

Development of CTL-based e-comic learning media assisted by Canva AI for Pancasila education in fourth-grade elementary school

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Abstract

The present study was conducted in response to the low learning outcomes of students in understanding Pancasila Education content, particularly in applying Pancasila values in everyday life. This problem was related to the use of learning media that were still limited and less engaging, as well as learning activities that tended to be conventional. One way to improve students' understanding is through the use of interesting, contextual learning media supported by Artificial Intelligence, such as CTL-based e-comics. This study aimed to develop an e-comic, identify its validity, and examine students' knowledge acquisition outcomes after using the developed e-comic. This research adopted the Research and Development (R&D) method based on the ADDIE framework. The study involved 20 fourth-grade students of SD Negeri 23 Lubuklinggau as research participants. The findings indicated that the developed e-comic obtained validity scores of 0.96 from the material expert, 0.85 from the media specialist, and 0.87 from the linguistics specialist, all of which were categorized as highly valid. The practicality test results showed percentages of 94.2% in the individual trial, 91.08% in the small-group trial, and 97.3% in the product trial, which were categorized as highly practical. The pre-test and post-test results indicated an increase in students' academic performance after using the developed e-comic. The mean N-gain value was 0.52, which was categorized as medium. Based on the results of the study, the AI-assisted CTL-based e-comic developed using Canva is feasible for use in Pancasila Education learning at primary schools.



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INTRODUCTION

Human resource capacity can be developed through education. Through education, individual competencies can be enhanced in the affective, cognitive, and psychomotor domains. This is in line with Sönmez (2017), who stated that learning objectives in each subject can be determined based on several domains of ability, namely cognitive, affective, psychomotor, and intuitive domains, which are structured progressively according to the characteristics of the learning system. In primary school education, students begin to build the foundations of thinking skills and character development. Therefore, learning is a key element that has a significant impact on students' development. Consequently, instruction in primary schools needs to be designed to be engaging, meaningful, and aligned with students' developmental characteristics.

Pancasila Education is one of the essential subjects in elementary schools and plays a vital role in shaping students' character. This subject aims to instill the values of Pancasila so that students are able to apply them in everyday contexts and uphold national unity and integrity (Lestari & Marzuki, 2020). In addition to mastering concepts, students are expected to internalize values and attitudes that reflect Indonesian national identity. Therefore, the learning process of Pancasila Education needs to be implemented effectively to ensure that students not only understand the content but also apply and embody its values in real-life situations. However, in practice, Pancasila Education in elementary schools still faces several challenges. Learning is often conducted using conventional methods, such as lectures and textbooks, which tend to make students less engaged during learning activities. As a result, students may feel bored, and learning objectives are not optimally achieved. This condition indicates the need for more innovative and engaging learning media to support the learning process. Pancasila Education is an important subject in elementary schools because it helps students understand moral values, citizenship attitudes, and character education in everyday life. However, observations conducted at SD Negeri 23 Lubuklinggau showed that students had difficulties understanding the meaning of Pancasila principles because learning activities still relied mainly on textbooks and conventional teaching methods. As a result, students were less active and showed low interest during the learning process.

To address this problem, teachers need learning media that are interesting, contextual, and appropriate to students' characteristics. One learning approach that can support meaningful learning is Contextual Teaching and Learning (CTL). According to Dewey's (1930) theory, learning becomes more meaningful when students connect learning materials with real-life situations. Therefore, integrating CTL into e-comic media is expected to make learning more engaging and helpful in improving students' comprehension.

Educational media play an important role in fostering a conducive and effective learning atmosphere. Interactive media can enhance students' motivation and

engagement by presenting material in a more interesting and meaningful way (Okdiansyah et al., 2021). In addition, the implementation of appropriate media may help teachers deliver content more effectively and encourage active student participation (Chintya Oktaviani & Risda Amini, 2023). Therefore, selecting learning media that align with students' characteristics is essential for improving the quality of learning.

Comics are one of the media that can increase students' interest in learning. Comics are visual media that combine images and text, enabling them to convey educational messages in a more engaging and easily understandable way for students. According to Chandra (2018), comics are a series of images or cartoons arranged sequentially to depict a story, thereby conveying a message to readers in a more engaging manner. Through the stories presented in comics, students can understand learning materials in a more enjoyable way. Additionally, the use of stories in comics can encourage students to be more enthusiastic about reading and participating in learning. The simple presentation and depiction of situations through images can more easily stimulate students' enthusiasm and interest in reading (Umy Oktami Andini et al., 2022).

Along with technological advancements, comics have evolved into digital formats known as e-comics. E-comics are electronic comics that are accessible through digital technology and offer more interactive instructional experiences (Khotimah & Ratnawuri, 2021). The application of technology in instructional media allows for more engaging and flexible learning processes. In addition, the emergence of Artificial Intelligence (AI) technology has accelerated the development of digital learning resources. AI can support the development of e-comics by generating visual content and adapting materials to students' needs, making learning more interactive and effective (Rachmadtullah et al., 2024; Ali et al., 2025).

Apart from learning media, the selection of an appropriate learning approach is also important in supporting effective instruction. One approach that can be applied is the CTL framework. Instruction should be supported by instructional models that engage students in active participation throughout the learning process (Ariyanti et al., 2026). CTL emphasizes the relevance of learning materials to real-world experiences, enabling students to understand the meaning and usefulness of the material.

Several previous studies indicate that comics can help improve students' academic achievement. Research conducted by Junioviona et al. (2020) demonstrated that the use of comics as educational media can effectively enhance students' motivation and learning outcomes in lessons reflecting the principles of Pancasila in elementary schools. Furthermore, research by Pramesti et al. (2025) emphasized that the use of comics in learning materials created using Canva is suitable for educational use because it enhances students' comprehension and makes learning more engaging. However, research integrating e-comic media with a CTL approach supported by AI technology in Pancasila Education at the primary school level is still relatively limited. This indicates a

research gap in Pancasila Education learning at the primary school level that aligns with technological advancements.

Given this gap, the novelty of this study lies in the development of CTL-based e-comic media integrated with Artificial Intelligence (AI) technology to make learning more interactive and enjoyable. Through this integration, the developed learning medium is expected to help improve students' engagement and understanding. Furthermore, the e-comic medium has a more attractive appearance and includes audio features, which help students understand the material through clear images. This finding is in line with the view of Ersila et al. (2023), who noted that human imagination often struggles to process and respond to abstract objects or images that have never been encountered in one's memory.

Therefore, the present study seeks to develop CTL-based digital e-comic teaching media supported by Artificial Intelligence (AI) for Pancasila Education in elementary schools and to determine its validity, practicality, and effectiveness in improving student learning outcomes.

METHOD

The method used in this study was Research and Development (R&D) to develop an e-comic as a Contextual Teaching and Learning (CTL)-based learning resource using Canva to enhance the teaching of Pancasila Education in primary schools. This development study employed the ADDIE framework, which consists of five sequential stages: analysis, design, development, implementation, and evaluation.

The study was carried out at SD Negeri 23 Lubuklinggau. A total of 20 fourth-grade students participated in this study. In addition, this study involved several validators, including a subject matter specialist, a media specialist, and a language specialist, who assessed the suitability of the developed media.

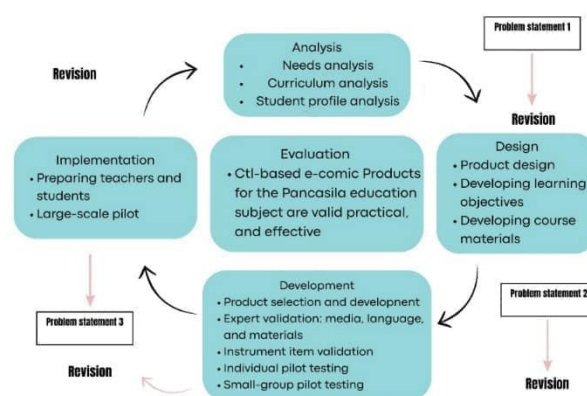


Figure 1. The ADDIE Development Stages (Adapted from Branch, 2009)

Analysis, At this stage, observations and interviews were conducted to identify learning problems, student needs, and media needs in Pancasila Education learning. Design, At the design stage, the researcher prepared learning objectives, storyboards, comic characters, learning materials, and the layout design of the CTL-based e-comic.

Development, At this stage, the e-comic was developed using Canva. The product was then validated by subject matter experts, media experts, and language experts. Implementation, The developed e-comic was implemented with fourth-grade students of SD Negeri 23 Lubuklinggau through individual and small-group trials. Evaluation, Evaluation was conducted at each stage to improve the developed product based on expert suggestions and trial results.

This study employed several instruments, namely validation sheets, practicality questionnaires, and learning achievement tests. These instruments were developed based on the research objectives and indicators of Pancasila Education material regarding the meaning of Pancasila principles in daily life. The validation sheets were used to assess the feasibility of the developed CTL-based e-comic media. The validation instruments consisted of three aspects: material validity, language validity, and media validity. Content validation evaluated the suitability of the subject matter with learning objectives and curriculum indicators. Language validation evaluated readability, clarity, and the appropriateness of language for fourth-grade elementary school students. Media validation examined visual appearance, layout, typography, color composition, and the usability of the e-comic media. The validation results were calculated using Aiken's V formula.

The validation instrument used a five-point Likert scale ranging from 1, indicating very poor, to 5, indicating very good. The validation process involved three expert validators consisting of a content specialist, a language specialist, and a media expert. The validity score was calculated using the Aiken's V formula. A usability questionnaire was administered to students after the implementation phase to assess the usability and usefulness of the developed e-comic. The questionnaire used a five-point Likert scale and a Guttman scale. It covered several aspects, including appearance, clarity of content, ease of use, appeal, and students' motivation to learn. Examples of questionnaire items include: "The appearance of this digital comic is attractive," "The material is easy to understand," and "This digital comic helps me understand the meaning of the principles of Pancasila." The usability test was conducted through individual trials, small-group trials, and field implementation.

The learning outcome instrument consisted of multiple-choice tests administered in the form of pre-assessment and post-assessment. The tests aimed to assess students' cognitive achievement before and after using the developed e-comic media. The pre-assessment and post-assessment contained the same indicators and level of difficulty to ensure consistency in measuring students' learning improvement. The test items were constructed based on the learning objectives and indicators derived from the learning outcomes of Pancasila Education for fourth-grade elementary school students. The cognitive test consisted of 20 multiple-choice questions covering several cognitive levels, namely C1, remembering; C2, understanding; C3, applying; and C4, analyzing. The indicators included identifying the meaning of Pancasila principles, analyzing appropriate behaviors based on Pancasila values, and applying Pancasila values in daily life.

The study used a one-group pre-test and post-test design involving 20 fourth-grade elementary school students who were selected purposively as research participants. The implementation was conducted during the Pancasila Education learning process using the developed CTL-based e-comic media. The pre-test and post-test consisted of 15 multiple-choice questions. Both tests contained the same items, with only the sequence changed.

RESULT AND DISCUSSION

Result

Results are the main part of scientific articles, containing: final results without data analysis process, hypothesis testing results. Results can be presented with tables or graphs, to clarify the results verbally. Discussion is the most important part of the entire contents of scientific articles. The objectives of the discussion are: answering research problems, interpreting findings, integrating findings from research into existing sets of knowledge and composing new theories or modifying existing theories.

The development process produced a CTL-based e-comic learning resource utilizing Canva for the Pancasila Education subject in Grade IV at SD Negeri 23 Lubuklinggau. The learning resource was designed using the ADDIE framework, which consists of five sequential stages: analysis, design, development, implementation, and evaluation.

Linguist Validation

Table 1. Linguist Validation Results

Aspect	Score	Category
Straightforwardness	0.95	High
Communicative	0.95	High
Dialogic and Interactive	1.00	High
Average	0.96	High

Based on the results of the linguist validation, the CTL-based e-comic obtained an average score of 0.96. This score is categorized as high because it exceeds 0.80, indicating that the CTL-based e-comic for Pancasila Education is valid and can be used in classroom learning.

Media Specialist Validation

Table 2. Media Expert Assessment Results

Factor	Result	Category
Appearance	0.88	High
Ease of Use and Usability of the Medium	0.83	High
Appropriateness for Learning	0.91	High
Average	0.87	High

Based on the results of the media validation, the CTL-based e-comic obtained an average score of 0.87. This score is categorized as high because it exceeds 0.80, indicating that the CTL-based e-comic for Pancasila Education is valid and can be used in classroom learning.

Subject Matter Expert Validation

Table 3. Subject Matter Expert Validation Results

Factor	Result	Category
Study Guide	0.875	High
Curriculum Alignment	0.95	High
Motivation and Interest	0.75	High
Average	0.85	High

Based on the results of the subject matter expert validation, the CTL-based e-comic obtained an average score of 0.85. This score is categorized as high because it exceeds 0.80, indicating that the CTL-based e-comic for Pancasila Education is valid and can be used in classroom learning. The validity interpretation criteria are presented in Table 4.

Table 4. Interpretation of Aiken's Validity

Correlation Coefficient	Interpretation of Validity
> 0.80	High
$0.60 \leq V \leq 0.80$	Fairly High
$0.40 \leq V \leq 0.60$	Fair
$0 \leq V \leq 0.40$	Poor

Source: Azwar (2012)

Individual Trial

A one-on-one trial was conducted involving three Grade IV students of SD Negeri 23 Lubuklinggau to assess the practicality of the CTL-based e-comic in Pancasila Education. The practicality assessment sheet used in this trial consisted of student responses to eight statements designed to evaluate the practicality of the medium.

Table 5. Individual Trial Results

Factor	Result	Category
Media Presentation	100%	Highly Practical
Motivation to Learn	88.8%	Highly Practical
Understanding of the Material	100%	Highly Practical
Clarity of Presentation	100%	Highly Practical
Engaging Nature of the Media	66.6%	Practical
Average	91.08%	Highly Practical

Based on the questionnaire assessment obtained through the one-on-one trial with three students, each of whom responded to eight statements regarding the CTL-based e-comic medium used in Pancasila Education for Grade IV students of SD Negeri 23 Lubuklinggau, an average score of 91.08% was obtained. This score is categorized as

highly practical because it falls within the average score range of 81%–100%. Based on these assessment results, it can be concluded that the CTL-based e-comic medium is practical for use in learning.

Small-Scale Trial

A small-group trial was conducted involving nine fourth-grade students at SD Negeri 23 Lubuklinggau to assess the practicality of the CTL-based e-comic in Pancasila Education. The practicality assessment sheet used in this trial contained student responses to eight statements designed to evaluate the practicality of the medium.

Table 6. Small-Scale Trial Results

Aspect	Score	Category
Media Presentation	100%	Highly Practical
Motivation to Learn	96.6%	Highly Practical
Understanding of the Material	90%	Highly Practical
Clarity of Presentation	100%	Highly Practical
Engaging Nature of the Media	100%	Highly Practical
Average	97.32%	Highly Practical

Based on the questionnaire assessment obtained through the small-group trial involving nine students, each of whom responded to eight statements regarding the CTL-based e-comic in Pancasila Education for Grade IV students of SD Negeri 23 Lubuklinggau, an average score of 97.32% was obtained. This score is categorized as highly practical because it falls within the average score range of 81%–100%. Based on these assessment results, it can be concluded that the CTL-based e-comic medium is practical for use in learning.

The preliminary trials showed that all components of the learning media evaluation obtained high scores in both trial phases and were categorized as highly practical. These results strengthen the evidence that the developed learning medium has consistent quality and is well received by students.

The use of the e-comic elicited very positive responses from students. Students stated that the content was easily accessible, the material was easy to understand, and the presentation was engaging. The average score at the end of the learning session also improved compared to the pre-test score. The field trial was conducted with all fourth-grade students at SD Negeri 23 Lubuklinggau. This stage aimed to measure the effectiveness of the e-comic in Pancasila Education learning. The N-Gain score categories are presented in Table 7.

Table 7. N-Gain Criteria

N-Gain Value	Category
$N\text{-Gain} \geq 0.70$	High
$0.30 \leq N\text{-Gain} < 0.70$	Medium
$0.00 \leq N\text{-Gain} < 0.30$	Low

Source: Supriadi (2021)

Table 8. N-Gain Results from the Field Trial Data

Pre-test Mean	Mastery in Pre-test	Post-test Mean	Mastery in Post-test	Score Increase
58.5	5/20 students	80.4	17/20 students	21.9

The pre-test data showed that the average score was 58.5. This test was administered before the use of the CTL-based e-comic. Based on the 15-question test, 15 students had not yet achieved the minimum mastery criterion of 70, indicating that many students had not met the expected proficiency standard. However, after the students learned using the e-comic medium, the post-test average score increased to 80.4. In the post-test, three students had not yet achieved mastery, while 17 students had achieved mastery. Thus, there was an improvement in students' learning outcomes from the pre-test to the post-test, with an average score increase of 21.9.

The pre-test scores ranged from 40 to 80, with an average score of 58.5. Meanwhile, the post-test scores ranged from 53 to 100, with an average score of 80.4. To determine the effectiveness of the developed medium, the N-Gain formula was used as follows:

$$\text{N-Gain} = (\text{Post-test Score} - \text{Pre-test Score}) / (\text{Ideal Score} - \text{Pre-test Score})$$

$$\text{N-Gain} = (80.4 - 58.5) / (100 - 58.5)$$

$$\text{N-Gain} = 21.9 / 41.5$$

$$\text{N-Gain} = 0.52$$

The average pre-test score was 58.5, while the average post-test score was 80.4. The effectiveness coefficient was 0.52, which falls within the N-Gain interval of $0.30 \leq g < 0.70$ and is classified as medium. Therefore, it can be concluded that the use of the CTL-based e-comic medium is effective in improving learning outcomes in Pancasila Education for Grade IV students of SD Negeri 23 Lubuklinggau.

Discussion

The research results demonstrate that the CTL-based e-comic learning media developed with the assistance of Canva is suitable for use in Pancasila Education for fourth-grade elementary school students. This is supported by the results of expert validation and pilot testing, which showed that the media is visually appealing, practical, and capable of facilitating students' understanding of the material. This finding is in line with Satria and Ekok (2020), who stated that learning media function as tools to convey messages in a planned manner in order to create an effective learning environment.

The e-comic developed in this study applies the CTL approach, which connects learning materials with students' real-life experiences to help them understand the content more meaningfully. This is consistent with Dewey's (1930) theory, which states that learning becomes more meaningful when students are involved in real-life situations related to their daily experiences. Therefore, presenting Pancasila material through comic stories, colorful illustrations, and situations close to students' daily lives

helps students understand the material more easily and concretely, as also explained by Riyadusshalihin et al. (2025). Furthermore, the application of AI-assisted Canva features supported the development of a more interactive and visually engaging e-comic through layout recommendations, image enhancement, and visual design generation, thereby increasing students' interest and involvement during learning activities. However, the implementation of AI-assisted e-comic media also requires adequate technological support, such as digital devices, projector facilities, and teachers' ability to operate digital learning media effectively. Therefore, teacher preparation and technical support are important to optimize the implementation of AI-assisted e-comic learning media in elementary school classrooms.

In line with the view expressed by Fajriati et al. (2024), AI can be tailored to students' ability levels, enabling more interactive and adaptive learning. This is also consistent with the view that AI technology can increase audience engagement and ultimately lead to improved outcomes or benefits. However, the use of AI must be approached wisely and responsibly to ensure that it has a positive effect on students and the broader educational environment (Sytnyk et al., 2024). The AI-powered Canva features used in this study primarily supported the visual design development process, including automatic layout recommendations, image quality enhancement, background generation, and design consistency adjustments. These features helped researchers develop more visually engaging e-comic media more efficiently and consistently in accordance with the characteristics of elementary school students. Therefore, the role of AI in this study was not as a self-learning intelligent system, but rather as a supporting technology that facilitated the media development process and improved the visual quality of instructional materials.

The validity of the CTL-based e-comic media was assessed by three experts, namely a language expert, a media expert, and a subject matter expert. The validation process was conducted before the media were used by students in learning activities. The validators provided feedback in the form of suggestions and comments on the developed e-comic media, thereby identifying several sections that still needed improvement. The improvements made included aspects related to language use, media presentation, and adjustments to the characters' expressions in the comic to better align with the characteristics of elementary school students.

Based on the experts' assessment, the CTL-based e-comic met the eligibility criteria and was therefore suitable for use in fourth-grade elementary school classrooms. These results indicate that the developed media met the criteria for language quality, visual presentation, and appropriateness of learning content. This aligns with the opinion of Panjaitan et al. (2022), who stated that validity analysis of learning media is conducted to determine whether the media meet validity criteria. Data analysis is carried out by calculating the average value of each indicator. Thus, learning media can be considered valid if they meet the eligibility requirements based on expert evaluations.

The practicality phase was conducted through individual and small-group trials, as well as evaluations by fourth-grade elementary school teachers. In this phase, students were first given an explanation of how to use the e-comic medium and were then asked to provide feedback on its use through a student response questionnaire. Based on the results of these trials, no further suggestions or feedback regarding product revisions were found from either students or teachers. This indicates that the media, which had been refined during the previous validation stage, already aligned with learning needs and was easy to use in classroom instruction. This aligns with the view of Safitri et al. (2022), who stated that learning media validated by experts typically require fewer revisions during the pilot testing phase because the content, language, and design have been adapted to the characteristics of learners. Thus, media that have undergone validation and refinement generally meet the criteria for suitability and can be used more effectively in learning activities.

The results of the pilot study also showed that the developed e-comic medium was easy for both students and teachers to use in the learning process. Students were able to understand how to use the medium well and were interested in the stories and images presented in the comic. Images make learning more effective because they assist in the storage and retrieval of information in students' long-term memory (Frey & Fisher, 2008). The findings of this study are in line with Pramesti et al. (2025), who found that Canva-assisted comic-based learning materials are suitable for educational use because they can enhance students' understanding and make the learning process more engaging and interactive. With Canva, educators can easily create engaging and interactive learning materials tailored to students' needs without requiring advanced design skills (Mulyono et al., 2024). In addition, Nurhadifah Amaliyah and Rande (2024) explained that digital comics can improve students' understanding by combining visual and narrative elements, thereby helping students grasp the content more easily.

Thus, the absence of revisions during the practicality testing phase indicates that the developed CTL-based e-comic media met the criteria for feasibility and ease of use in learning. This is further supported by highly positive feedback from students and teachers, thereby allowing the CTL-based e-comic media to be categorized as practical and suitable for use in Pancasila Education instruction for fourth-grade elementary school students.

The effectiveness of the CTL-based digital comic in this study was determined through pre-tests and post-tests administered before and after the use of the medium in instruction. These tests aimed to measure the extent of students' understanding of the material regarding the application of Pancasila principles in daily life. The results showed that after the use of CTL-based digital comics in learning, students' understanding of the material increased. However, although the N-gain result was categorized as moderate, this condition was influenced by internal factors, including students who still struggled with reading and had very quiet dispositions, making them less active in communicating with peers or teachers. In addition, some students remained unfocused during lessons because they frequently played or asked to leave

the classroom. These conditions prevented students from fully grasping the material, resulting in their failure to achieve learning mastery.

To address this issue, the researcher provided additional attention and support to students who experienced difficulties. This support was provided by engaging students in more frequent communication to help them feel more comfortable and encourage them to ask questions without hesitation. In addition, the researcher guided students who still struggled with reading by asking them to read slowly and helping them understand the words and sentences in the learning materials. Through this approach, students are expected to become more focused on their learning and gradually achieve the same level of mastery as their peers.

The findings of this study align with Yeni and Yurnetti (2025), who stated that the implementation of Contextual Teaching and Learning (CTL) can enhance student engagement and learning outcomes because instruction is linked to real-life situations, making it easier for students to master the material being studied. Learning activities in this study also developed across sessions. In the first session, learning activities were still focused on explaining the material by following the CTL steps and using the e-comic as a medium for conveying information. At this stage, students began to show interest in the media used; however, their engagement and thinking activities were not yet optimal because learning was still dominated by the teacher's explanations.

In the subsequent lesson, the learning activity was designed by posing questions about each story in the comic. Students were then asked to discuss the answers with their groups and present the results of the discussion to the class. This activity encouraged students not only to read the comics but also to analyze the story content, engage in discussion, and express their opinions, thereby making learning more active and meaningful. The e-comic medium developed in this study also features an engaging visual design and uses simple, communicative language, making it suitable for elementary school students. This aligns with McCloud's (1993) assertion that a good comic must clearly integrate text and images and be arranged sequentially to ensure ease of understanding for readers. Furthermore, the presentation of comic content depicting everyday life situations also makes it easier for students to understand the learning material (Safarati & Marlina, 2023).

The use of e-comics in learning can also create a more active and interactive learning environment. In the learning process, students do not merely listen to the teacher's explanations but are also engaged in activities such as reading comic stories, discussing them, and responding to the content within the comics. Thus, e-comics not only help students comprehend the material visually but also enhance their engagement in learning through contextual stories closely related to their daily experiences.

Furthermore, the use of e-comic media, which integrates text, images, and audio, is also capable of enhancing students' attention and learning motivation. This aligns with Mayer's (2001) view that students learn better when material is presented through a combination of words and images rather than words alone, because this combination helps students build understanding both verbally and visually.

Based on these research findings, it can be concluded that the use of CTL-based e-comic media is effective in the learning process. This medium is capable of increasing students' engagement in learning and helping them understand the material more easily through the presentation of engaging stories, clear visuals, and relevance to students' daily lives.

CONCLUSION

CTL-based electronic comics assisted by AI-supported Canva features show potential as a learning tool for fourth-grade Pancasila Education within the context studied at SD Negeri 23 Lubuklinggau. The findings indicated that the developed media were categorized as highly valid and practical, while the effectiveness results revealed a moderate improvement in learners' achievement, with an N-gain value of 0.52. The integration of contextual storytelling, visual representation, audio features, and educational games helped support students' engagement and understanding of Pancasila values in daily life. However, the generalization of these findings is limited to fourth-grade elementary school students, the Pancasila Education subject, and the specific classroom environment in which the study was conducted. In addition, the role of AI in this study was limited to supporting the media development process through AI-assisted Canva features rather than functioning as an independent intelligent instructional system. Further research is needed to investigate the effectiveness of CTL-based e-comics in different educational contexts, broader participant groups, and various subject areas. Future studies are also recommended to examine the effectiveness of additional engaging features, students' reading abilities, and more advanced AI integration on students' learning engagement and achievement.

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