

DIFFERENCES IN THE EFFECT OF STEM-BASED DIGITAL COMIC MEDIA ON HUMAN RESPIRATORY SYSTEM DISORDERS ON STUDENT LEARNING OUTCOMES AT SMP AL BAITUL AMIEN JEMBER

Dina Kamelia Insani¹, Haning Hasbiyati², Miftahul Hakim³

^{1,3} Biology Education, Teacher Training and Education, Jember Islamic University

²Engineering, Jember State Polytechnic

Email: dinakamelia80@gmail.com, haning.hasbiyati@polije.ac.id, hakimfkipuij@gmail.com

ABSTRACT

This study aims to determine the difference in the effect of STEM-based digital comic media on human respiratory system disorders on student learning outcomes at Al Baitul Amien Jember Junior High School. The population in this study were VIII grade students and the samples were class VIII-A as the control class and class VIII-B as the experimental class. The method used in this research is Quasi Experiment Design. With a research design of nonequivalent control group design. Data analysis using the Mann whitney test. The results of data analysis on students' cognitive learning outcomes showed that the significant value of $0.000 < 0.05$, it can be concluded that "Hypothesis accepted". So that in this study there is a significant difference in the effect of using STEM-based digital comic media on the material of human respiratory system disorders on the cognitive learning outcomes of 8th grade students of Al Baitul Amien Jember Junior High School.

ARTICLE HISTORY

Received 12 July 2024
Revised 15 October 2024
Accepted 24 October 2024

KEYWORDS

Learning Media
Digital Comics
Learning Outcomes

Introduction

Learning outcomes are the abilities possessed by students after participating in the learning process (Harefa et al., 2023). Learning outcomes are the skills that students have at the end of learning. Affective, cognitive, and psychomotor aspects are included in the category of experiences students receive (Hutapea, 2019). Wibowo et al. (2021) revealed that learning outcomes are very significant in the learning process because they allow teachers to know how students' experience or knowledge has developed and how they are trying to achieve their learning goals during the learning process. Ramen A (2020) states that media is a useful supporting tool for students because it can help teachers when delivering material in teaching and learning activities. By presenting interesting media, it can help students understand lessons better and faster (Neni Isnaeni & Dewi Hildayah 2020).

The results of interviews with science teachers at Al Baitul Amien Jember Junior High School show that students' cognitive learning outcomes still reach 75% with KKM 76. Learning

*CORRESPONDING AUTHOR. Email: haning.hasbiyati@polije.ac.id,

media is only in the form of powerpoint and textbooks provided by the school. As a result, students feel bored during learning activities (Isna, interview, October 18, 2023).

To overcome the above problems, teachers are required to be able to create a learning process that is not monotonous. To achieve this, teachers can apply comics as an interesting learning media. Comics are a type of literary work that uses illustrations arranged so that they can form a storyline (Riwanto et al., 2019). Digital technology can help the development of comics (Handayani, 2021). According to Ramadan, B. S. (2020), the advantages of digital comics are that they are more economical and more practical in terms of reading because there is no need to buy the printed version. This is very suitable for the characteristics of students who really like using smartphones. Digital comic learning media can be integrated with the STEM approach.

One of the ongoing researches is developing STEM-integrated learning media. According to Khairiyah (2019), one way to create active learning is the STEM approach which focuses on real problems. Students' cognitive abilities can be improved with STEM through digital comic media.

One of the materials integrated with STEM is the human respiratory system. This happens because most students find it difficult to master material about the human respiratory system because they do not know about the organs and processes of human breathing. So, the right approach is needed to get the best results (Handayani, 2021). This material includes interrelated designs such as structure, function, process, and disease.

One of the relevant studies, "The Use of Digital Comic Media in Science Learning to Improve Motivation and Cognitive and Affective Learning Outcomes", was conducted by Prodjosantoso and Jumadi (2014). In this study, seventh grade students at SMPN 1 Banjarnegara showed an increase in cognitive learning outcomes through the use of pictorial learning media. (Taufik et al., 2023).

Therefore, a study was conducted on "Differences in the Effect of STEM-Based Digital Comic Media on Human Respiratory System Disorders on Student Cognitive Learning Outcomes at Al Baitul Amien Jember Junior High School" to determine the effect of STEM-based digital comic media on student learning outcomes at Al Baitul Amien Jember Junior High School.

Research Methods

The method used is Quasi Experiment Design. With research design nonequivalent control group design. The population of this study was the VIII class of SMP Al Baitul Amien Jember which was taken as many as two classes: class VIII B (experimental) and class VIII A (control). The sampling technique used Probability sampling that is by providing the same opportunity at the time of data collection. Data collection methods in the form of tests and documentation. Data analysis used two methods: homogeneity test and normality test as prerequisite test and mann whitney test to test the hypothesis.

Data Analysis

Before analyzing data, it is important to conduct a prerequisite analysis. According to Sugiyono (2019), the results of prerequisite testing are as follows:

1. Normality Test

The calculation results obtained are as follows:

Table 1. Normality Test

Class		Kolmogrov – Smirnov			Shapiro Wilk		
		Statistik	Df	Sig.	Statistik	df	Sig
Student Learning Outcome	Pre test eksperimen	.161	29	.052	.944	29	.126
	Posttest eksperimen	.270	29	.000	.864	29	.001
	Pretest control	.182	22	.057	.917	22	.065
	Posttest control	.153	22	.198	.938	22	.179

Source : Data Processed

The data obtained showed that the experimental class post-test was not normally distributed. Therefore, a non-parametric test (Mann-Whitney test) was conducted.

2. Homogeneity Test

The homogeneity test results are shown in the following table:

Table 2. The Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Student Learning Outcomes	Based on median	.763	1	49	.387
	Based on Median	.354	1	49	.555
	Based on median and with adjusted df	.354	1	39.406	.555
	Based on trimmed mean	.752	1	49	.390

Source : Data Processed

The homogeneity test results which calculate the significant value of the post-test data on the research variables of $0.387 > 0.05$ indicate that the data is homogeneous.

3. Hypothesis Testing

The Mann-Whitney test is used as an alternative to the independent sample t test if the research data is not normally distributed. The results are as follows:

Table 3. The Hypothesis Testing

Cognitive Learning Outcomes	
Mann-Whitney U	77.000
Wilcoxon W	330.000
Z	-4.689
Asymp. Sig. (2-tailed)	.000

Source : data processed

Based on the results of the man whitney test on students' cognitive learning outcomes, it is known that it is significant at $0.000 < 0.05$, it is concluded that "Hypothesis accepted". So this study proves that there is a significant difference between the control class and the experimental class due to the effect of using digital comic media on learning.

Discussion

Based on the calculation of data analysis, it is known that the post-test results are not normally distributed so that the Man whitney test is carried out with Asymp.Sig results of 0.000 on the assessment of students' cognitive learning outcomes. This means that the hypothesis is accepted because Asymp. Sig < 0.05 . Comparison graph of the average student posttest results is as follows:

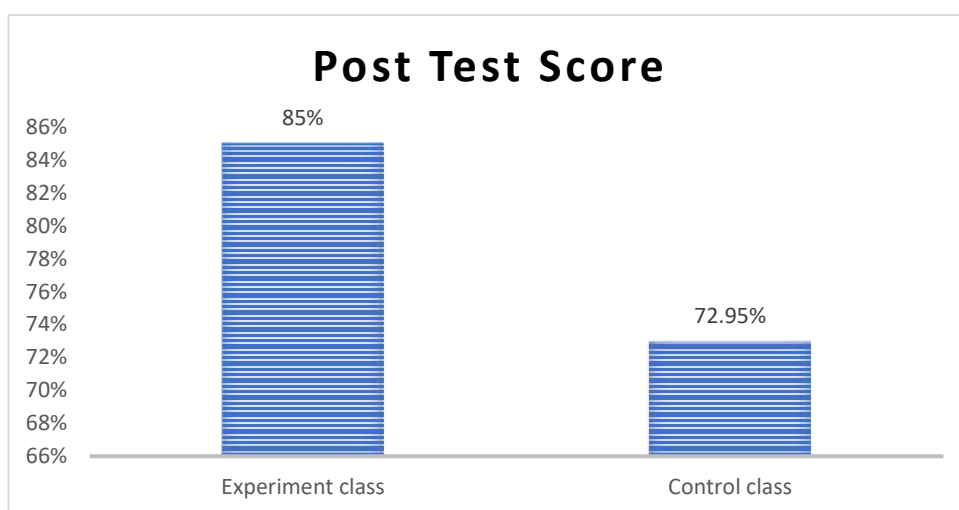


Figure 1. Post Test Score

The picture above shows the success of digital comic media on students' cognitive learning outcomes. The average post-test score of the experimental class was 85, while the average post-test score of the control class was 72.95. Based on this data, there are differences in learning outcomes between the two classes due to the use of STEM-based digital comic media. This is in line with research findings (Dwiyanty et al., 2023) that the use of digital comics improves student learning outcomes, with the average value of students in Class VIII SMP Negeri 4 Tarakan reaching 84%. It is also in line with research conducted by (Hasbiyati et al., 2019) that the use of smartphone-based e-books can improve student learning outcomes in science learning.

With digital comic media, students not only read but also see images of comic characters (Riwanto et al., 2019). Digital comics can attract students' attention through interesting images and stories, making them more interested in reading and learning the material. Attractiveness can arise from the presentation of varied images (Siregar et al., 2022). Another advantage of comic media can stimulate students' interest in learning the material presented in comics because there are images that can add new varieties and encourage students to be fully involved in their learning (Dwi et al., 2023). (Dwi et al., 2023). In addition, improving learning outcomes also depends on the right learning approach, namely STEM-based learning. According to (Khoiriyah 2021), the 21st century requires technology in the

learning process. Many educational technologies have the potential to increase global competitiveness and improve the quality of learning. This innovation can also change the way we learn to meet 21st century standards. Student learning outcomes can be improved with interesting learning methods, namely using the STEM approach.

The learning process through STEM-based digital comic media is quite interesting. In the comic media, students appreciate the funny cartoon images shown to them. Reading comics is a fun (entertaining) activity because of the interesting visual display. The cover of the comic can encourage students to see and read the contents of the comic. (Narestuti et al., 2021). In addition, in the digital comics, several educational games are also provided for students so that apart from reading stories in the comics, students can also play these games where in this study the educational games were played after learning activities.

Based on research at Al Baitul Amien Junior High School in Jember, STEM-based digital comic media can be used as learning media because it makes a significant contribution to the success of learning. The results of the data obtained show an increase in learning before the introduction of digital comic media. The percentage of student learning achievement before the use of digital comic media in Class VIII B SMP Al Baitul Amien Jember reached 75%. While after using digital comic media the percentage of student learning outcomes increased by 80%. This is because it has advantages in the learning media used, such as research (Noning, 2020) which shows that digital comic media affects the learning outcomes of seventh grade students at Air Besar Junior High School. Another study conducted by Victoria et al. showed a significant effect on the science learning outcomes of students who used digital comic media in class VIII of SMP Negeri Mandala Raimanuk. (Isa et al., 2020).

The following is a comparison chart of student learning outcomes:

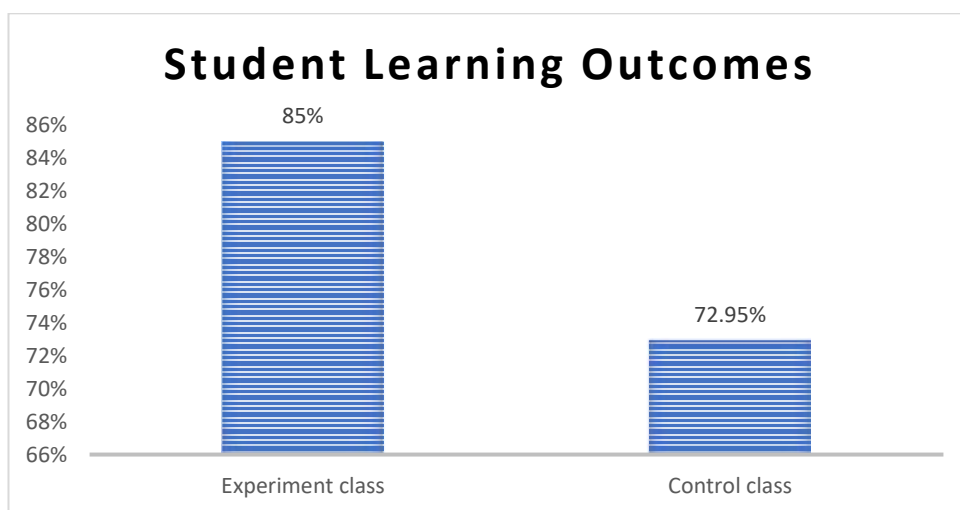


Figure 2. Student Learning Outcomes

In addition to the implementation of test data collection activities, practicum activities were also carried out. Where this practicum is carried out by students to fulfill one of the four fields of study in STEM, namely engineering and mathematics. Where the engineering is the steps of the practicum of the dangers of smoking while for mathematics, namely calculating the speed of running out of cigarettes.

From some of the data obtained above, the use of STEM-based digital comics provides differences in learning outcomes between experimental and control classes. This is due to the

use of different media between the two classes. The control class used ppt media while the experimental class used STEM-based digital comic media, in which there were some funny cartoon images and an attractive appearance so that the visualization of the material presented became more real. Thus, digital comics have an important role as learning media to improve student learning outcomes. This is proven by (Safitri et al., 2023) suggesting that the use of digital comics during learning can improve student learning outcomes

Digital comics can make it easier for students to understand the material and can repeat material that has not been understood. in digital comics there are several illustrations that contain real events about the material of human respiratory system disorders. Digital comics are more time efficient because they are supported by navigation buttons on the desired page or material. According to Kustandi (2020) Digital comics are media that tell stories using visuals with word balloons in each panel. The purpose of using digital comics as a learning medium is to help students develop imagination, articulate ideas effectively, and tell stories logically. (Aisyah et al., 2023).

The successful use of digital comics is also supported by school policies that allow students to use mobile phones/smartphones in learning. According to research (Hasbiyati 2020) the use of smartphone-based learning media in biology subjects can significantly improve student learning outcomes. Digital comics can be used as practical learning support because they are portable and allow students to access material at any time without having to open the LKS book.

Conclusion

Based on the research conducted, it can be concluded that there is an effect of STEM-based digital comic media on the material of human respiratory system disorders on the cognitive learning outcomes of Al Baitul Amien Jember Junior High School students. Student learning outcomes before using digital comic media amounted to 75% while after using digital comic media amounted to 80% so that there was an increase in student learning outcomes of 5%. Based on the man whitney test using SPSS, students' cognitive learning outcomes were 0.000, so the hypothesis was accepted.

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