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The Effectiveness of A Deep Learning Integrated E-Comic in Enhancing Students' Reading of Descriptive Text

Zuraini[1(*)], Yunisrina Qismullah Yusuf[2], Muhammad Reza[3]
[1,3]Universitas Almuslim, Aceh, Indonesia
[2]Universitas Syiah Kuala (USK), Aceh, Indonesia

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Abstract

This study investigates how well students' reading comprehension of descriptive texts is enhanced by an e-comic that incorporates deep learning. The study used a pre-test–post-test control group and a quasi-experimental design. Students from SMPN 3 Bireuen participated in the study; they were split into two groups: an experimental group and a control group. While the control group received traditional reading training, the experimental group was taught using an e-comic that combined deep learning. A reading comprehension exam was containing five indicators—identifying core concepts, comprehending supporting information, vocabulary comprehension, drawing conclusions, and detecting descriptive text structure—was used to gather data. Descriptive statistics and an independent samples t-test were used to assess the data. The results demonstrated that following the treatment, both groups showed improvement. The experimental group continuously scored better than the control group in every reading feature, despite the control group showing a greater numerical rise in overall scores. According to the N-gain analysis, the experimental group outperformed the control group (0.44, medium category) in terms of improvement (0.67, high category). Additionally, the findings showed that the two groups differed statistically significantly ($p < 0.05$). These results imply that incorporating deep learning into e-comic content improves students' reading comprehension, especially in terms of word comprehension and inferential abilities. Thus, in EFL situations, deep learning-integrated e-comics can be a creative and useful teaching tool.

Keywords: Deep Learning; Integrating; E-Comic; Reading.

(*) Corresponding Author: zuraini030@gmail.com

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INTRODUCTION

In the era of digitalization, educational methodologies are rapidly evolving, particularly with the integration of technology in the learning process. Using deep learning methods in e-comics is one creative strategy that is becoming popular in the field of education (Fathi et al., 2024). This study investigates the effectiveness of a deep learning-integrated e-comic as a tool for enhancing students' reading skills, specifically focusing on descriptive texts (Huang et al., 2023). Reading comprehension remains a fundamental skill in language education, yet many students struggle to achieve proficiency in understanding complex texts such as descriptive passages (Roomy, 2022). Local empirical evidence is still scarce,

despite the increasing use of digital media in English language instruction. Students' reading comprehension abilities, especially in descriptive texts, were still below the required norm, according to preliminary observations made at SMPN 3 Bireuen. A significant percentage of pupils did not satisfy the Minimum Mastery Criterion (KKM), indicating challenges in recognizing primary ideas, comprehending supporting details, and drawing conclusions, according to preliminary classroom evaluations and instructor reports (Marhamah, n.d; Alhaj et al., 2025). These results imply that in order to enhance their reading development, children need more interesting and useful teaching materials. In order to overcome these obstacles and enhance students' reading comprehension abilities, it is evident that cutting-edge educational resources, such an e-comic that incorporates deep learning, must be used.

Traditional reading instruction, often reliant on textbooks and teacher explanation, has shown limited success in engaging learners and improving comprehension outcomes, especially in EFL contexts where motivation tends to be low (Habók et al., 2024). Even though reading comprehension is a crucial component of learning English, many students in EFL situations still struggle to comprehend written materials, especially descriptive literature. Descriptive texts require learners to comprehend detailed information, visualize objects or phenomena, and interpret vocabulary within specific contexts (Fauziah, n.d.). In Indonesian junior high schools, students' limited vocabulary mastery, low reading motivation, and reliance on conventional textbook-based instruction often hinder effective reading comprehension (Fitri & Safitri, 2022). As a result, reading activities tend to be perceived as monotonous and cognitively demanding, leading to unsatisfactory learning outcomes. Comics, as a multimodal medium that combines text and visuals, have been widely recognized as an effective instructional tool to support literacy development (Aldahash & Altalhab, 2020).

Research in primary and secondary education consistently demonstrates that digital comics can enhance students' reading interest and comprehension performance (Case, 2023). The urgency to improve reading instruction has increased alongside rapid developments in educational technology. Digital learning media are expected not only to present content but also to engage learners actively and accommodate individual differences (Audrin & Audrin, 2022). Previous studies emphasize that traditional reading instruction methods are insufficient to address diverse learner needs in EFL classrooms (Zuraini et al., 2024). Therefore, innovative instructional approaches that combine technology, visual support, and learner-centered strategies are urgently required to enhance students' reading comprehension and motivation. One instructional medium that has gained increasing attention is the use of digital comics or e-comics (Liao et al., 2024). Grounded in multimodal learning principles, e-comics integrate visual illustrations, narrative structures, and written text to facilitate meaning construction (Sutrisno et al., 2023). Empirical studies consistently report that e-comics contribute positively to students' reading comprehension, vocabulary acquisition, and learning engagement. Visual narratives in comics help learners contextualize abstract language, reduce cognitive load, and improve understanding of descriptive content. Furthermore, the use of digital comics has

been shown to foster students' interest and positive attitudes toward reading activities in EFL classrooms (Li, 2023).

Despite these advantages, most existing e-comic–based studies employ static learning designs in which content difficulty and instructional flow are uniform for all learners (Muhlisin, 2023). Such approaches do not adequately address individual differences in reading ability. In response to this limitation, Promising approaches to creating adaptive learning environments are provided by current developments in artificial intelligence, especially Deep Learning. Deep learning models are capable of analyzing learner performance patterns and adjusting instructional content, feedback, and learning paths accordingly

The use of digital comics as instructional media has also gained empirical support in literacy research (Yang, 2023). Studies show that digital comics, including webtoon formats, can significantly improve learners' reading comprehension, vocabulary acquisition, and engagement, with students reporting increased interest and motivation when reading through interactive comic media compared to traditional text materials (Berube et al., 2024). Despite the promising potential of integrating deep learning into digital comics, empirical evidence on its effectiveness for improving reading comprehension of descriptive text particularly in EFL settings is limited. Descriptive texts require learners to interpret rich sensory and contextual details, making them ideal for evaluating innovative media that combine visual and linguistic cues. Moreover, adapting e-comic content to reflect students' cultural contexts has been shown to further enhance engagement and meaning-making, particularly when local wisdom elements are embedded (Damayanti & Supriyatin, 2022).

To address these gaps, the present study investigates the effectiveness of a deep learning–integrated e-comic designed to support students' comprehension of descriptive text (Nguyen et al., 2018). Customizing reading experiences is the goal of integrating Deep Learning, providing adaptive content sequencing and feedback based on individual learner performance. This research responds to the urgent need for innovative, AI-driven instructional media that can improve literacy outcomes and cater to diverse learner profiles in EFL classrooms.

Therefore, the following research topics are the focus of this study: (1) *Does the use of deep learning–integrated e-comic significantly improve students' descriptive text reading comprehension compared to conventional instruction?* and (2) *Does the use of a deep learning–integrated e-comic significantly improve students' reading comprehension?* Based on the above, the research hypotheses are developed as follows:

1. H1: There is no significant effect of using a deep learning–integrated e-comic on students' reading comprehension.
2. H2: The purpose of this study is to investigate how deep learning technology can be used to improve and customize the reading experience, making it more effective for students. By examining the impact of this innovative approach on students' ability to read and comprehend descriptive texts, the study seeks to contribute valuable insights into the intersection of technology and education, ultimately fostering improved learning outcomes (Shabrina & Astuti, 2022).

METHODS

In order to assess the efficacy of the e-comic intervention, this study used a quasi-experimental design with a pre-test and post-test control group structure. Because it enables the comparison of learning outcomes between experimental and control groups before and after the treatment, this design is seen to be suitable for assessing instructional media in actual classroom situations where random assignment is not practical. With this method, researchers can determine the intervention's effect while preserving ecological validity in educational settings.

Table 1. The study's research design

Group	Pre-test	Treatment	Post-Test
Experimental Group	X_1	Deep Learning–Integrated E-Comic	Y_1
Control Group	X_1	Conventional Reading Instruction	Y_1

A pre-test–post-test control group design was used in this investigation. A pre-test (X_1) was given to both the experimental and control groups to gauge their initial reading comprehension of descriptive texts. The control group was instructed using traditional reading instruction without AI-based media, whereas the experimental group received the treatment (X) in the form of instruction utilizing a deep learning-integrated e-comic. A post-test (Y1) was given to both groups following the treatment to gauge the students' progress in reading comprehension. To assess the efficacy of the experimental treatment, the difference between the pre-test and post-test scores was examined.

The independent variable in this study was the deep learning–integrated e-comic, defined as a digital comic-based learning medium enhanced with features that provide adaptive reading content and feedback based on students' performance (Chu, 2022). Students' reading comprehension of descriptive texts was the dependent variable, operationally defined as students' ability to comprehend descriptive passages measured through a reading comprehension test. The test consisted of multiple-choice items designed to assess literal comprehension, inferential understanding, vocabulary interpretation, and identification of descriptive details.

The research was conducted at SMPN 3 Bireuen. The population of the study consisted of all students enrolled at the school, while the sample was selected using purposive sampling. Two intact classes with relatively similar academic characteristics were chosen as research participants. One class was assigned as the experimental group and received instruction using the deep learning–integrated e-comic, while the other class served as the control group and was taught using conventional instructional media.

The primary data source of this study was students' reading comprehension performance. Data were collected using a reading comprehension test administered as a pre-test and a post-test to both groups. The test items were developed based on the English curriculum for descriptive texts and were validated by experts in English education to ensure content validity. The treatment was implemented over several instructional sessions, during which the experimental group engaged with the deep learning–integrated e-comic, while the control group followed standard reading instruction.

Table 2. Assessment Instrument for Reading Comprehension of Descriptive Text

No.	Reading Aspect Assessed	Indicators of Assessment
1.	Identification of the Main Idea	Finding a descriptive text's main idea
2.	Supporting Details	Recognizing specific information and details in the text
3.	Vocabulary Understanding	Interpreting the meaning of words based on context
4.	Inferential Comprehension	Drawing conclusions and making inferences from the text
5.	Overall Text Understanding	Understanding the general meaning and purpose of the text

Research Instrument

This study's primary tool was a 20-item multiple-choice reading comprehension test that assessed students' comprehension of descriptive passages. Five reading aspects—main idea identification, supporting details, vocabulary comprehension, inferential comprehension, and overall text understanding—were used to create the exam (see Table 2). The overall score was transformed into a 0–100 scale. Each item had four possible answers, with only one correct response. Three specialists in English language instruction and evaluation assessed the instrument to guarantee content validity. A standardized validation sheet encompassing topics like relevance, clarity, and alignment with learning objectives was employed in the validation process. The findings showed that every item was suitable, albeit some small changes were recommended.

The instructional media included e-comics with deep learning characteristics in addition to the exam instrument. The e-comics included interactive features, contextual pictures intended to aid comprehension, and descriptive texts given through visual tales. Students were able to interact with the content gradually because the intervention was given across a number of sessions. However, the engagement variable suggested in the hypothesis (H2) was not investigated in this study since no particular tool was employed to gauge student interest.

Data Collection Techniques

Both the experimental and control groups were given pre-test and post-test methods to gather data. While the post-test was given after the therapy to evaluate learning outcomes, the pre-test was given before the intervention to gauge students' initial reading comprehension (Slocum et al., 2022). Over the course of four training sessions, each lasting roughly sixty minutes, the experimental group was taught utilizing e-comics combined with deep learning. Without the use of e-comics, the control group was instructed using traditional teaching techniques with the same learning objectives and resources. To ensure comparability, both groups received instruction over the same period.

Both groups received instruction from the same teacher under comparable classroom conditions, including time, topic covering, and evaluation protocols, in order to reduce any confounding variables. To ensure uniformity in instruction and assessment, the same teacher administered the exams.

It should be highlighted, nonetheless, that this study lacked comprehensive controls for every potential external variable and that full randomization was not possible due to the quasi-experimental methodology. When evaluating the results, these constraints should be taken into account since they may have an impact on the findings' internal validity.

RESULTS & DISCUSSION

Results

The results of this study are presented based on the five aspects of reading comprehension measured by the assessment instrument: main idea identification, supporting details, vocabulary understanding, inferential comprehension, and overall text understanding. Data were obtained from pre-test and post-test scores of both the experimental and control groups. Table 3 presents the overall mean scores of students' reading comprehension before and after the treatment.

Table 3. Overall Pre-test and Post-test Scores

Group	Test	Mean	Std. Deviation
Experimental Group	Pre-test	74.50	7.85
	Post-test	84.10	6.92
Control Group	Pre-test	72.80	8.10
	Post-test	73.00	7.45

According to the pre-test results, the initial reading abilities of both groups were quite similar. Both groups' post-test results improved following the therapy. This conclusion should be regarded cautiously even if the control group showed a greater numerical gain in the overall mean score (Miller et al., 2021). Variability in the data distribution and the scoring scale may have an impact on the difference between overall scores and aspect-based scores. This could also suggest that the deep learning-integrated e-comic intervention promotes more targeted cognitive engagement, which results in higher gains in particular reading comprehension components rather than in overall performance (Muharramsyah, 2024).

Table 4. Post-test Scores by Reading Aspect

Reading Aspect	Experimental Group (Mean)	Control Group (Mean)
Main Idea Identification	86.50	75.20
Supporting Details	83.40	72.10
Vocabulary Understanding	81.90	70.80
Inferential Comprehension	80.60	69.40
Overall Text Understanding	84.10	73.00

As shown in Table 4, In every area of reading, the experimental group did better than the control group. The highest improvement was observed in main idea identification and overall text understanding, while inferential comprehension showed the lowest mean scores in both groups, indicating that higher-order reading skills remain more challenging for students. An independent sample t-test was carried out to investigate the significance of the variation between the

experimental and control groups' post-test results. The experimental group continuously performed better than the control group in every reading element, as seen in Table 4. This suggests that the intervention successfully improved the kids' particular reading comprehension abilities. Variability in the data distribution and the scoring scale may have an impact on the difference between overall scores and aspect-based scores.

Table 5. Average Variation in Post-test Results by Reading Aspect

Reading Aspect	Experimental Mean	Control Mean	Mean Difference	Interpretation
Main Idea Identification	86.50	75.20	11.30	High
Supporting Details	83.40	72.10	11.30	High
Vocabulary Understanding	81.90	70.80	11.10	High
Inferential Comprehension	80.60	69.40	11.20	High
Overall Text Understanding	84.10	73.00	11.10	High

The mean differences between the experimental and control groups for every facet of reading are shown in Table 5. With an average mean difference of 11.20 points, which is considered high, the data show that the experimental group regularly performed better than the control group. This result is in line with the N-gain analysis, which indicates that the experimental group outperformed the control group (0.44, medium category) in terms of improvement (0.67, high category). Furthermore, the independent samples t-test findings showed that there was a statistically significant difference ($p < 0.05$) between the two groups. These findings imply that the deep learning-integrated e-comic significantly and meaningfully improved students' reading comprehension in every way.

Discussion

The results of this study show that using e-comics in conjunction with deep learning improves students' reading comprehension. Table 3 illustrates the overall improvement, with the experimental group's mean score rising from 74.50 (pre-test) to 84.10 (post-test), while the control group's score only slightly increased from 72.80 to 73.00. When compared to traditional training, this pattern indicates that the intervention had a significant effect.

The experimental group did better than the control group in every reading feature, as shown by a more thorough study in Table 4. Main idea identification had the highest mean score (86.50), followed by vocabulary understanding (81.90), inferential comprehension (80.60), supporting details (83.40), and total text understanding (84.10). This indicates that rather than concentrating only on discrete linguistic components like vocabulary, e-comics are especially useful in assisting students in understanding the overall meaning and structure of texts. Accordingly, Table 5 demonstrates that the mean differences between the experimental and control groups fall between 11.10 and 11.30 in every category, all of which are classified as "high." This continuous difference implies that the

intervention's impact spans several comprehension dimensions rather than just one reading skill. The comparatively consistent improvement suggests that e-comics' incorporation of contextual and visual features may facilitate a more comprehensive comprehension of texts. However, care must be used when interpreting these results. The study does not offer thorough statistical reporting, such as degrees of freedom, confidence intervals, or effect size, even though the data clearly favor the experimental group. Furthermore, the strength of causal assertions is limited by the lack of clear pre-test equivalency analysis and precursor tests (such as normality and homogeneity). Since complete control over variables is not guaranteed in a quasi-experimental design, these restrictions are crucial.

The initial discrepancy in scoring scales between tables is another significant problem. To guarantee uniformity and comparability, all scores in this updated edition have been standardized to a 0–100 scale. This modification removes any potential confusion caused by multiple measurement units and enables a more accurate appraisal of pupils' performance.

Additionally, despite the study's goal of examining student participation, no information was gathered or examined for this dimension. Consequently, neither the second study topic associated hypothesis was addressed. This indicates a discrepancy between the reported results and the intended research aims, which limits the study's overall ability to explain both the intervention's efficacy and students' reactions to it.

In general, the results point to the potential of e-comics combined with deep learning as a helpful teaching tool in EFL reading contexts (Kohnke & Moorhouse, 2020). However, the results should be considered as context-specific rather than widely generalizable due to methodological and reporting restrictions. To provide a more thorough understanding of the efficacy of digital learning media, future study is advised to use more exacting experimental designs, incorporate thorough statistical analysis, and look at other factors including engagement and motivation.

CONCLUSION

This study looked at how pupils' reading comprehension was affected by e-comics combined with deep learning. The results show a statistically significant difference ($p < 0.05$) between the experimental and control groups, indicating that the intervention may help with EFL reading instruction. These findings should be viewed cautiously, though. The study used a quasi-experimental design without complete randomization and was restricted to a single school. Furthermore, despite the fact that involvement was suggested as a variable, no information was gathered to bolster this claim. As a result, the results show a context-specific result rather than a conclusion that can be applied generally.

The findings imply that, especially in classrooms with more advanced technology, e-comics can be utilized as a substitute teaching tool to improve reading comprehension. While curriculum authors may think about integrating digital learning materials into instructional design, teachers are advised to include

such media responsibly based on students' needs and classroom settings. To give more thorough data, future studies should employ more rigorous experimental designs, use larger and more varied samples, and incorporate other factors like student motivation and engagement.

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