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Comic Media Impact: Improving Reading Science Literacy Through Exciting Adventures in Picture Worlds

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Abstract: This study investigates the impact of comic media on improving science literacy in elementary school students. A quasi-experimental design was used with two groups: an experimental group utilizing comic media and a control group employing traditional methods. Pretest and posttest assessments measured students' reading abilities in science. A t-test analysis was performed to compare the groups' performances. The findings indicate that students exposed to comic media showed significant improvement in reading abilities compared to those in the control group. These results suggest that comic media not only enhances student interest in learning but also improves information retention. The study recommends integrating comic media into the primary school curriculum to effectively boost students' science literacy.

Keywords: Comics; Elementary School; Science Literacy

Introduction

Education is one of the main pillars in the development of a nation. nation (Johari *et al*., 2024; Sucipto *et al*., 2024; Zain *et al*., 2024). Quality education will produce human resources that are competent, creative, and able to adapt to the times (Hafidz *et al*., 2023; Miftah *et al*., 2024; Wahab, 2022). One important aspect of education is literacy, the ability to read, write and understand information. Science literacy, in particular, is the ability to understand science concepts and apply that knowledge in everyday life (Suparya *et al*., 2022; Sutrisna, 2021).

Based on a survey conducted in 2015 by the Program for International Student Assessment (PISA), literacy and reading skills in Indonesia are in the lowest position, which is ranked 64th out of 72 countries. In addition, research conducted in 2016 on the Most Literate Countries around the world showed that Indonesia ranked 60th out of 61 countries studied (Manik *et al*., 2024; Paricahya *et al*., 2024; Rafidah *et al*., 2024). This data illustrates the literacy crisis situation in Indonesia, where basic reading and text comprehension skills are far below international standards. This is a serious indicator that the quality of education in Indonesia requires urgent attention and intervention (Rihada *et al*., 2021; D. A. K. Sari & Setiawan, 2023; Winata *et al*., 2021).

The low literacy levels of these students indicate weaknesses in the education system, particularly in the literacy programs currently in place (Harlanu *et al*., 2023; Jasrial *et al*., 2023; Razak *et al*., 2022). Existing literacy programs need to be significantly improved to improve the quality of education (Herawati *et al*., 2023; Mustofa *et al*., 2023; B. Nugraha *et al*., 2022). Improving the quality of literacy programs will have a direct impact on increasing students' interest in reading and reading skills, which in turn will improve the overall quality of education in Indonesia (Aksarah & Bangkele, 2024; Amifelia *et al*., 2024; Hasnaini & Doyan, 2024). However, this effort to improve literacy is not only limited to literacy programs in schools, but must also involve various elements of society and be supported by

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appropriate policies. (Hidayati *et al*., 2024; Suparya *et al*., 2022; Zahra & Amaliyah, 2023).

In the context of basic education, science literacy is one of the fundamental aspects that need to be instilled early on. Science literacy not only includes the ability to read and understand scientific information, but also involves the ability to think critically, solve problems and make decisions based on scientific evidence. Children in elementary school should be introduced to various science concepts in an interesting and easy-to-understand manner so that they are interested and motivated to learn more about science. This interest and motivation is important because it can form a strong foundation for future science learning, as well as encourage their interest in science and technology (Muliani *et al*., 2021; Suryati *et al*., 2024; Utami *et al*., 2022).

One of the media that can be used to improve science literacy is comics. Comics as visual media have a special appeal for children because they present stories with interesting and easy-to-understand images. The vivid illustrations and entertaining narratives in comics can make complex science concepts more accessible and understandable to children. In addition, comics can also awaken their imagination and creativity, making science learning more fun and interactive. Thus, the use of comics in science learning in elementary schools can be an effective strategy to improve science literacy and build a strong foundation for future scientific understanding. (Handayani, 2021; Priyangga *et al*., 2023; Utama *et al*., 2023).

Comics have great potential to be used as learning media, especially in conveying science concepts that are often considered difficult by students (Dewi & Tyas, 2024; Kerans & Sanjaya, 2024; Wijaya & Linawati, 2024). The use of comics in learning can help students understand the material more easily and fun, making the learning process not only informative but also entertaining; Wulan *et al*., 2023).

The stories and illustrations in comics can facilitate the understanding of complex and abstract concepts in a more visual and narrative way. This visualization makes abstract science concepts more concrete and easy to understand (Akbar *et al*., 2024). For example, complex concepts such as the water cycle, the process of photosynthesis, or the principle of gravity can be explained through interesting stories and images, so that learners can more easily absorb the information conveyed. In addition, comics can also improve learners' memory because information presented visually and narratively tends to be easier to remember than plain text (Fauza *et al*., 2023; Wibowo & Koeswanti, 2021).

The use of comics in learning can also stimulate students' imagination and creativity, encourage them to think critically and make connections between the concepts learned and the real world. Thus, comics not only function as learning aids, but also as an effective medium to generate interest and motivation to learn science in students (Darllis *et al*., 2021; Jannah & Reinita, 2023; Puspitasari *et al*., 2021).

Revelant research by Sutrisna, (2021) entitled Analysis of the science literacy skills of high school students in Sungai Penuh City found that the low science literacy skills of students were influenced by several factors, namely low interest in reading, evaluation tools that have not led to the development of science literacy, and lack of teacher knowledge about science literacy.

Haqiqi & Permadi, (2022) entitled The Effect of Comic Media Use on Student Learning Outcomes in Class III Theme I Subtheme I at Mi The Noor reported that there was an effect of using comic media on student learning outcomes. Kaluku *et al*., (2023) in a study entitled The Effect of Comic and Poster Media on Nutrition Counseling on Balanced Nutrition Knowledge of Orphanage Children stated that there was an effect of a significant increase in balanced nutrition knowledge in orphanage children before and after being given comic media and poster media.

This study offers several significant novelties compared to previous research on enhancing science literacy through comics. Firstly, it employs a unique narrative and adventure approach in comic media to improve learning outcomes and science literacy. The integration of engaging adventure elements is designed to capture students' interest, making the learning process more enjoyable and immersive. Secondly, the study develops adventure-based digital comics, providing a more interactive and engaging learning experience, which is crucial in fostering sustained student engagement and motivation. Unlike traditional methods, these digital comics allow students to actively participate in the storyline, make decisions that influence the narrative, and interact with various comic elements, thereby enhancing their involvement and learning experience.

Thirdly, this study specifically evaluates the impact of comic media on reading science literacy, offering targeted insights into how to improve the comprehension and understanding of scientific texts among elementary school students. Fourthly, by measuring various literacy aspects—such as comprehension, analysis, and the application of scientific information in daily life—this research provides a comprehensive perspective on literacy development. These innovative methods contribute significantly to advancing science education and literacy among young learners.

The importance of this research lies in its potential to transform science education by introducing a more

dynamic and student-centered learning tool. Understanding the effects of comic media on science literacy is vital for developing effective, engaging, and innovative educational methods. The findings could serve as a valuable resource for teachers and educational practitioners in crafting strategies that enhance students' science literacy, ultimately supporting the broader goal of nurturing scientifically literate citizens.

Method

This study used the Quasi Experimental Design method with an unequal pretest-posttest control group configuration, consisting of two different groups: an experimental group and a control group. The research was conducted in Region I of West Padang District, with the research subjects being fourth grade students during the even semester of the 2023/2024 school year.

Data collection was done through the application of tests to measure students' ability in Science reading literacy before and after the intervention using comic media. Before receiving the intervention, learners took a pretest, while after the intervention they took a posttest to evaluate their understanding of the material studied. Data analysis used SPSS 20.0 software to assess the normality of data from the pretest and posttest results, as well as Levene's test to test the homogeneity of variance between the experimental and control groups.

Data validity was the main focus in this study, ensuring that the measurement instruments used were in line with the research objectives to guarantee the accuracy and reliability of the results obtained

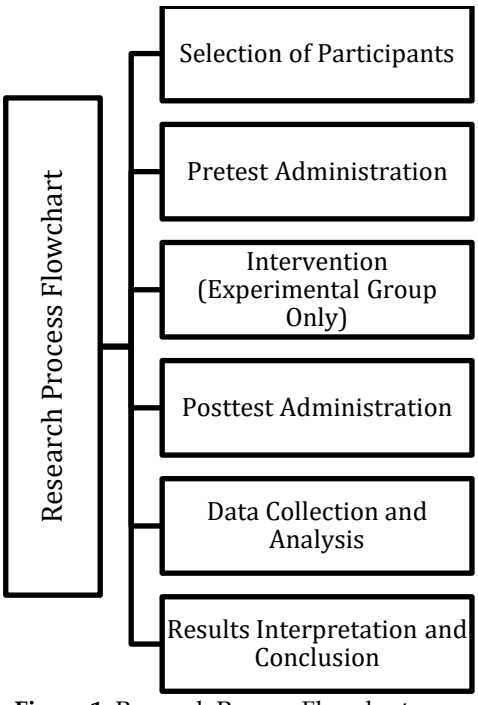

Figure 1. Research Process Flowchart

Result and Discussion

Based on research conducted at SDN Percobaan Padang Region 1, Padang Sub-district, it was found that both sample groups came from the same population. This study showed that the two groups experienced different educational treatments: Class A, as the experimental group, used comic-based learning media, while Class B, as the control group, used learning modules as their media.

This difference in learning strategies made it possible to conduct a comparative analysis of the effectiveness of both media in improving learning outcomes among students. The findings reveal the potential impact of different teaching methodologies on student performance and engagement in a classroom context. Further research into the implications of these findings may provide valuable insights for educators and decision-makers in their efforts to improve the quality of education in similar environments.

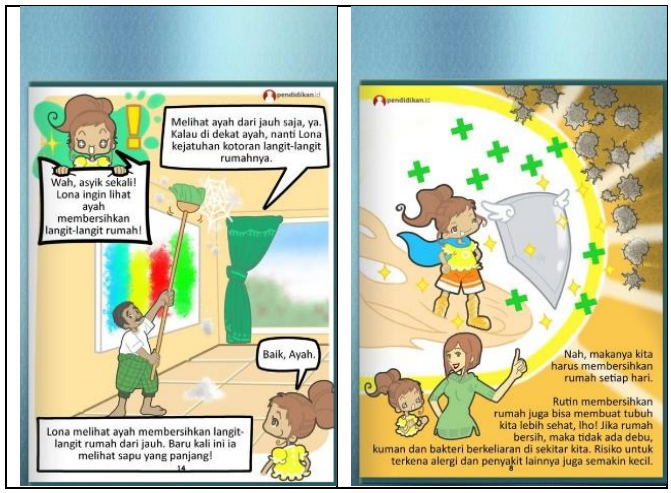

Figure 2. Digital Literacy Comic Display

Therefore, this study underscores the importance of considering diverse instructional a pproaches to meet the diverse learning needs of students. The data analysis of the post-test scores of students' learning outcomes is described as follows:

Table 1. Results of Post-test Analysis of Learning Outcomes

Statistics	Experiment Class	Control Class
N	20	20
Mean	86.65	67.15

According to the data listed in Table 1, there is evidence that the mean scores obtained from the experimental class were significantly higher than those of the control class. In particular, the average academic performance of students who used comic-based learning resources

showed a clear advantage over those who did not use such resources. For example, the average learning outcome of students in the experimental group engaged in science reading activities with comic media reached 86.65, while the average of the control group using traditional learning methods was 67.15. This comparison highlights the benefits of using comic media in improving student learning outcomes. One of the main advantages of comic media is its ability to make educational content more interesting, which can increase students' interest and concentration during the learning process. This results in increased student engagement which can improve their retention and memory capabilities, as well as assist in the assimilation and synthesis process of the subject matter.

After conducting the aforementioned analysis, the next step involves assessing the normality and homogeneity of the data set through rigorous testing procedures.

Table 2. Normality Test Result Data

Data	Kolmogorov-smirnov	Asymp Sig (2-tailed)	Result Conclusion
Eksperimen Post-test	0.921	0.261	Normally Distributed
Kontrol Post-test	1.049	0.187	Normally Distributed

Based on the data listed in Table 2, an analysis was conducted to test the normality of the data using the Kolmogorov-Smirnov test. In the experimental group, the significance value (Sig) for the Kolmogorov-Smirnov test was 0.261, exceeding the conventional significance threshold of 0.05. Likewise, in the control group, the Asymptotic Significance (Asymp Sig) value for the Kolmogorov-Smirnov test was 0.187, also exceeding the critical value of 0.05. These results indicate that both the experimental and control groups showed normal distribution of data before the intervention and in the control group, based on the Kolmogorov-Smirnov test.

Compliance with this normal distribution assumption is essential to ensure the validity and reliability of the statistical analyses conducted on the data from both groups in this study. As such, adherence to this assumption of normality increases the robustness and confidence in the findings and conclusions drawn from the data analysis of the experimental and control groups in this study.

Table 3. Homogeneity Test Result Data

Experimental & Control Class Data	Sig	Conclusion
Post-test Learning Outcomes	0.734	Homogen

Based on the information contained in Table 3, an analysis was conducted to evaluate the homogeneity of the data using the Levene Statistics test. The significance value resulting from the Levene's Statistics test for the post-intervention experimental group was 0.734, exceeding the standard significance level of 0.05. This finding indicated that the data showed homogeneity, indicating consistency among both experimental and control groups after the intervention.

Table 4. Post-test Results of Experimental Class and Control Class Learning Outcomes

Data	Sig. (2-tailed)	Conclude
Post-test	0.001	There is a significant influence

Based on the data listed in Table 4, the results of the post-test t-test collected from the experimental and control groups using SPSS 20 software showed a significance level (two-tailed) of 0.001, which is lower than the significance threshold of 0.05. This means that the null hypothesis (Ho) is rejected, and the alternative hypothesis (Ha) is accepted, indicating a significant difference between the post-test results of the experimental group using comic media in science learning and the control group.

This difference is also reflected in the average score of the post-test results, where the experimental group scored an average of 86.65 while the control group scored 67.15. Thus, it can be concluded that the use of comic media in science learning in the experimental class provides better learning outcomes compared to the use of traditional methods in the control class.

In addition, a series of tests including normality test, data homogeneity assessment, and hypothesis testing have been conducted on this data. The results of the hypothesis test showed a significance level (two-tailed) of 0.001, lower than 0.05, indicating that the use of comic media significantly affected the reading ability of elementary school students.

This study aims to explore the impact of using comic media in improving reading science literacy among elementary school students. The method used was a quasi-experimental design with an unequal pretest-posttest control group configuration. Two different groups were involved in the study: an experimental group that used comics as learning media and a control group that used conventional learning methods.

Data collection was done through pretest and posttest tests to evaluate students' reading ability before and after the intervention using comic media. Data analysis was conducted using statistical software to

assess significant differences between the two groups. The results showed that students who engaged in learning with comic media experienced a significant improvement in reading ability compared to the control group.

This finding is in line with the results of previous studies, such as research conducted that the use of mathematics comic learning media is effective in increasing students' interest and learning outcomes in mathematics. This is in line with the findings that the use of comic media has a fairly good effectiveness on student learning outcomes. In addition, recent research by Utama *et al*., (2023) confirmed that comic media is feasible to use in learning the sub-theme of environmental conservation efforts in elementary schools. Overall, these studies support the use of comic media as a learning tool that can improve interest and learning outcomes in various subjects.

This study is consistent with recent research highlighting the positive role of comic media in science learning. From a cognitive perspective, the integration of colorful images in reading materials can improve information retention in children. Research shows that the use of visual aids, such as pictures, significantly improves students' performance in understanding and recalling material compared to the use of plain text. (Nurhakim *et al*., 2024; Priyangga *et al*., 2023; Willya *et al*., 2023).

By reviewing results from previous studies this new research can test whether the use of comics in science learning also results in significant improvements in student interest and learning outcomes, similar to effects that have been observed in math and environmental learning contexts. As such, this research will make a novel contribution by extending the application of comics media into the science literacy domain, while corroborating evidence on the effectiveness of comics as an interdisciplinary learning medium (H. Y. Sari, 2022; Setyorini *et al*., 2023; Zuhroh *et al*., 2023).

Based on the findings from previous research, a new study entitled "The Impact of Comic Media: Improving Science Literacy Through Exciting Adventures in the Illustrated World" can explore how the use of comic media not only improves interest and learning outcomes in math and environmental conservation, but can also be used as an effective tool to improve science literacy. The study could develop the hypothesis that comic media, through engaging adventure narratives and rich visuals, is able to make science concepts easier to understand and interesting for students. The study could focus on how comics specifically designed for science education can facilitate the understanding of complex concepts through interactive stories and visualizations that support learning (Nurhakim *et al*., 2024; Oktaviana & Ramadhani, 2023)

Comics, with their simple and easy-to-understand nature, are not only informative but also educational. The attractive illustrations in comics not only captivate readers but also increase their engagement with the text content. The use of comics in education aims to liven up the learning atmosphere in an innovative way. Other studies have also shown that the use of comics can increase students' interest in learning and help in better retention of the material (Mikamahuly *et al*., 2023). This study found that the use of comic media significantly improved students' reading ability. The posttest results showed that students who engaged in learning with comics recorded a higher average score compared to the control group. Comics successfully attracted students' interest and helped them understand science concepts better through visual narratives and interesting stories.

The implication of this study is that educators can utilize comics as an effective learning tool to improve science literacy in primary schools. The integration of comics in the curriculum can result in a more interesting and enjoyable learning experience for students, which in turn can improve their motivation and academic outcomes. In addition, the use of comics can also help in overcoming the science literacy challenges faced by students.

Limitations faced in this study include the limited generalizability of the results because the study was conducted in one particular primary school area in one particular school year. Thus, the results may not be directly applicable to a wider population of students or in a different place and time. In addition, control of external variables such as home learning environment factors or other social influences could not be fully controlled, which could potentially affect the results of the study. The duration of the study, which was only conducted in one even semester, also limits the exploration of the long-term impact of using comics in learning.

For future research, it is recommended to conduct a more in-depth evaluation of the long-term effectiveness of using comics in improving science literacy. Expanding the research to more schools and regions can help test the applicability of the research results more broadly. Diversifying the comic media used and integrating digital technology can expand the scope of students with different learning styles. In addition, the adoption of a more robust research design with tighter control of variables needs to be considered to minimize potential bias in the research results. With these steps, it is hoped that the understanding of the effectiveness of using comics in improving science literacy in elementary schools can be improved, as well as provide a firmer

foundation for wider and more sustainable implementation in education.

Conclusion

After conducting an in-depth review of the literature on the impact of comic media on students' science literacy at SDN Padang in the Experimental Learning Year 2023/2024, it can be concluded that there was a significant improvement in students' science literacy skills after adopting comic-based learning materials. The use of comic media as an educational tool proved effective in arousing students' interest in reading and improving their literacy skills. Interesting persona narratives in comics play an important role in motivating students to actively engage in the learning process. By integrating comics into the curriculum, educators can enrich their teaching approaches, provide students with more diverse learning experiences and ultimately improve their academic performance. Further research is needed to evaluate the long-term impact and effectiveness of using comics in improving students' science literacy at the basic education level.

Authors Contribution

The following statements should be used Conceptualization NAA, AF, LA, TDH contributed to the data collection process, data processing, article writing.

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Conflict of Interest

The authors declare no conflict of interest.

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