	Students feel the new method is more engaging and easier to understand.

2. Discussion

The success analysis of this community service program provides comprehensive evidence of how whiteboard animation-based media effectively transforms local history education. As demonstrated by the success indicators in Table 2, the program achieved significant milestones in both student literacy and teacher professional competence. The quantitative findings, particularly the N-Gain score of 0.53, confirm that this intervention provides a moderate yet substantial improvement in cognitive understanding. This suggests that the visual-narrative nature of whiteboard animation successfully bridges the gap between abstract historical artifacts and student comprehension.

Furthermore, the high level of participant satisfaction (average score 4.5) and the 60-percentage-point increase in teacher competence reflect the program's practical relevance. Unlike traditional methods, this approach empowered educators at SMP Negeri 02 Kota Bengkulu to overcome technological barriers using accessible tools like Canva and SpeedPaint. These results affirm that the program not only improved immediate learning outcomes but also fostered a sustainable pedagogical innovation. Therefore, this model serves as a potentially scalable framework for integrating cultural heritage into the modern digital classroom, ensuring that local values remain preserved and engaging for the digital-native generation.

2.1. Implications

The results of this community service activity imply that the integration of whiteboard animation media based on local museum collections can serve as an effective strategy to strengthen literacy in local history and culture at the junior high school level. The positive engagement of both teachers and students indicates that interactive and contextual learning media not only enhance teachers' pedagogical capacity in developing innovative instructional materials, but also increase students' interest, understanding, and motivation to learn local content. Furthermore, the hands-on training provided to teachers suggests potential sustainability, as educators are equipped with practical skills and accessible digital tools that can be independently applied in future lessons. These implications highlight that similar community service

programs can be replicated in other schools with comparable needs, supporting broader efforts to preserve local cultural knowledge while improving the quality of learning through creative digital media.

2.2. Research Contribution

This community service program contributes to educational and community-based learning research by providing empirical evidence on the practical implementation of whiteboard animation as a digital learning medium grounded in local museum collections. It extends existing literature on interactive learning media by demonstrating how locally contextualized digital content can effectively bridge cultural heritage and formal education, particularly in enhancing literacy in local history and culture. In addition, this research offers a replicable model of teacher capacity building through hands-on training that integrates accessible digital tools, thereby contributing to discussions on sustainable professional development in schools. The findings also enrich community service-based research by highlighting the role of collaboration between higher education institutions and schools in preserving local cultural knowledge while simultaneously improving the quality and innovation of classroom learning.

2.3. Limitations

Despite the positive outcomes, this activity has several limitations that should be acknowledged. First, the implementation was conducted in a single school with a relatively short duration, which limits the generalizability of the findings to other educational contexts or regions. Second, while quantitative assessments were conducted, the long-term retention of students' literacy levels remains to be observed in future studies. Third, the learning media focused only on selected local history and culture materials from the Bengkulu Provincial Museum, so the scope of content integration remains limited. Lastly, differences in teachers' digital literacy levels and access to technological resources may affect the consistency and long-term application of whiteboard animation media in classroom practice.

2.4. Suggestions

Based on the identified limitations, several suggestions can be proposed for future activities and research. Further implementations should involve a larger number of schools and be carried out over a longer period to strengthen the validity and generalizability of the results. Future studies are also encouraged to incorporate quantitative evaluation methods, such as pre- and post-assessments, to more accurately measure improvements in student literacy and teacher competence. Expanding the range of learning materials by integrating collections from various local cultural institutions could enrich content diversity and relevance. In addition, providing continuous mentoring and advanced training for teachers, along with ensuring adequate technological infrastructure, is recommended to support the sustainable and effective use of whiteboard animation media in classroom learning.

D. Conclusion

The community service activity carried out at SMP Negeri 02 Kota Bengkulu successfully introduced a whiteboard animation-based learning method as an innovative medium to enhance student literacy. The training provided to teachers gave them practical resources in the form of a guide module and access to supporting applications, enabling them to develop digital learning media independently. The socialization session for students showed that a learning approach combining local history and culture with digital technology is capable of increasing students' interest in learning and active participation. This active participation serves as an indicator of the activity's success. Thus, the transformation of local history and culture material into whiteboard animation not only enhances student literacy but also plays a role in preserving regional cultural heritage. This model has the potential to be applied sustainably as a creative learning strategy relevant to the development of the digital era.

Future development of this community service program offers several strategic directions that may enhance its impact and sustainability. First, it is necessary to develop a digital content repository consisting of whiteboard animation materials related to Bengkulu's local history and culture. Such a repository would allow teachers and students to access, reuse, and integrate the materials into various learning contexts. Second, the teacher training component could be expanded to include advanced digital pedagogy, such as the use of motion graphics, interactive learning modules, and the integration of Learning Management Systems (LMS), thereby strengthening educators' competence in utilizing technology-enhanced learning tools. Third, the application of whiteboard animation should be tested across additional subject areas to evaluate the transferability and consistency of its effectiveness in improving students' learning outcomes. Fourth, a follow-up evaluation employing a mixed-methods approach is recommended to capture long-term

impacts on students' literacy development and sustained changes in teachers' instructional practices. Finally, collaboration with the Bengkulu Provincial Museum can be broadened by developing virtual museum tours, curating digitalized collections, and creating contextual learning modules that further promote the preservation of local cultural heritage within formal education.

E. Acknowledgment

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F. Author Contribution Statement

Yudi Setiawan served as the Coordinator for the Community Service Implementation, overseeing the conceptualization and methodology of the project. Andang Wijanarko was responsible for the formulation and development of the training content, specifically the Whiteboard Animation material. Endina Putri Purwandari took the lead in the analysis and evaluation of the activity results, including the N-Gain calculation and the interpretation of quantitative data. Finally, Meisy Dianita and Stefanie Laksmi Lakshita acted as vital members, providing essential logistical support, technical assistance, and general activity support throughout the implementation.

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