JIGE 6 (4) (2025) 2370-2384
JURNAL ILMIAH GLOBAL EDUCATION
ejournal.nusantaraglobal.ac.id/index.php/jige
DOI: https://doi.org/10.55681/jige.v6i4.4471

The Effect of Using Digital Comics on Science Learning Outcomes of Grade VI SDN 1 Japurabakti

Rizkiyah[1*], Nurkholis[1], Diana Setiana[1]
[1)]Elementary School Teacher Education Study Program, University of Muhammadiyah Cirebon, Indonesia
**Corresponding author email : rizkiyahrizkiyah966@gmail.com*

Article Info

Article history:

Received August 15, 2025
Approved September 12, 2025

Keywords:

Digital Comics, Learning Outcomes, Science

ABSTRACT

This study aims to determine the effect of digital comic-based learning models on science learning outcomes. This research uses Quantitative, quasi-experimental methods with a research design of nonequivalent control group design. The population in this study were grade VI students of SDN 1 Japurabakti in 2024/2025. The sample used was 38 students from class VI SDN 1 Japurabakti. The research instrument used an essay test consisting of 10 questions about students' understanding of science lessons and a student response questionnaire consisting of interesting aspects, aspects of convenience and aspects of achieving learning objectives. Data processing techniques using normality test, homogeneity test, paired sample t-test, independent sample t-test and N-Gain test. The results showed that the application of digital comic media based on WEBTOON applications with the theme of earth friend comics implemented learning with 2 class groups, namely experimental classes and control classes. The experimental class that applied digital comic media with the results of student responses amounted to 89.5% with a very positive category. While the results of student tests show an increase in student science learning outcomes with the average pretest and posttest scores of the experimental class from 50.2 to 67.7 with an N-Gain of 0.22 including in the medium category. While based on the results of the science lesson understanding test, students experienced an increase in each indicator with a pretest average value of 50.5 and a posttest average value of 74.2 with a moderate category. The results showed that there was an effect of the digital Comics learning model on the science learning outcomes of students.

Copyright © 2025, Author.
This is an open access article under a CC–BY-SA license

How to cite: Rizkiyah, R., Nurkholis, N., & Setiana, D. (2025). The Effect of Using Digital Comics on Science Learning Outcomes of Grade VI SDN 1 Japurabakti . *Jurnal Ilmiah Global Education*, *6*(4), 2370–2384. https://doi.org/10.55681/jige.v6i4.4471

INTRODUCTION

Increasing technological progress is one of the benchmarks for the country to develop or develop. Technology development is very closely related to the understanding of science as a basis in technology design. Understanding science lessons is also a measure of school report cards in the numeracy and literacy section. This is closely related to early science education which allows for a significant improvement in science skills and also utilizes technology as a result of science products after undergoing a lot of development. Science education in elementary school is a very important foundation for technological progress because science

education that is interesting and able to significantly increase learning outcomes becomes a benchmark for students in the future will be able to improve understanding and improve technology and science education that is not boring will be able to encourage more and more students who like science learning.

Natural Science (IPA) learning is a material that is less interested in students and is considered quite difficult because it has to apply science theory and practice at the same time. Not to mention having to apply natural conditions in learning which is quite difficult and requires greater effort in its application. Science learning must be interesting and able to apply the material to daily life so that students can understand the material more easily. The independent curriculum opposes project-based learning so that it is very in line with the learning pattern expected in science that conducts observation, experimentation, and drawing conclusions.

Education must coexist with technology, especially since the daily lives of students today are not spared from the technology used by meeka in their well-being. Making learning interesting by combining familiar interests and learning models in harmony becomes interesting and easy for students to accept. So far, science learning media uses boring lecture learning for children, judging from this, there needs to be interesting learning that is in demand by students, one of which is digital media in the form of pictures. The tendency of students in observing science learning tends to try to visualize the material so that it can be reasoned and can be applied in daily life. By directly changing the learning that has been visualized, it will greatly facilitate science learning.

Improving science learning is one of the benchmarks for technological progress in the future because the basis of all technology is the concepts that exist in science learning, besides that it also preserves nature and all joints of life related to natural conditions are studied in science lessons. The implementation of the independent curriculum in science lessons prioritizes the application of deep learning models and digital media as integrated learning media. Which can be applied in daily life. So that it is able to improve student learning outcomes to a higher level and is able to improve students' skills. Learning activities using digital media that are integrated in the presentation of science are able to increase students' interest.

IPAS in elementary school has a holistic and psychologically integrated perspective on an event. Elementary school students are also still at the stage of concrete, simple, holistic, and non-detailed thinking. IPAS learning should involve students in various activities. As a combination of two subjects, namely science and social studies, social studies learning activities can be carried out through a variety of learning activities and to provide a direct learning experience to students, these activities include learning activities which are very important principles or principles in teaching and learning interactions. In learning social studies affects the activities and interests of students in learning and managing the natural environment and the social environment simultaneously (Diana, et al. 2024).

The digital comics learning model is suitable for implementing the Independent Curriculum because it has advantages in improving learning outcomes, academic achievement, learning motivation, and 4C (*Communication, Collaboration, Creative Thinking, Critical Thinking*) skills of students (Dewi. 2023). The digital comic learning model is able to improve 4C skills and create active learning. The digital comic model must be supported by a learning approach that is in accordance with the independent curriculum and relevant to the 21st century (Riskayanti. 2021). . The main problem that must be answered in this is what teaching model can improve the

quality of human resources in order to welcome the era of globalization. One of the best ways is to introduce and develop science and technology (Science and Technology) early in formal education because our students are human resources in the future (Nurkholis. 2013). The importance of this is that learning methods that utilize digital media are felt to be important and essential in the learning process.

The implementation of learning using technology with the *Problem Bassed Learning* (PBL) learning model in science subjects is said to be able to improve student learning outcomes according to the results of the validity test. The PBL model is said to have succeeded in improving the learning outcomes of science in class V because of the increase in student learning outcomes before and after learning using the model. This increase can be seen from the results of students' pretest and post-test work, so it is said that the Problem Based Learning (PBL) learning model in science subjects in grade V of SD Negeri 5 Cilimus can improve student learning outcomes (Nurkholis, et al. 2023). This study shows that teaching using technology greatly affects learning outcomes.

The main problem that the researcher wants to solve is how to apply education-based digital comic media to science learning outcomes and how to influence education-based digital comics on science learning outcomes. This is based on the fact that science learning is often considered difficult and boring by students because of the many abstract concepts that are less interesting if presented conventionally. Therefore, innovation in learning media is needed that not only facilitates the understanding of concepts, but also increases students' interest and motivation to learn. Digital comics as an attractive visual medium are considered to have the potential to answer these challenges. Therefore, this study focuses on the application and influence of digital comic media on science learning outcomes, in order to determine its effectiveness in the context of elementary school learning.

The purpose of this study is to find out the application of education-based digital comic media to science learning outcomes and to find out the influence of education-based digital comics on science learning outcomes

METHOD

This study uses an experimental research method, which is the method adopted in this study. This method is an experiment-based research that can be defined as: an experiment in a controlled environment designed to prove a known truth or to test the validity of a hypothesis. An important element in the experimental method is the control that distinguishes it from non-experimental methods in quantitative research (Zonyfar et al. 2022). In addition, the research design uses *quasi-experimental,* which is experimental research that is used because of the difficulty in obtaining a control class that is useful for controlling external variables that have an impact on the research. The type of *quasi-experimental* design applied is *nonequivalent control group design.* This design includes two groups, namely control and experiments that are not determined through random selection.

Data Analysis Techniques: The data analysis in this study was carried out using. First, Questionnaire is several written statements or questions used to collect data in the form of data from individual or personal students. The researcher used a type of closed questionnaire in which several answer options have been provided. In measuring the questionnaire, the researcher used the *Likert scale.* The *Likert* scale is used to assess a person's opinions, behaviors, and viewpoints related to a problem provided in several answer choices. The problem is determined by the

researcher specifically for the purpose of research. The questionnaire used in this study was a response questionnaire from students. Response questionnaires are used to see responses to learning. The questionnaire was measured on the *Likert* scale which had a choice of Strongly Agree (SS), Agree (S), Disagree (TS) and Strongly Disagree (STS). Second, the Test Test is a series of questions or questions used to assess and assess knowledge and skills both individually and in groups (Zonyfar et al., 2022: 77-78). The type of test used by the researcher is *an essay*. Tests were given to research subjects to evaluate the extent to which the subjects understood the material after the learning process was carried out with the digital Comic learning model. This study uses tests that include *pretest* and posttest. *The pretest* aims to find out the subject's initial knowledge, while the posttest is used to assess the improvement of the subject's skills after learning with the digital comic learning model.

RESULTS AND DISCUSSION

Application of Digital Comic Media to Student Learning Outcomes

1. The stages of implementation carried out by the researcher in the control and experiment class
   a. Perform student grouping
      In this stage, before grouping, a pretest will be carried out first to divide students in order to get the ideal division of students both in terms of the proportion of men and women as well as in terms of the proportion of pretest results. The pretest results are as follows:

Table 4.1 Pretest *Result Data* All Classes

Yes	Student Code	Score	Total Score
1	PD 1	5	50
2	PD 2	4	40
3	PD 3	5,5	55
4	PD 4	4,5	45
5	PD 5	6,5	65
6	PD 6	5	50
7	PD 7	3,5	35
8	PD 8	5,5	55
9	PD 9	4,5	45
10	PD 10	5	50
11	PD 11	5,5	55
12	PD 12	5	50
13	PD 13	4	40
14	PD 14	4	40
15	PD 15	5	50
16	PD 16	3,5	35
17	PD 17	5	50
18	PD 18	4	40
19	PD 19	6	60
20	PD 20	5	50
21	PD 21	6,5	65

22	PD 22	7	70
23	PD 23	5	50
24	PD 24	4,5	45
25	PD 25	6	60
26	PD 26	5,5	55
27	PD 27	5,5	55
28	PD 28	5	50
29	PD 29	4	40
30	PD 30	5,5	55
31	PD 31	4,5	45
32	PD 32	4	40
33	PD 33	4,5	45
34	PD 34	5	50
35	PD 35	6	60
36	PD 36	5,5	55
37	PD 37	5,5	55
38	PD 38	5,5	55
Sum			1910

The next class division is carried out as follows with the following grouping in which the data of the students' pretest results is obtained with 2 test groups.

Table 4.2 Control Class *Pretest* Result Data

Yes	Participant Code Educate	Score	Total Score
1	PD 1	5	50
2	PD 2	4	40
3	PD 3	5,5	55
4	PD 4	4,5	45
5	PD 5	6,5	65
6	PD 6	5	50
7	PD 7	5	50
8	PD 8	4	40
9	PD 9	5,5	55
10	PD 10	4,5	45
11	PD 11	3,5	35
12	PD 12	5,5	55
13	PD 13	4,5	45
14	PD 14	6	60
15	PD 15	5,5	55
16	PD 16	5,5	55
17	PD 17	4,5	45
18	PD 18	5	50

19	PD 19	5,5	55
Sum			950

Table 4. 3 Experimental Class *Pretest* Result Data

Yes	Participant Code Educate	Score	Total Score
1	PD 1	5	50
2	PD 2	4	40
3	PD 3	4	40
4	PD 4	4,5	45
5	PD 5	5	50
6	PD 6	4	40
7	PD 7	5	50
8	PD 8	3,5	35
9	PD 9	5	50
10	PD 10	4	40
11	PD 11	6	60
12	PD 12	5,5	55
13	PD 13	5,5	55
14	PD 14	5,5	55
15	PD 15	6	60
16	PD 16	5	50
17	PD 17	6,5	65
18	PD 18	7	70
19	PD 19	5	50
Sum			960

b. Analysis of *Student* Pretest Results

The pretest is carried out to determine the initial ability of students in the control class and the experimental class. The pretest was conducted on May 15, 2025. The number of students in the control class and the experimental class was 38 students. The test used is in the form of essay questions which include 10 science learning skill questions. The following are the results of the data processing of pretest students in the control class and the experimental class shown in Table 4.2 and Table 4.3.

Table 4. 4 Recapitulation of *Pretest Result Data*

Class	Sum Learners	Score Highest	Score Lowest	Flat-Flat
Control	19	65	35	50
Experiment	19	70	35	50,5

The class division was carried out by reviewing the average score of students who were almost the same, namely the average number of students in the control class was 50 and the experimental class was 50.5 with the number of students 19 students each. The comparison is described in the graph as follows:

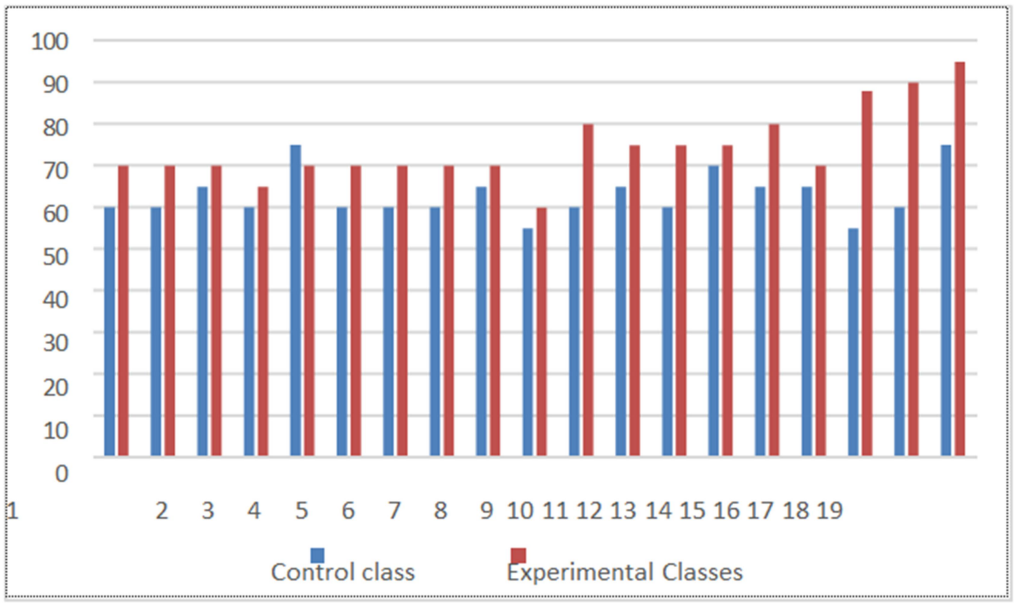

Figure 4. 1 Pretest Average Score of Each Number of Control Class and Experimental Class Questions

Sourced from Figure 4.1, the average pretest score of the control class on all question numbers is greater than the average score of *the experimental* class pretest except for question numbers 1 and 8. So overall it can be concluded that the control class has greater initial skills than the experimental class. To further clarify the score of each student, see Appendix 6.

c. Conducting Learning in both classes.

The teaching was carried out with a duration of 2 x 45 minutes or 2 JP. Learning in the classroom is assisted by science teachers at the school who conduct learning conventionally with teaching modules that have been prepared by the researcher, in the classroom experiments are carried out by the researcher directly by conducting learning using digital comics so that learning can be done directly at the same time between the two classes. This is done so that students do not exchange information during break hours or change learning times, which can happen if both classes are given learning at different times with 1 educator. In its implementation, it can be seen from the observation that students who learn to use digital comics have more interest than those who use conventional learning methods in the control class.

d. *Posttest* after completion of learning

Table 4.5 Control Class *Posttest* Result Data

Yes	Student Code	Score	Total Score
1	PD 1	6	60
2	PD 2	5	50
3	PD 3	6	60
4	PD 4	6	60
5	PD 5	7	70
6	PD 6	6	60
7	PD 7	6	60
8	PD 8	6	60
9	PD 9	6,5	65
10	PD 10	5,5	55
11	PD 11	6	60
12	PD 12	6,5	65
13	PD 13	5,5	55
14	PD 14	7	70
15	PD 15	6,5	65
16	PD 16	6,5	65
17	PD 17	5,5	55
18	PD 18	6	60
19	PD 19	7	70
Sum			1165

The posttest results of the control class students had a total of 1165 with an average score of 61.32. Lowest score of 55 out of high 70.

Table 4. 6 Experimental Class *Posttest* Result Data

Yes	Student Code	Score	Total Score
1	PD 1	7	70
2	PD 2	6,5	65
3	PD 3	6,5	65
4	PD 4	6,5	65
5	PD 5	8	80
6	PD 6	7	70
7	PD 7	7	70
8	PD 8	7	70
9	PD 9	8	80
10	PD 10	6	60
11	PD 11	8,5	85

12	PD 12	7,5	75
13	PD 13	7,5	75
14	PD 14	8	80
15	PD 15	8	80
16	PD 16	7	70
17	PD 17	8	80
18	PD 18	9	90
19	PD 19	8	80
Sum			1410

The posttest results of control class students had a total of 1410 with an average score of 74.2. The lowest score is 6.5 and the highest is 90. The data is presented in table 4.7 below:

Table 4. 7 Recapitulation of *Posttest Result Data*

Class	Sum Learners	Highest Score	Lowest Score	Average
Control	19	75	55	62,9
Experiment	19	95	65	74,4

The comparison of the test results of each child is as follows:

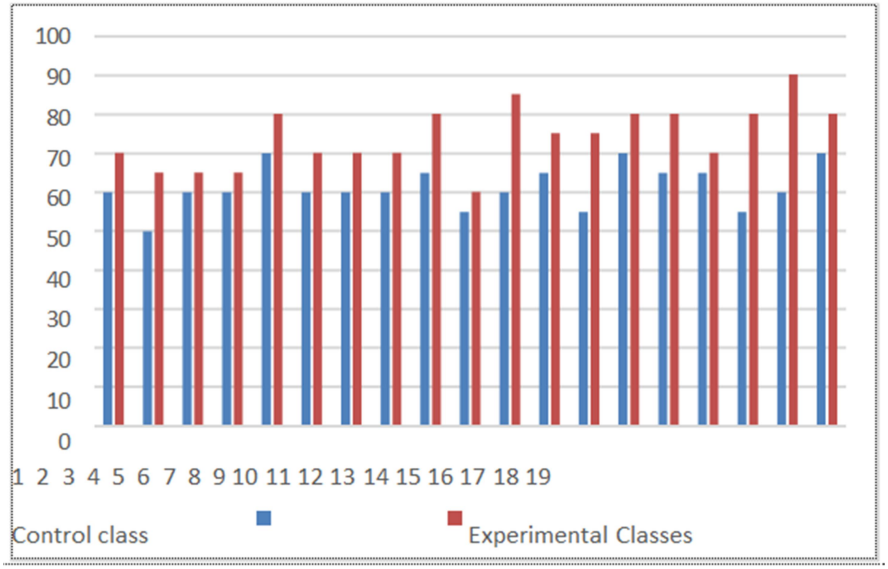

Figure 4. 2 Average *Posttest Score* of Each Question Number

2. Analyze the results of the pretest and posttest to determine the impact of student learning

Posttest is carried out to determine the final ability of students in the control class and the experimental class. *The posttest* will be conducted on May 16, 2025. The number of students in the control class and the experimental class was 19 students. The test used is in the

form of essay questions which include 10 questions about students' science learning outcomes. The following are the results of the data processing of pretest students in the control class and the experimental class shown in Table 4.6 and Table 4.7.

The data from *the posttest results* was processed to see the average score, highest score and lowest score for each class. Sourced from Table 4.7, it shows that the highest score of the control class is worth 75 points while the experimental class is worth 95 points. The lowest score of the control class was worth 55 points while the experimental class was worth 65 points. The average posttest score of the control class received a score of 62.9 points. Meanwhile, the experimental class got a score of 74.4 points. This shows that the final ability of the experimental class students is better than the control class students with an average *pretest score difference* of 11.5 points. The difference in score cannot be said to be significant, so testing must be carried out using SPSS 26 by conducting a normality test, homogeneity test and average difference test. The following is the difference in the average posttest score *of* the control class and the experimental class on each question number can be observed in Figure 4.2.

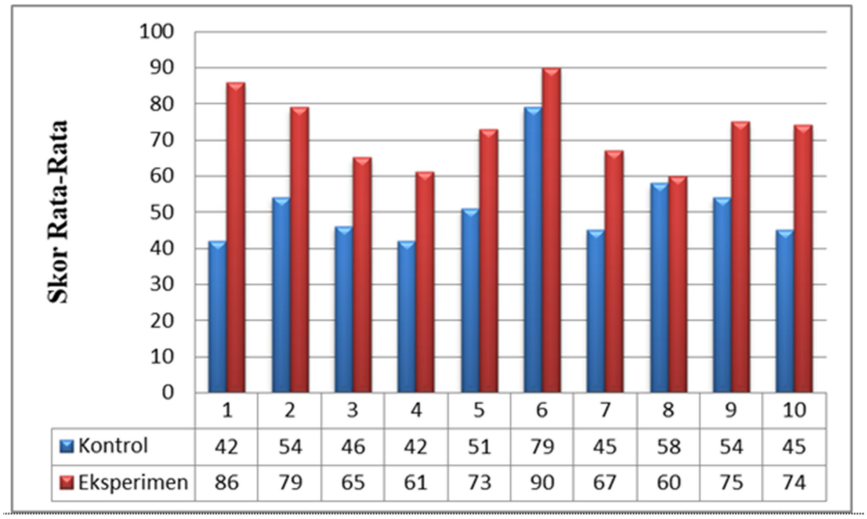

Figure 4. 3 Posttest Average Score of Each Number of Control Class and Experimental Class Questions

Sourced from Figure 4.3, the average score of the experimental class *posttest* on each question number is greater than the average score of the control class *posttest*. So overall it can be concluded that the experimental class has a greater final skill than the final skill of the control class and it can be stated that digital comic learning has a good influence in improving student learning outcomes.

Digital Comics Affect Students' Science Learning Outcomes

The increase in science learning outcomes of experimental class students is due to the use of the digital comic learning model that focuses teaching and learning activities on students or *student learning* and collaborates with *Science* and *Technology* and increases students' attractiveness and understanding of the material can be seen in Table 4.8.Sourced from the results of *the pretest* and *posttest* of students in the experimental class, it shows that there is an increase in the learning

outcomes of science students in each indicator of science learning outcomes which can be seen in the following Table 4.8:

Table 4. 8 Score scores according to the Pretest Scientific indicators

CONTROL CLASS											
	GRADE AVERAGE										FLAT-FLAT
No Question	1	2	3	4	5	6	7	8	9	10	
Fluency	0,5					10	3,2				4,6
Flexibility				8,9				8,4			8,6
Originality		1,1							4,2		2,6
Elaboration			0		4,2					9,5	4,5
EXPERIMENTAL CLASSES											
	GRADE AVERAGE										AVERAGE
No Question	1	2	3	4	5	6	7	8	9	10	
Fluency	0					8,9	0,5				3,1
Flexibility				9,5				9,5			9,5
Originality		2,1							7,2		4,65
Elaboration			0		3,2					9,5	4,23

Table 4. 9 Score scores according to Posttest Scientific indicators

CONTROL CLASS											
	GRADE AVERAGE										AVERAGE
No Question	1	2	3	4	5	6	7	8	9	10	
Fluency	6,3					10	3,2				6,5
Flexibility				8,9				8,4			8,6
Originality		1,6							6,8		4,2
Elaboration			0		5,5					10	5,2
EXPERIMENTAL CLASSES											
	GRADE AVERAGE										FLAT-FLAT
No Question	1	2	3	4	5	6	7	8	9	10	

Fluency	8,9					10	3,4				7,4
Flexibility				10				9,5			9,8
Originality		6,3							8,9		7,6
Elaboration			0		7,1					10	5,7

In tables 4.8 and 4.9 the rank is 1-10 and can be concluded in table 4.10 and table 4.11 as follows:

Table 4. 10 Improvement of Science Learning Outcomes of Control Class Students

Learning outcome indicators IPA	**Average Score – Average**		**Difference**	**Interpretation**
	Pretest	***Posttest***		
Fluency	4,6	6,5	1,9	Keep
Flexibility	8,6	8,6	0	No Upgrade
Originality	2,6	4,2	1,6	Keep
Elaboration	4,5	5,2	0,7	Low
Rata – Rata	**5,1**	**6,1**	**1**	**Keep**

Table 4. 10 Improvement of Science Learning Outcomes of Experimental Class Students

Learning outcome indicators IPA	**Average Score – Average**		**Difference**	**Interpretation**
	Pretest	***Posttest***		
Fluency	3,1	7,4	4,3	Keep
Flexibility	9,5	9,8	0,3	Low
Originality	4,6	7,6	3	Keep
Elaboration	4,2	5,7	1,5	Keep
Rata – Rata	**5,3**	**7,6**	**2,3**	**Keep**

Based on tables 4.9 and 4.10, it can be combined into table 4.11 to see a comparison of the improvement in science learning outcomes from the two classes.

Table 4. 11 Comparison of Improvement in Science Learning Outcomes

Learning outcome indicators IPA	**Increased**		**Difference**	**Interpretation**
	Control	***Experiment***		
Fluency	1,9	4,3	2,4	Keep
Flexibility	0	0,3	0,3	Low
Originality	1,6	3	1,4	Keep
Elaboration	0,7	1,5	0,8	Low
Rata – Rata	**1**	**2,3**	**1,3**	**Keep**

Based on Sourced from Table 4.11 which presents the achievement of each indicator, science learning outcomes have improved, which can be seen from the average posttest score of 5.3 points which is greater than the average *pretest* score of 7.6 points which is categorized as moderate. The Fluency explanatory indicator shows the most significant average score increase, with an average difference of 4.3 points categorized as moderate, the Flexibility explanatory indicator shows the most significant average increase in scores, with an average difference of 0.3 points that are categorized as Low even though their initial score is already high so this increase cannot be more than 0.5 because The maximum limit is 10 and the pretest score is 9.5. Then followed by the Originality Indicator showing an average increase in scores worth 3 points which is categorized as moderate. In addition, the Elaboration indicator showed an average increase in scores of 1.5 points which was categorized as moderate. More clearly the improvement of science learning outcomes in the experimental class on each indicator of science learning outcomes can be seen in Figure 4.4.

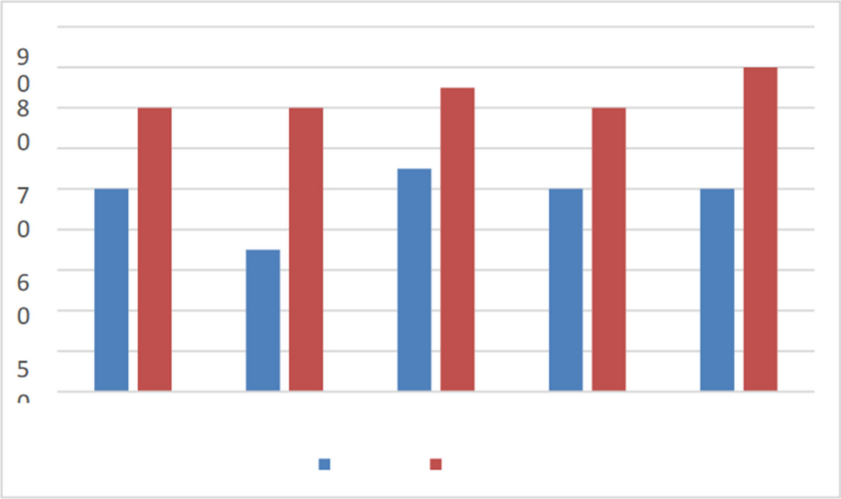

Figure 4. 4 Average *Pretest* and *Posttest* Scores on Each Science Learning Outcome Skill Indicator

Sourced from Figure 4.4 which presents an average posttest score that is greater than the average *pretest* score for each science learning outcome indicator. This shows a significant increase for each indicator. So that the conclusion obtained is that the application of the Digital Comic model can significantly improve students' science learning outcomes.

Research at SDN 1 Japurabakti in 2024/2025 shows that the learning model using digital comics has a positive effect on the science learning outcomes of grade VI students, shown by an increase in the average pretest and posttest scores from 50.2 to 67.7 and an N-Gain score of 0.22 (medium category), as well as an increase in each indicator of learning outcomes with an N-Gain of 0.49 (medium category), also supported by a very positive student response with a score of 89.5%. Meanwhile, research by Mawan Akhir Riwanto (2018) also concluded that the use of digital comic media can increase the effectiveness of learning on the theme "Always Save Energy", as well as foster students' enthusiasm for learning because of the presentation of interesting material through pictures and cartoon characters. Both studies confirm that digital comics are able to improve the quality of learning, both in terms of learning outcomes and student motivation and response, Kurniawan (2020) argues that the use of digital comics in learning has a positive impact, both on learning outcomes and active student involvement in the learning process.

CONCLUSION

There is an influence of the digital comics learning model on the science learning outcomes of Semester 2 students of grade VI SDN 1 Japurabakti in 2024/2025. Overall, the results showed an increase in the average score *Pretest* and posttest from 50.2 points to 67.7 points with a score of *N-Gain* worth 0.22 points including the medium group. Meanwhile, based on the science learning results, each student experienced an increase in each indicator, with an average score *Pretest* worth points and the average posttest score of 50.5 points to 74.2 points. With an N-Gain value the result is 0.49 points which is categorized as moderate.

Students responded very positively to the digital comic model with an average score of 89.5%, which means that all aspects received a response with a very positive category from students. So that digital comic learning can be stated to have a great influence on student learning outcomes.

REFERENCE

Afifah, Afni Nur, Nur Ilmiyanti, and Toto. 2019. "STEM-Based Project Based Learning Model (Digital Comics) to Improve Students' Mastery of Science Concepts and Learning Outcomes." Quangga: Journal of Education and Biology 11 (2): 73–78.

Agnafia, Desi Nurul. 2019. "Analysis of Students' Science Learning Outcomes Ability in Biology Learning." Florea 6 (1): 45–53.

Aini, Meliyana, Mellyatul Aini, Indah Yunitasari, and Dwi Swastanti Ridianingsih. 2023. "Implementation of STEM-Based Project Based Learning Model on Problem-Solving Skills." JPE (Journal of Edutama Education) 10 (2): 61–66.

Alfaeni, Denies, Mia Nurkanti, and Mimi Halimah. 2022. "Students' Collaboration Skills Through a Project Based Learning Model Using Zoom on Ecosystem Materials." BIOEDOUKASI Journal of Biology Education University of Muhammadiyah Metro 13(2): 143–49.

Allanta, Tirka Rizal, and Laila Puspita. 2021. "Analysis of Science Learning Outcomes and Student Self Efficacy: The Impact of Digital Comics - STEM on Ecosystem Materials." Journal of Science Education Innovation 7 (2): 158– 70.

Amen, Sholicatul, and Mar'atus Sholihah. 2024. "STEM Integrated DIGITAL COMICS Improve the Science Learning Outcomes of Grade XII High School Students." Journal of Jurisprudence: Publications of Research in Education and Language 2 (2): 357–62.

Ardiansyah, Heru, Jhon Riswandi, and Fahmy Armanda. 2021. "The Influence of the PBL Model with a STEM Approach on the Cognitive Competence of Students in Class XI

Digestive System Materials in High School/MA." Bioscience: Journal of Education VII (I): 46– 51.

Aripin, Ipin, and Iim Halimatul Mu'minah. 2019. "The Implementation of ICT-Assisted STEM-Based Science Learning to Improve 21st Century Skills." Journal of Science VIII (2): 29–35.

Azzahra, Utami, Fitri Arsih, and Heffi Alberida. 2023. "The Influence of the Project-Based Learning Model (Digital Comics) on Science Learning Outcomes of Students in Biology Learning: A Literature Review." BIOCHEPHY: Journal of Science Education 03 (1): 49–60

Nurkholis. 2023. "Implementation of the Digital Media-Assisted Project Based Learning Model in Improving Mathematics Learning Outcomes in Class V Elementary School". Elementary Education

Nurkholis, Hendri Raharjo, Toto Santi Aji. 2022. "The Use of Learningapps as an Interactive Learning Media in Elementary Schools". Cakrawala Pendas Journal. 48

Nurkholis. 2013. Education in an Effort to Advance Technology.Journal of Education, Vol. 1 No. 1.

Dianasari Dianasari, Hanikah Hanikah, Diana Setiana. 2018. "The Effectiveness of Project Based Learning (Digital Comics) Based on the Transfer of Pancasila Values in Improving Elementary School Textbook Writing Skills for Pgsd UMC Students". JOURNAL OF BASIC EDUCATION PERKHASA: Journal of Basic Education Research 4.

Diana Setiana, Fikriyah Fikriyah.2024. "Improving Learning Outcomes Through the Implementation of Project-Based LKPD on Social Science Materials in Class V of Gebang State Elementary School". J-CEKI: Journal of Scientific Scholars

Zakiah, Linda, and Lestari Ika. 2019. Science Learning Outcomes in the Context of Learning. Erzatama Karya Indah.

Zonyfar, Candra, Rini Nuraini, Dini Silvi Purnia, Irma Setyawati, Tiolina Evi, Silvester Dian, Handy Permana, and Maria Susila Sumartiningsih. 2022. Research Methodology. Pena Persada.