

Analysis of Digital Comic Media Containing Local Wisdom in Elementary School Science Literacy Learning

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Abstract— Science learning in the digital era still tends to be conventional and lacks the utilization of digital technology and local wisdom. This study employed a qualitative approach with a descriptive qualitative design. The purpose of this research was to provide an in-depth description of the development and implementation process of digital comics containing local wisdom in science learning. Data were collected through in-depth interviews with teachers and students, classroom observations, and document analysis. The results of the study show that: (1) the development pattern of local wisdom-based digital comics requires the collaborative involvement of teachers, students, and cultural experts; (2) the effectiveness of the media is reflected in the improvement of students' conceptual understanding, learning motivation, and connection with local culture; and (3) key factors for successful implementation include teacher support, content relevance to daily life, and integration of cultural values. The implication of this study highlights the importance of collaborative strategies in developing digital learning media based on local wisdom to support more contextual science literacy.

Keywords— Digital comics, Local wisdom, Science literacy, Elementary education.

I. INTRODUCTION

The development of digital technology has transformed the way information is delivered in education, including in science learning. Ideally, science learning in the digital era should be able to integrate technology, learning content, and local wisdom values to create a more meaningful and contextual learning experience. However, the reality in the field shows that science learning still tends to be conventional and has not yet utilized the potential of digital technology and local wisdom optimally [1].

Empirical findings indicate that most students experience difficulties in understanding scientific concepts, especially when asked to relate them to everyday life[2]. This issue is worsened by the lack of learning media that specifically integrate science with students' local contexts. Previous studies have emphasized that the use of digital media combined with local wisdom values can enhance both students' conceptual understanding and learning motivation Permata Sari et al [3]. This problem arises due to several factors, including: (1) limited availability of learning media relevant to local culture, (2) teachers' limited understanding in developing contextual, digital-based learning media, and (3) the suboptimal utilization of local wisdom potential in science learning[4].

One promising solution is the development of digital comics containing local wisdom. This medium has the

advantage of combining engaging visual narratives with scientific content while simultaneously presenting local cultural values. Several studies have shown that digital comics can increase students' engagement and understanding in science learning [5].

Moreover, the integration of local wisdom within the comics also supports more contextual and relevant learning. Previous research also highlights the importance of local wisdom in education. For instance, Georgiou and Sharma [6] found that active learning using digital media can improve students' conceptual understanding, emphasized that local wisdom plays a crucial role in shaping students' character and identity. Nevertheless, those studies remain limited in explaining how digital comics with local wisdom are used in classroom practice and how teachers and students experience them in enhancing scientific literacy.

Based on this research gap, the present study employed a qualitative descriptive approach to explore in depth the process of developing and implementing digital comics incorporating local wisdom in science learning. The focus of this research was directed toward teachers' and students' experiences in using this medium, their perceptions of its effectiveness, and the key factors supporting its successful implementation.

This study is expected to contribute to the development of the body of knowledge regarding the integration of

digital technology, local wisdom, and science learning, as well as to serve as a practical reference for teachers in developing more innovative and contextual learning media.

II. METHOD

In this study, employed a qualitative approach with a descriptive qualitative design. The research subjects were elementary school teachers and students who used digital comics containing local wisdom in science learning. Data collection techniques included in-depth interviews, participatory observations, and document studies. Interviews were conducted with classroom teachers and students to explore their perceptions of the use of digital comics. Observations were carried out during the learning process to examine students' interactions with the media, while documentation was used to analyze the digital comic products and learning records. Data validity was ensured through source and technique triangulation. The use of digital comics based on local wisdom in learning has been widely supported by educational experts. According to Priyanga et al. [7] e-comics rooted in local culture can significantly improve students' scientific literacy because they link scientific concepts with familiar cultural contexts, making abstract topics more understandable. Similarly, Kusumaningrum and Masruro [8] found that local wisdom-based digital flipbook comics increased elementary students' learning interest by up to 44.5%, highlighting their motivational power in engaging learners. Furthermore, Murti, Gunarhadi, and Winarno [9] emphasized that educational comics incorporating local values can also foster students' moral and social character, such as empathy, nationalism, and responsibility. In line with these findings, the present study explores how digital comics containing local wisdom are perceived and utilized by teachers and students in science learning at the elementary level. The triangulated data from interviews, observations, and document analyses are expected to provide a comprehensive understanding of how local culture-based digital comics support scientific literacy, engagement, and character development in classroom contexts.

III. RESULT AND DISCUSSION

The Integration of Digital Comics, Scientific Literacy, and Local Wisdom in Science Learning

Digital comics are narrative-based learning media that combine text and illustrations to convey concepts in a more engaging and comprehensible way. According to McCloud [10], comics as a medium are capable of

providing an immersive learning experience through the integration of visuals and narrative. In the educational context, digital comics are considered effective in enhancing student engagement and bridging abstract scientific concepts into more concrete understanding [11]. Scientific literacy encompasses the ability to understand concepts, apply scientific knowledge in everyday life, and make science-based decisions OECD [12]. Holbrook and Rannikmae [13] emphasize that scientific literacy involves not only theoretical understanding but also critical thinking, problem-solving, and practical application within socio-cultural contexts. Meanwhile, local wisdom refers to values, practices, and traditional knowledge developed within a community and passed down through generations. Hidayati [14] notes that local wisdom can serve as a contextual learning source that enriches students' understanding of natural and social phenomena. The integration of local wisdom into science learning not only strengthens cultural identity but also brings scientific concepts closer to students' real-life experiences [15]. Thus, the combination of digital comics, scientific literacy, and local wisdom represents a strategic approach to creating contextual, engaging, and culturally relevant science learning experiences.

The Effectiveness of Digital Comics Containing Local Wisdom in Enhancing Scientific Literacy

The development of digital technology and the growing demand for contextual science learning have encouraged innovations in educational media. Digital comics containing local wisdom have emerged as a promising solution for improving students' scientific literacy while preserving cultural values. Qualitative research has shown the effectiveness of digital comics in enhancing learning outcomes. For instance, Ermiana et al. [16] reported a significant improvement in learning outcomes with a sig. value of 0.005, although the N-gain score remained relatively low (0.16), indicating a need for further refinement. Similarly, Sari et al. [17] demonstrated the effectiveness of local wisdom-based digital comics in enhancing students' mathematical representation and creative thinking skills, supported by MANOVA analysis showing significant differences. Fitria et al. [18] also confirmed that experimental classes using digital comics achieved higher scientific literacy scores compared to control classes. Beyond improving learning outcomes, the use of digital comics integrating local wisdom also contributes to the development of students' higher-order thinking skills. Priyanga et al. [19] reported an increase in scientific literacy with an N-gain of 0.40 for science knowledge and 0.37 for science

competency, outperforming traditional textbooks. Hudan Ramadhan et al. [20] found that integrating local wisdom elements such as long bumbung in physics comics enhanced students' higher-order thinking skills. Kevin Aditia et al. [21] recorded an N-gain score of 0.63 in critical thinking ability, with media and content validation scores of 4.15 and 4.1, respectively, indicating high-quality instructional media.

Supporting Factors for the Effectiveness of Digital Comics

The effectiveness of local wisdom-based digital comics is supported by several key factors. The narrative and visual integration rooted in local culture enhances students' emotional engagement in understanding scientific concepts. The accessibility of media through digital platforms promotes flexible and independent learning. The integration of cultural values makes science learning more contextual, while the interactive format of digital comics fosters active learning and boosts student motivation. A synthesis of research findings indicates that local wisdom-integrated digital comics have the potential to improve scientific literacy not only in terms of knowledge but also in fostering critical thinking, creativity, and contextual understanding that are relevant to real-life situations.

Key Determinants of Successful Implementation

Several critical factors influence the successful implementation of local wisdom-based digital comics. Ermiana et al. [22] emphasize the importance of integrating local cultural values within the ADDIE model to ensure a systematic media development process. Sari et al. [23] highlight the relevance of the TPACK (Technological Pedagogical Content Knowledge) framework, which harmonizes technology, pedagogy, and content as the foundation for successful implementation. Fitria et al. [24] assert that visual quality, storyline appeal, and problem-based approaches further enhance media effectiveness. Priyangga et al. [25] revealed that high media validity assessed by experts in media, content, and learning is a strong indicator of success. Rahmad Ramadhan et al. point out the importance of mobile platform accessibility and EPUB formats, while Kevin Aditia et al. [26] emphasize the significance of usability, visual quality, and communicative language as essential aspects. Other supporting factors include the integration of interactive elements such as videos and problem-solving scenarios that improve conceptual understanding, teacher training to maximize media use, continuous evaluation mechanisms to assess media effectiveness, and the

application of Augmented Reality (AR) technology to enrich students' learning experiences. These findings confirm that the success of implementing local wisdom-based digital comics requires a holistic approach encompassing the integration of technology, pedagogy, and content. When these three aspects are managed harmoniously and supported by expert validation and user feedback, digital comics can become an effective, sustainable, and culturally relevant learning medium for students in the digital era.

Classroom Implementation and Factors Influencing Success

Field findings indicate that the development of digital comics containing local wisdom was carried out through close collaboration among teachers, students, and media developers. Teachers played a crucial role in preparing science content aligned with the curriculum, while students were actively involved in providing input regarding storylines, language, and characters that reflected their own experiences. Media developers then organized the visualization and technology aspects to produce a contextual and engaging digital comic product.

This aligns with Priyangga et al. [27], who emphasized that local wisdom-based e-comics were validated as highly effective by material, media, and student experts, making them suitable for use in enhancing scientific literacy. The integration of local cultural values within the storyline also helped students better understand scientific concepts by connecting them with their daily experiences. As stated by Mulyati and Soetopo [28], digital comics based on local culture effectively enhance reading skills while preserving local wisdom.

The Effectiveness of Local Wisdom-Based Digital Comics in Learning

In terms of effectiveness, learning that employs local wisdom-based digital comics provides a more meaningful learning experience. Observations revealed an increase in students' motivation and classroom engagement. Students became more active in discussions, asked more questions, and showed interest in rereading the comic even after the learning activity ended. This is supported by Kusumaningrum and Masruro [29], who found that digital flipbook comics containing local wisdom were able to increase students' learning interest by up to 44.5%.

Teachers also reported that using such media made it easier to explain abstract concepts, as the illustrations

corresponded to cultural contexts familiar to students. According to Kamila et al. [30], digital comics featuring local legends are effective not only in promoting cultural values but also in enhancing student engagement. Consequently, digital comics improve not only cognitive understanding but also affective outcomes, such as emotional attachment to local culture. This finding aligns with Hasibuan et al. [31], who noted that folklore-based digital comics strengthen students' active participation in learning.

Key Factors Supporting Successful Implementation

Several factors influence the successful classroom implementation of local wisdom-based digital comics, including illustration and narrative quality, content relevance to local culture, and the teacher's role in integrating the media into instruction. Teacher support plays a pivotal role, as teachers connect the comic's content with curriculum objectives while facilitating student discussions and reflections.

This corresponds with Alfanda et al. [32], who stated that digital comics based on local wisdom are highly feasible as innovative learning media because they enhance student engagement. Student involvement during the use of the media also fosters a sense of ownership toward learning. Suharta et al. [33] further found that local wisdom-based digital comics significantly improve students' critical thinking skills. Similarly, Mayasari et al. [34] reported that local wisdom-based science comics from South Kalimantan were rated as highly valid by experts and received positive responses from both teachers and students.

Furthermore, Kurniawati et al. [35] demonstrated that the use of local wisdom-based comics from Jember in science learning successfully increased student learning outcomes, achieving a classical mastery rate of 85.7%.

Cultural and Pedagogical Implications

Thus, local wisdom-based digital comics function not only as media for teaching scientific concepts but also as tools for fostering cultural appreciation and identity formation. This approach creates learning experiences that are more relevant, enjoyable, and contextually grounded. Jusriadi and Abdullah [36] affirm that the integration of local wisdom through digital media strengthens students' cultural identity while promoting culturally responsive pedagogy.

IV. CONCLUSION

This qualitative study concludes that digital comics incorporating local wisdom play a significant role in

enhancing students' scientific literacy. The media not only improve students' understanding of scientific concepts but also strengthen their sense of local cultural identity. The development of local wisdom-based media should be carried out collaboratively to ensure that the results are contextual, engaging, and meaningful for learners.

This medium makes learning more interesting, contextual, and meaningful while simultaneously reinforcing local cultural identity. The development of digital comics requires collaboration among teachers, students, and media developers to ensure that both the content and visuals meet learning needs. The effectiveness of the media is reflected in the increased motivation, conceptual understanding, and student engagement during learning activities.

The success of implementation is also greatly influenced by the quality of illustrations, the integration of cultural values with scientific content, and the support of teachers in incorporating the media into the learning process. Therefore, digital comics based on local wisdom can serve as an innovative strategy in science learning at the elementary level as well as a means of cultural preservation.

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