



Development of Indonesian historical heritage comics to enhance elementary school students' higher-order thinking skills

Yulina Ismiyanti*¹, Yunita Sari¹, Jupriyanto¹, Lolita Enfesta²

¹Elementary School Teacher Education Program, Universitas Islam Sultan Agung
Kaligawe Street Km.4, Terboyo Kulon, Genuk, 50112, Semarang City, Central Java, Indonesia

²Ramon Magsaysay Central Elementary School
Monarca Building, Magsaysay Street Ramon Magsaysay St, Digos, 8002 Davao del Sur, Philippines

*Corresponding Author. E-mail: yulinaismiyanti@gmail.com

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Abstract: This study aims to develop a digital comic based on Indonesian historical heritage and to examine its feasibility, practicality, and effectiveness in enhancing elementary school students' higher-order thinking skills (HOTS). The study employed a Research and Development (R&D) approach using the ADDIE model, which consisted of analysis, design, development, implementation, and evaluation stages. The participants were 35 fifth-grade elementary school students selected through purposive sampling. Data were collected using expert validation sheets, teacher and student response questionnaires, and HOTS tests administered as pretests and posttests. The data were analysed using descriptive percentage analysis and paired-sample t-tests. The results show that the developed digital comic is categorized as very feasible based on expert validation, very practical based on teacher and student responses, and effective in significantly improving students' HOTS, as indicated by the significant difference between pretest and posttest scores. These findings suggest that digital comics integrating Indonesian historical heritage can serve as innovative and engaging instructional media for promoting higher-order thinking in elementary social studies learning. This study implies that culturally contextual digital learning media can support HOTS-oriented instruction and contribute to the development of more meaningful and interactive learning environments in elementary education.

Keywords: digital comics, Indonesian historical heritage, higher-order thinking skills, elementary school students

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Introduction

The development of Higher-Order Thinking Skills (HOTS) has become a central priority in 21st-century education, including at the elementary school level. HOTS referred to students' abilities to analyse, evaluate, and create knowledge, which were essential competencies for preparing learners to face increasingly complex global challenges. International studies emphasised that learning environments that actively promoted higher-order thinking significantly contributed to students' problem-solving abilities, critical reasoning, and readiness for lifelong learning (Ismiyanti et al., 2023; Nafis & Nuryanto, 2025). Instructional approaches that emphasise problem-solving activities, such as problem-based learning, can significantly improve elementary school students' critical thinking skills and support the development of higher-order thinking processes (Darmawati & Mustadi, 2023). Consequently, elementary education had increasingly been expected to shift from fact-oriented

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instruction toward learning processes that engaged students in higher-level cognitive activities through meaningful and contextual learning experiences.

Despite the growing emphasis on HOTS within educational policies and curriculum reforms, its implementation in elementary classrooms remained limited. Many instructional practices still relied on conventional teacher-centred approaches dominated by lectures and textbook-based learning, which primarily emphasised memorisation rather than analytical and evaluative thinking. Empirical evidence indicated that such instructional practices frequently positioned students as passive recipients of information and provided limited opportunities for analysing, evaluating, and constructing knowledge (Cahyaningtyas et al., 2022; Wulansari & Tyas, 2025). As a result, students often experienced difficulties when confronted with analytical questions, evaluative tasks, or activities that required them to formulate arguments and conclusions independently. This condition indicated a gap between curriculum expectations that emphasised HOTS development and the actual learning practices occurring in elementary school classrooms.

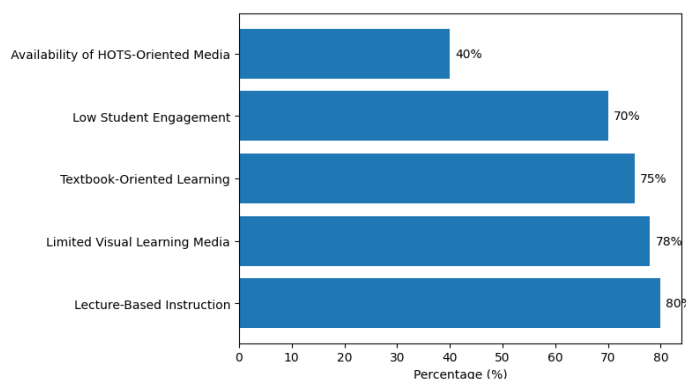


Figure 1. Key Challenges in Implementing HOTS-Oriented History Learning at the Elementary School Level

The challenge became particularly evident in Social Studies learning, especially in topics related to Indonesian historical heritage. At the elementary school level, historical materials were commonly presented in the form of narrative texts with limited visual representation. However, elementary students generally operated within the concrete operational stage of cognitive development, which required learning materials that were contextual, visual, and closely connected to their real-life experiences. Previous research reported that decontextualised history instruction reduced students' engagement and limited their ability to develop critical historical thinking skills (Maulidiana et al., 2021; Nafis & Nuryanto, 2025). Consequently, students tended to memorise historical facts and chronological events rather than analyse historical causes, evaluate cultural values, or construct meaningful interpretations of historical phenomena.

Various studies have proposed the use of digital learning media as an alternative strategy to address these challenges. Recent studies have also reported that interactive e-comic learning media based on digital technology can enhance students' engagement and support the presentation of instructional content in visually meaningful ways, making learning materials easier for elementary school students to understand (Auliya et al., 2025). Digital media, including instructional videos, animations, and interactive learning applications, were reported to enhance students' motivation and engagement in learning activities (Putra et al., 2025). In addition, the development of digital learning resources integrated with problem-based learning and multicultural contexts has also been reported to support meaningful learning experiences and improve students' critical thinking skills in elementary education (Desyandri et al., 2024). However, several limitations remained in the existing literature. Many digital learning resources still functioned primarily as tools for delivering information rather than as media that explicitly facilitated higher-order cognitive processes. Furthermore, the integration of local cultural and historical contexts within digital learning media remained relatively limited, which reduced the effectiveness of contextual learning approaches in promoting meaningful understanding (Dewi & Tyas, 2025). These limitations indicated the need for instructional media that integrated visual storytelling, contextual historical content, and structured HOTS-oriented learning activities.

Recent scholarly studies have explored the potential of comics and visual narratives as effective instructional media in education. Digital comics that integrate local wisdom and cultural contexts have been reported to create more meaningful learning experiences by connecting instructional materials with students' social and cultural environments (Solihati et al., 2024). Digital comic creation has also been increasingly recognised as an innovative instructional strategy in technology-supported learning environments because it allows students to engage with learning materials through visual storytelling and interactive narrative design (Belda-Medina, 2024). Comics combined textual information with visual storytelling, enabling complex concepts to be presented in engaging and accessible formats for young learners. Similarly, interactive comics have been found to enhance students' engagement and facilitate deeper understanding of social science concepts through narrative visualization (Youn & Kim, 2021). Previous studies reported that comic-based learning could improve conceptual understanding, student engagement, and critical thinking by presenting contextualised narrative scenarios that stimulated reasoning and discussion (Widiyastuti et al., 2021; Tay et al., 2024; Rasmet et al., 2025; Al-Ghifary et al., 2024). In line with these findings, digital comic learning media integrated with character values have also been shown to improve students' critical thinking skills and encourage reflective learning processes (Darmayanti et al., 2022). Furthermore, educational comics have been shown to support the development of analytical and evaluative thinking by encouraging students to interpret information, identify relationships between events, and formulate conclusions based on narrative contexts (Abrori et al., 2025). These findings demonstrated the pedagogical potential of comics as a learning medium capable of integrating visual and textual information to facilitate deeper cognitive processing. In addition, educational comics have also been shown to support character education and students' social awareness in elementary classrooms. Multicultural comic media can embed values such as tolerance while maintaining students' engagement during learning activities (Anggito & Sartono, 2022).

Nevertheless, existing studies on digital comics in education had predominantly emphasised learning engagement and conceptual understanding, leaving a significant research gap regarding the development and empirical validation of culturally grounded digital comics that explicitly integrated Higher-Order Thinking Skills (HOTS) within elementary Social Studies learning (Widiyastuti et al., 2021; Tay et al., 2024; Rasmet et al., 2025; Abrori et al., 2025). In addition, previous digital learning media were rarely designed to systematically incorporate HOTS indicators such as analysis, evaluation, and creation within structured learning activities (Auliya et al., 2025; Dewi & Tyas, 2025). The integration of Indonesian historical heritage as a culturally contextualised narrative foundation for developing higher-order thinking also remained relatively unexplored in prior studies. Consequently, there was still a lack of empirically validated instructional media that simultaneously integrated visual storytelling, culturally contextualised historical content, and HOTS-oriented learning design in elementary Social Studies education.

In this regard, digital comics based on Indonesian historical heritage were considered a promising instructional solution to address the limitations of conventional history learning in elementary education. Digital comics combined visual storytelling with textual narration, which aligned well with elementary school students' cognitive development and learning preferences. Previous studies reported that digital comics and graphic narratives effectively supported conceptual understanding, critical thinking, and analytical reasoning by presenting complex information in engaging and accessible formats (Wulansari & Tyas, 2025). Through narrative-driven scenarios, digital comics enabled students to analyse historical events, identify cause-and-effect relationships, and evaluate historical values embedded within stories. Furthermore, integrating Indonesian historical heritage within digital comics strengthened culturally responsive learning and enhanced students' sense of relevance and meaning in learning activities (Pamungkas et al., 2025).

The novelty of this study lies in the systematic development and empirical evaluation of Indonesian historical heritage-based digital comics that explicitly integrated HOTS indicators analysis, evaluation, and creation within narrative learning activities through the ADDIE development model. Unlike previous studies that primarily focused on improving students' motivation or general comprehension outcomes, this research comprehensively examined the feasibility, practicality, and effectiveness of the developed digital comics through expert validation, user response analysis, and statistical testing using paired sample t-tests. This approach provided empirical evidence supporting the

use of culturally grounded digital learning media to promote higher-order thinking in elementary education.

Based on the foregoing discussion, this study aims to develop digital comics based on Indonesian historical heritage that were feasible, practical, and effective in enhancing elementary school students' HOTS. Specifically, the objectives of this research were to examine the feasibility of the developed digital comics through expert assessments, analyse teacher and student responses to determine the practicality of the media in classroom learning, and evaluate the effectiveness of the digital comics in improving students' HOTS through pre-test and post-test comparisons. The findings of this study were expected to contribute both theoretically and practically to the development of innovative and culturally responsive digital learning media. Furthermore, the results were expected to provide insights for educators and researchers in integrating digital technology and Indonesian historical contexts into elementary school learning and to support the development of higher-order thinking skills in Indonesian education.

Methods

This study employed a Research and Development (R&D) approach aimed at developing an instructional product in the form of digital comics based on Indonesian historical heritage. In addition to producing the product, the study also examined the feasibility, practicality, and effectiveness of digital comics in improving elementary school students' Higher-Order Thinking Skills (HOTS) (Lewis III & Lewis, 2021). The development model used was ADDIE, which consisted of five stages: analysis, design, development, implementation, and evaluation (Maulidiana et al., 2021). His model was selected because it provided a systematic and practical framework for developing digital learning media that aligned with the characteristics of elementary education (Muchlas Abrori et al., 2025). The research was conducted during the second semester of the 2024/2025 academic year at Genuksari 02 Semarang Elementary School, Indonesia. The school was selected purposively because it had implemented the Merdeka Curriculum and was supported by adequate digital learning facilities that enabled the integration of technology-based instructional media.

The research population consisted of all fifth-grade students at the school, while the sample was determined using purposive sampling by considering students' readiness to participate in digital learning activities and their involvement in Social Studies learning (Tay et al., 2024). The field trial involved 35 fifth-grade students who participated directly in learning activities using the developed digital comics. In addition to students, the study also involved subject-matter experts, media experts, and instructional experts as validators to assess the feasibility of the developed product, while classroom teachers participated as users of the learning media during the implementation stage. The main objective of this study was to produce digital comics based on Indonesian historical heritage that met three criteria: feasible, practical, and effective. Product feasibility was evaluated based on expert assessments of content accuracy, media design, and instructional aspects. Practicality was measured through teacher and student responses regarding the ease of use and attractiveness of the media, while effectiveness was determined by examining the improvement of students' HOTS after the implementation of the digital comics.

The research procedures followed the ADDIE development model systematically. During the analysis stage, a needs analysis was conducted through classroom observations and teacher interviews to identify problems in Social Studies learning, particularly in Indonesian historical heritage topics, as well as students' difficulties in answering HOTS-oriented questions (Istiqomah et al., 2021). Curriculum analysis was also conducted to ensure alignment between the developed media, learning objectives, and HOTS indicators. During the design stage, the structure and storyline of the digital comics were developed by designing characters, visual illustrations, and narrative scenarios based on Indonesian historical heritage. HOTS indicators analysis, evaluation, and creation were embedded within the comic narratives through discussion questions and learning activities. At this stage, research instruments, including validation sheets, teacher and student response questionnaires, and HOTS test items, were also developed. The development stage involved producing the digital comics according to the predetermined design. The resulting product was then validated by subject-matter experts, media

experts, and instructional experts to assess content feasibility, visual quality, and pedagogical suitability. Feedback from the experts was used to revise the product before classroom implementation.

During the implementation stage, the revised digital comics were applied in Social Studies learning for fifth-grade students. Teachers used the digital comics as the primary instructional media for teaching Indonesian historical heritage, while students engaged in reading the comic narratives, participating in discussions, and completing HOTS-oriented learning tasks embedded within the media. The evaluation stage aimed to determine the practicality and effectiveness of the developed digital comics. Practicality was assessed through teacher and student response questionnaires, whereas effectiveness was measured by comparing students' HOTS scores obtained from pre-tests and post-tests administered before and after the learning intervention.



Figure 2. Research Procedure Based on the ADDIE Model (Radeswandri et al., 2021)

The research data consisted of both quantitative and qualitative data. The instruments used included expert validation sheets to evaluate content, media, and instructional feasibility; teacher and student response questionnaires to measure the practicality and user acceptance of the digital comics; and HOTS tests to assess students' abilities to analyse, evaluate, and create. Data were collected through the distribution of questionnaires to experts, teachers, and students, the administration of HOTS tests before and after the use of digital comics, and documentation to support the product development and implementation process. The collected data were analysed using descriptive and inferential statistical techniques. Feasibility and practicality data were analysed using descriptive percentage analysis to determine assessment categories, while effectiveness data were analysed using a paired sample t-test after conducting prerequisite tests, including the normality test, to identify significant differences in students' HOTS before and after the use of digital comics (Kwangmuang et al., 2021). The research was conducted in accordance with educational research ethics, including obtaining permission from the school, ensuring voluntary participation of research subjects, and maintaining the confidentiality of students' identities.

Results and Discussion

Results

Analysis Phase Results (Needs Analysis)

The analysis phase aimed to examine the initial conditions of Social Studies learning, identify student and teacher needs, assess curriculum alignment, and determine HOTS indicators to be developed through digital comic media. Classroom observations in Grade V revealed low student engagement during history lessons. Table 1 presents evidence of low students' HOTS in Indonesian historical heritage learning. Learning activities were predominantly textbook-based and teacher-centred, limiting opportunities for higher-order thinking. When confronted with analytical and evaluative questions, most students struggled to provide logical reasoning and draw conclusions. Conversely, students demonstrated a strong interest in visual media. Their engagement increased when images or videos were

used; however, these media did not systematically support HOTS development. These findings indicated the need for visually engaging learning media designed to stimulate higher-order thinking skills.

Table 1. Low HOTS Learning Outcomes in Grade V on Historical Heritage Materials

HOTS Indicators	Cognitive Level	Learning Evidence from Classroom Observation	Achievement (%)	Category
Analysing historical heritage artifacts.	C4 (Analysis)	Students had difficulty identifying the function and historical context of heritage objects.	46%	Low
Evaluating the significance of historical sites.	C5 (Evaluation)	Students were unable to provide logical arguments regarding the importance of heritage preservation.	43%	Low
Creating conclusions from historical evidence.	C6 (Creation)	Students failed to synthesise information from texts and images of heritage sites.	39%	Low
Interpreting historical sources and relics.	C4 (Analysis)	Students relied on memorisation rather than interpretation of historical evidence.	48%	Low
Applying historical heritage concepts.	C4 (Application–Analysis)	Students struggled to connect heritage materials with present-day contexts	44%	Low

The results presented in Table 1 indicated that students had difficulty analysing historical artefacts and understanding their historical context. For instance, many students were unable to explain the function and significance of historical heritage objects. Similarly, students encountered difficulties when asked to evaluate the importance of preserving historical sites. This finding suggested that students tended to rely on memorisation rather than engaging in deeper analytical reasoning. Such learning patterns often occur when instructional approaches emphasise the recall of historical facts instead of encouraging students to interpret historical events critically. As a result, students rarely had opportunities to analyse historical events, evaluate cultural values, or construct their own interpretations of historical phenomena.

Classroom observations also revealed that students showed increased interest when visual learning media such as pictures or videos were used. Although these media improved student engagement, they did not systematically support the development of HOTS. Therefore, the findings suggested the need for instructional media that combined visual representation with contextual learning activities capable of stimulating analytical and evaluative thinking.

Teacher interviews further supported these findings. Teachers reported that Indonesian historical heritage topics contained strong narrative potential but lacked supporting learning media that integrated historical content with HOTS-oriented learning tasks. Teachers also noted that students often struggled to answer HOTS questions because existing learning materials did not provide concrete contextual representations of historical events.

Curriculum analysis showed that Indonesian historical heritage materials within the Merdeka Curriculum required students to analyse cause-and-effect relationships, evaluate historical values, and connect historical events with contemporary contexts. These competencies corresponded with the higher cognitive levels of Bloom's taxonomy, particularly analysing (C4), evaluating (C5), and creating (C6).

Therefore, the development of digital comics based on Indonesian historical heritage was considered consistent with curriculum demands and relevant for supporting 21st-century learning objectives.

Results of the Design Stage (Product Design)

The design stage was focused on developing the digital comic concept, organising the content structure, designing visual elements, and preparing research instruments to measure the product's feasibility, practicality, and effectiveness.

The digital comic was designed around the theme of Indonesian historical heritage, which was closely related to students' daily lives. The storyline was developed in a narrative form, featuring characters that represented elementary school students. Each story included conflicts related to historical events and concluded with questions or tasks oriented toward Higher-Order Thinking Skills (HOTS). Through this approach, the stories not only presented factual information but also encouraged students to think critically, evaluate historical events, and construct ideas based on their understanding of the narratives.

The visual design of the comic was adapted to the characteristics of elementary school students by using colourful illustrations, simple language, and an easy-to-read layout. The comic was presented in digital format, allowing access through electronic devices available in schools. Navigation was designed to be simple to enable students to use the media independently. Each section of the comic was also equipped with usage instructions and integrated learning activities. Figure 3 shows a sample display of the Indonesian historical heritage digital comic.



Figure 3. Digital Comic Cover

Figure 3 shows an example of the digital comic interface developed in this study. The integration of visual storytelling and narrative context within digital comics was expected to facilitate deeper cognitive processing. According to multimedia learning theory, the combination of verbal and visual information can enhance students' conceptual understanding and support meaningful learning. Therefore, the design of the digital comics aimed not only to increase engagement but also to promote analytical thinking during historical learning activities.

Results of the Development Stage (Product Development)

The development stage resulted in a digital comic product that was subsequently validated by experts before being implemented in the classroom. The developed digital comic contained Indonesian historical heritage material packaged in the form of an interactive picture story. Each story was accompanied by HOTS questions that encouraged students to analyse, evaluate, and create ideas. Product development considered material suitability, visual quality, and integration with HOTS learning objectives. The validation results indicated that the digital comic was in the very feasible category in terms of content, media, and learning aspects. The results of the digital comic product validation are presented in Table 2. Several suggestions for improvement from the experts were related to the explanation of historical terms and text size. Revisions were made without changing the main structure of the story; therefore, the product was ready for use at the implementation stage. The results of the revisions based on expert input are shown in Figure 4.

Table 2. Expert Validation Results of the Indonesian Historical Heritage Digital Comics

Validation Aspect	Indicators Evaluated	Mean Score	Feasibility Category	Expert Suggestions
Content (Material)	Accuracy of historical content, relevance to curriculum, clarity of concepts, alignment with HOTS indicators	4.60	Very Feasible	Clarify several historical terms to improve students' understanding
Media (Visual Design)	Illustration quality, text readability, layout consistency, and interactivity	4.55	Very Feasible	Adjust text size in several panels for better readability
Learning (Pedagogical)	Alignment with learning objectives, integration of HOTS questions, student engagement, and instructional flow	4.65	Very Feasible	No major revision required
Overall	-	4.60	Very Feasible	Minor revisions without changing the main story structure

Scale: 1.00–1.80 = Not Feasible; 1.81–2.60 = Less Feasible; 2.61–3.40 = Fairly Feasible; 3.41–4.20 = Feasible; 4.21–5.00 = Very Feasible

As shown in Table 2, the content validation aspect obtained a mean score of 4.60, indicating that the historical materials were accurate and aligned with curriculum objectives. The media design aspect achieved a mean score of 4.55, demonstrating that the visual elements, layout, and readability were appropriate for elementary school students. Meanwhile, the instructional aspect obtained the highest mean score of 4.65, suggesting that the integration of HOTS-oriented activities within the comic narratives was pedagogically appropriate. These findings indicated that the digital comics met the required standards for instructional media. Minor revisions suggested by experts mainly involved clarifying certain historical terms and adjusting text size to improve readability. Figure 4 illustrates the revisions made based on expert feedback.

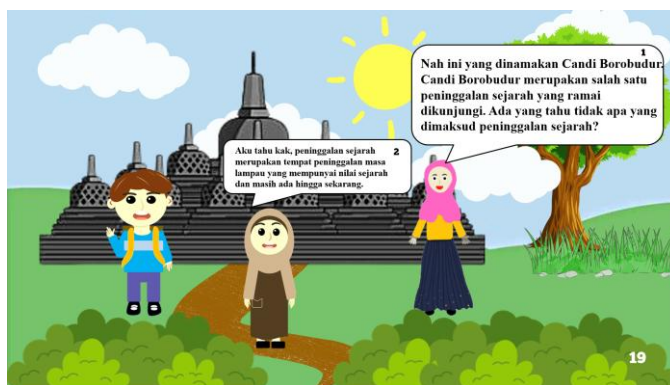


Figure 4. The Revised Results Based on Expert Input Explain some Historical Terms to Improve Student Understanding

Results of the Implementation Phase (Product Implementation)

The implementation phase involved applying the revised digital comics in Social Studies learning with fifth-grade students at Genuksari 02 Semarang Elementary School. Learning activities were conducted using digital comics as the primary instructional media. During the learning process, students interacted with the digital comics through reading activities, group discussions, and HOTS-oriented learning tasks embedded within the narratives. Observational results indicated that students showed higher levels of engagement compared to conventional instructional methods. Students were more enthusiastic about asking questions and participating in discussions about historical events presented in the comics. Teachers also reported that the digital comics helped them explain historical materials more clearly and facilitated the implementation of HOTS-oriented learning activities. These findings

suggested that narrative-based digital media could create a more interactive learning environment that supported active student participation.

Results of the Evaluation Stage (Product Evaluation)

The evaluation stage was conducted to assess the practicality and effectiveness of the digital comic in improving students' HOTS. The results of the teacher and student response surveys indicated that the digital comics were in the very practical category, both in terms of ease of use and media appeal. The results of the teacher response analysis were presented in Table 3, while the results of the student response analysis were presented in Table 4. The pre-test results showed that students' HOTS abilities before using the digital comics were relatively low. After learning using the digital comics, the post-test results showed a significant improvement across all HOTS indicators. The normality test indicated that the data met the requirements for parametric statistical analysis. The results of the normality test were presented in Table 5. Furthermore, the results of the paired sample *t*-test showed a significance value of less than 0.05, indicating a significant difference between pre-test and post-test scores. The results of the paired sample *t*-test were presented in Table 6. These findings demonstrated that digital comics based on Indonesian historical heritage were effective in improving elementary school students' HOTS.

Table 3. Teacher Response Results on the Practicality of Digital Comics

Aspect Evaluated	Indicator Description	Mean Score	Category
Ease of Use	Simplicity of operating and implementing the media	4.70	Very Practical
Instructional Support	Assistance in explaining historical material	4.68	Very Practical
HOTS Facilitation	Support for HOTS-oriented learning activities	4.72	Very Practical
Media Attractiveness	Visual appeal and classroom engagement	4.65	Very Practical
Overall Mean	-	4.69	Very Practical

Table 4. Student Response Results on the Practicality of Digital Comics

Aspect Evaluated	Indicator Description	Mean Score	Category
Ease of Use	Interest and motivation during learning	4.73	Very Practical
Instructional Support	Clarity of historical material	4.60	Very Practical
HOTS Facilitation	Visual and interactive features	4.68	Very Practical
Media Attractiveness	Confidence in answering HOTS questions	4.65	Very Practical
Overall Mean	-	4.67	Very Practical

Table 3 shows that the digital comics obtained an overall mean score of 4.69, which fell into the very practical category. Teachers perceived the digital comics as easy to use and helpful in supporting instructional explanations. This finding is important, as ease of use is a critical factor influencing teachers' willingness to adopt new instructional media. In terms of instructional support, the digital comics were considered highly effective in assisting teachers in explaining Indonesian historical heritage material. The narrative structure, visual elements, and contextualised historical content enabled teachers to convey abstract concepts more clearly. Furthermore, the HOTS facilitation aspect received the highest mean score (4.72), indicating that the digital comics successfully supported HOTS-oriented learning activities. The inclusion of analytical, evaluative, and creative questions embedded within the comic narratives encouraged deeper cognitive engagement among students. The media attractiveness aspect also achieved a very practical category, reflecting that the visual design and presentation of the digital comics effectively captured students' attention and enhanced classroom interaction. Overall, these findings suggest that the digital comics were not only technically feasible but also pedagogically supportive for HOTS-based Social Studies instruction.

Consistent with the teacher responses, the analysis of student responses showed an overall mean score of 4.67, placing the digital comics in the very practical category. Students reported high levels of learning enjoyment and motivation, indicating that the use of digital comics created a more engaging and enjoyable learning environment compared to conventional instructional methods. This increased engagement is essential for fostering active participation in HOTS-oriented learning. Regarding content understanding, students perceived the historical material presented in the digital comics as clear and easy to understand. The combination of visual storytelling and contextual examples helped students grasp historical concepts more effectively. In addition, the media attractiveness aspect received a high score, confirming that the visual and interactive features of the digital comics played a significant role in maintaining students' attention during learning activities. Notably, students also reported increased confidence in answering HOTS questions, suggesting that the structured exposure to higher-order tasks within the digital comics contributed to their readiness to analyse, evaluate, and generate ideas. This finding aligns with the study's objective to enhance students' higher-order thinking skills through innovative learning media. Overall, the positive responses from both teachers and students indicate that the digital comics based on Indonesian historical heritage were highly practical, considered from both instructional and learner perspectives. These results support the argument that digital comics can serve as an effective and engaging instructional medium for HOTS-oriented Social Studies learning in elementary schools.

Table 5. Normality Test Results of Pretest and Posttest HOTS Scores (N = 35)

Data Set	Normality Test	Statistic	Sig. (p-value)	Decision
Pres-test HOTS Score	Kolmogorov–Smirnov	0.121	0.200	Normally Distributed
Post-test HOTS Score	Kolmogorov–Smirnov	0.109	0.200	Normally Distributed

The normality test was conducted to determine whether the pretest and posttest HOTS score distributions met the assumptions required for parametric statistical analysis. Based on the Kolmogorov–Smirnov test results, the pretest scores showed a statistic value of 0.121 with a significance value (p) of 0.200, while the posttest scores showed a statistic value of 0.109 with a significance value (p) of 0.200. Since the significance values for both datasets were greater than 0.05, the data were considered to be normally distributed. Therefore, the assumption of normality was fulfilled, and the use of a paired sample t -test for further analysis was deemed appropriate.

Table 6. Normality Test Results of Pretest and Posttest HOTS Scores (N = 35)

Paired Comparison	N	Mean	t	df	Sig. (2-tailed)
Pre-test	35	Lower			
Post-test	35	Higher	7.84	34	0.00

The paired sample t -test was conducted to examine the effectiveness of the Indonesian historical heritage digital comics in improving students' Higher-Order Thinking Skills (HOTS). The analysis involved 35 fifth-grade students who completed both the pretest and posttest. The results revealed a statistically significant difference between pretest and posttest scores ($t = 7.84$, $df = 34$, $p = 0.000$). This finding indicates that students' HOTS scores after the implementation of the digital comics were significantly higher than their scores prior to the intervention. The substantial t value reflects a strong magnitude of change, suggesting that the learning intervention produced a meaningful improvement rather than a trivial gain. The significance value ($p < 0.05$) confirms that the observed difference was not due to random chance. These results demonstrate that the use of digital comics based on Indonesian historical heritage was effective in enhancing elementary school students' higher-order thinking skills. From a pedagogical perspective, this improvement can be attributed to the integration of narrative-based historical content with HOTS-oriented questions that encouraged students to analyse, evaluate, and generate ideas. The interactive visual format also supported students' engagement and conceptual understanding, which are essential components in fostering higher-order cognitive processes. Therefore,

the findings support the effectiveness of digital comics as an innovative instructional medium for HOTS-oriented Social Studies learning at the elementary school level.

Discussion

The findings of this study indicated that elementary school students' Higher-Order Thinking Skills (HOTS) in Social Studies learning, particularly in Indonesian historical heritage topics, were initially relatively low. Students experienced considerable difficulties in analysing historical artefacts, evaluating the significance of heritage sites, and synthesising conclusions from historical evidence. These findings suggested that students had not yet developed the cognitive processes required for higher-order thinking, particularly analytical and evaluative reasoning (Setyawan & Mustadi, 2021). Such conditions reflected the dominance of teacher-centred instructional approaches that emphasised factual recall rather than encouraging students to construct knowledge actively. Similar patterns were reported in previous studies showing that history learning at the elementary level frequently focused on memorisation of historical facts rather than engaging students in higher-level cognitive activities (Husen & Kuswanto, 2025; Shaafi et al., 2025; Siba Sabon et al., 2022). From a constructivist learning perspective, the lack of inquiry-based and contextual learning experiences explained why students struggled to perform HOTS-oriented tasks despite repeated exposure to historical content.

Further analysis of the curriculum revealed a significant discrepancy between curriculum expectations and classroom implementation. The Merdeka Curriculum required students to analyse cause-and-effect relationships, evaluate cultural and national values, and connect historical events with contemporary contexts. These competencies corresponded with Bloom's revised taxonomy at the levels of analysis (C4), evaluation (C5), and creation (C6). However, the findings suggested that teachers often lacked appropriate instructional media capable of translating these abstract curriculum requirements into meaningful learning experiences for students. Similar challenges have been reported in international studies, indicating that teachers frequently encounter difficulties implementing HOTS-oriented learning due to the absence of supportive instructional media (Harianja et al., 2023; Khoo et al., 2025; Tay et al., 2024). Research on problem-based learning has also shown that inquiry-oriented instructional approaches can significantly improve students' higher-order thinking skills by encouraging analysis, evaluation, and problem-solving processes (Sutika et al., 2022). This discrepancy clarified why students' HOTS remained underdeveloped, indicating that curriculum reform alone was insufficient without innovation in instructional design and learning media.

To address this gap, the digital comics developed in this study were intentionally designed based on narrative-based learning theory. Narrative-based digital media, including digital storytelling, have been reported to support the development of higher-order thinking skills by encouraging students to analyse information and construct meaning through contextual narratives (Utami & Rahayu, 2023). Unlike conventional textbooks that present historical facts in fragmented forms, narrative-based instructional media organise information within meaningful storylines that facilitate students' comprehension and interpretation of historical events. The narrative structure allowed students to engage with historical content through contextual scenarios that encouraged them to analyse relationships between events and evaluate historical values. Previous studies on digital storytelling and comic-based learning also reported that visual narratives could improve students' engagement and conceptual understanding (Rasmet et al., 2025; Widiyastuti et al., 2021; Yulaichah et al., 2024). However, many of these studies primarily focused on improving motivation or basic comprehension outcomes. In contrast, the present study extended previous research by systematically embedding HOTS-oriented questions within the comic narratives, thereby explicitly targeting higher-order cognitive processes (Auliya et al., 2025; Ismiyanti et al., 2026; Perez et al., 2025; Prabawati & Nurharini, 2025). This instructional design explained why expert validators evaluated the developed digital comics as highly feasible in terms of content accuracy, media design, and pedagogical alignment.

The expert validation results also supported multimedia learning theory, which emphasises that integrating verbal and visual representations can enhance meaningful learning and reduce cognitive load. The combination of narrative text and visual illustrations in the digital comics allowed students to process historical information more effectively. Minor revisions suggested by experts, such as clarifying historical terminology and improving text readability, strengthened conceptual clarity without altering the core instructional design. Compared with previous studies that required extensive revisions due to

misalignment between learning objectives and media design, the relatively limited revisions in this study suggested that the digital comic design had been well aligned with HOTS-oriented learning principles.

During the implementation phase, the use of digital comics contributed to increased student engagement and more interactive classroom discussions. Similar findings have also been reported in studies examining digital comic-based learning media, which showed that visual narrative technology could increase students' reading interest and engagement during classroom learning activities (Hidayat et al., 2024). Students demonstrated greater willingness to ask questions, express opinions, and analyse historical events presented in the comics. This finding indicated that narrative-based learning media could stimulate students' curiosity and encourage active participation in learning activities. Compared with conventional history instruction, which often positioned students as passive recipients of information, the digital comics functioned as cognitive scaffolds that facilitated collaborative discussion and reflective thinking. Similar findings have been reported in studies on multimedia and interactive learning media, which emphasised that visually rich learning environments could enhance student engagement and support active learning processes (Dewi & Tyas, 2025; Nafis & Nuryanto, 2025). Furthermore, teachers reported that the digital comics were easy to use and supported instructional explanations, which is an important factor in the successful adoption of educational technology.

The statistical analysis provided further empirical evidence regarding the effectiveness of the digital comics in improving students' HOTS. The effectiveness of comic-based learning media has also been reported in science education studies, where interactive comic media were found to enhance students' conceptual understanding and engagement during classroom learning activities (Utamingsih et al., 2023). The paired sample t-test revealed a statistically significant improvement in students' HOTS scores after the implementation of the digital comics ($t = 7.84$, $p < 0.05$). This result indicated that the observed improvement was not caused by random variation but by the instructional intervention itself. The magnitude of the improvement suggested that the integration of narrative storytelling and HOTS-oriented learning tasks provided a meaningful learning experience for elementary school students. From a cognitive learning perspective, the narrative contexts presented in the comics allowed students to connect historical information with real-life situations, thereby facilitating deeper analytical and evaluative thinking. Similar improvements in higher-order thinking have also been reported in studies examining the use of comic-based learning media in science and social studies education (Collins & Reid, 2023; Muchlas Abrori et al., 2025; Pamungkas et al., 2025).

In addition to cognitive outcomes, the positive responses from both teachers and students indicated that the digital comics also supported affective aspects of learning. Students reported increased motivation, enjoyment, and confidence in answering HOTS-oriented questions. These affective outcomes were important because motivation and self-efficacy have been identified as key factors influencing the development of higher-order thinking. Compared with previous studies that primarily focused on cognitive outcomes, this study demonstrated that integrating narrative-based digital media with HOTS-oriented tasks could simultaneously enhance students' cognitive and affective engagement in learning activities.

From a theoretical perspective, the findings of this study contributed to the growing body of literature on digital learning media by demonstrating how narrative-based digital comics could operationalise HOTS within elementary Social Studies learning (Khoo et al., 2025; Siba Sabon et al., 2022; Tay et al., 2024). The integration of constructivist learning principles, multimedia learning theory, and Bloom's revised taxonomy provided a coherent conceptual framework for designing HOTS-oriented instructional media (Ismiyanto et al., 2025; Kwangmuang et al., 2021; Radeswandri et al., 2021; Shaafi et al., 2025). Practically, the findings suggested that digital comics could serve as an accessible and effective instructional medium that supported teachers in implementing HOTS-oriented learning in elementary classrooms.

Overall, the findings explained why digital comics based on Indonesian historical heritage were effective in enhancing students' HOTS. The success of the intervention resulted from the alignment between curriculum demands, narrative-based instructional design, visual learning principles, and the cognitive characteristics of elementary school students. Therefore, this study supported the use of digital comics as an innovative and pedagogically grounded instructional medium for promoting HOTS-oriented Social Studies learning in elementary education.

Conclusion

This study aims to develop digital comics based on Indonesian historical heritage and to examine their feasibility, practicality, and effectiveness in enhancing elementary school students' Higher-Order Thinking Skills (HOTS). The findings indicated that the developed digital comics were categorised as very feasible based on expert validation of content accuracy, visual design, and pedagogical aspects, while teacher and student responses showed that the media were highly practical and supportive of classroom implementation. Furthermore, statistical analysis revealed a significant improvement in students' HOTS after the use of the digital comics, demonstrating that narrative-based visual media effectively facilitated students' abilities to analyse historical events, evaluate cultural values, and construct conclusions in Social Studies learning. These findings suggested that digital comics integrating Indonesian historical heritage could serve as an innovative and culturally responsive instructional medium that supports HOTS-oriented learning in elementary education. Future studies were recommended to explore the integration of digital comics with other interactive learning technologies or apply this media approach in different subjects and educational contexts to further strengthen the development of higher-order thinking skills.

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