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The Effect of Biocard Learning Media on Students' Understanding of Concepts Related to the Human Reproductive System in the 11th Grade Science Class at SMA Diponegoro Panti Jember during the Academic Year 2022/2023

Ahmad Humaidi Kamil
UIN Kiai Haji Achmad Siddiq Jember, Indonesia
Correspondence author, ahmadkamil0308@gmail.com

Risma Nurlim
UIN Kiai Haji Achmad Siddiq Jember, Indonesia

Idiawati Nurlim
Universitas Hasanuddin, Indonesia

Abstract The purpose of this study is to determine the effect of using Biocard Media on students' competence in comprehending the material regarding to the Human Reproductive System. The research used a quantitative technique utilizing a Quasi experimental research design known as Nonquivalent Group Posttest Only Design. The sampling technique utilized a purposive sampling technique, with science class 2 being chosen as the control group and science class 1 as the experimental group. Data gathering methods include assessments and written documentation. The data analysis approach utilizes the t test. The research findings indicate that the experimental class students achieved a higher average score for mastery of concepts in the posttest compared to the control class. Specifically, the average score was 75.77 for the experimental class and 70.96 for the control class. Additionally, it was shown that Biocard Media had a substantial impact on students comprehension of concepts, as indicated by a significance value of 0.026.

Keywords: Biocard learning media, Students' understanding of concepts, Human reproductive system, SMA diponegoro panti jember

INTRODUCTION

Education is a planned and responsible activity conducted by professionals (educators) towards youth (students) in order to foster interaction and attain certain educational objectives. As per Article 1 of the Law of the Republic of Indonesia on

the National Education System (Sisdiknas) of 2022, education is defined as a deliberate and organized endeavor to enable and foster a conducive environment for learning, allowing students to actively cultivate their abilities (Sisdiknas, 2022). According to the law described above, for an education system to function optimally, it is not enough for only educators to be active participants. Students are also expected to take an active role in the learning process. As a result, the traditional teacher-centered approach, where educators solely lecture in front of the class from the beginning to the end of a lesson, is no longer sufficient. To address this, learning media is necessary to facilitate the transmission of information from educators to students. With the help of this media, students are not only expected to listen and take notes, but also to gain practical experience. Expansive education encompassing activities such as observation and discussion.

This is performed to enhance students' comprehension of the subject matter and facilitate their mastery of concepts by utilizing instructional media. It is an endeavor to move away from traditional teaching methods that solely rely on educators delivering lectures without the aid of instructional media, while students passively listen. By avoiding such methods, the learning process can effectively achieve its intended objectives (Zaki, 2020).

The integration of learning media is essential in the educational process as it serves to stimulate students' motivation and enthusiasm for studying. Media has the ability to not only enhance students' drive to learn, but also exert a beneficial impact on their psyche. Utilizing learning media enables enhanced engagement and communication between instructors and students (Tafonao, 2018).

According to observations conducted at Diponegoro Panti High School in Jember, the learning process still relies on traditional techniques, wherein the instructor alone delivers the subject through lectures and does not utilize any medium except from the chalkboard. Implementing technology-based media poses challenges due to insufficient school facilities and infrastructure, as well as school regulations prohibiting the use of smartphones. Consequently, researchers have opted for Biocard media, which does not rely on technology such as projectors or smartphones. This choice facilitates teachers in effectively delivering educational content and enhancing the engagement of students.

Biocard media is derived from flipchart media, resulting in a comparable size that typically ranges from 21x28 cm to 50x75 cm. Biocard media refers to a printed visual medium that enhances the clarity of thoughts and provides descriptions of the information being presented. In the absence of visual media, there is a high probability that students may forget the subject being explained (Barkah, 2021). The utilization of Biocard media in education occurs when the instructor elucidates the subject matter, facilitates discussions, and during student presentations (Nurfitriyah, 2015).

Concept Understanding, as defined by Bloom (1956) and Nurrita (2022), refers to the capacity to articulate information in a manner that is more comprehensible, while also being capable of interpreting and applying it. Mastery of concepts refers to the proficiency in elucidating complex ideas using our own language, simplifying

explanations, translating them, and using them in practical situations, such as problem-solving or the exploration of novel concepts.

The study conducted by Anderson and Krathwohl (2011) in Rahmah's research (2017) demonstrates that mastery of concepts is a fundamental aspect of the cognitive domain outlined by Bloom. This domain encompasses the following levels: Remembering (C1), Understanding (C2), Applying (C3), Analyzing (C4), Evaluating (C5), and Creating (C6).

Biology is a subject that primarily focuses on abstract concepts and stresses the teaching and learning activities, comprehension, and development of students' ideas and abilities. Consequently, studying biology necessitates the utilization of effective learning techniques and adequate educational resources (Galuh & Agus, 2014). The Human Reproductive System is a complex topic in Biology that involves abstract concepts and intricate discussions about the structure, function, and organs of the system. Students must commit the information to memory and have the ability to comprehend it (Deadara, 2017).

This study aim to investigate the impact of Biocard Media on students' comprehension of concepts related to the human reproductive system in Class XI Science at Diponegoro Panti Jember High School during the 2022/2023 academic year.

METHOD

The research used a quantitative technique utilizing a Quasi experimental research design known as Nonquivalent Group Posttest Only Design. This study methodology involves administering two distinct treatments to each group, followed by a comparative analysis of the outcomes resulting from the respective treatments (Jhangiani, et al., 2020).

NR1 X O1

NR2 O2

Jakni (2016)

Details =	NR1	: Experimental group without randomization
	NR2	: Control group without randomization
	X	: Treatment
	O1 & O2	: Posttest (experimental and control groups after treatment)

The data collection instruments used in this research were tests in the form of Posttests and Documentation. The posttest is used to determine students' mastery of concepts. The posttest instrument used is 20 multiple choice questions. The documentation sheet is used to record the results of students' midterm exams

between control class and experimental class students as a benchmark for students' initial abilities and also to complete the research data carried out.

This research was carried out at Diponegoro Panti Jember High School for six (6) meetings in the control class and experimental class, where five meetings were to explain the material and at the sixth meeting a Posttest was carried out. This research was conducted in April - May 2023. The subjects of this research were students in class XI Science at SMA Diponegoro Panti Jember with a population of 76 students. The samples chosen were class XI IPA 1 as the experimental class and class XI IPA 2 as the control class. The sampling technique used is purposive sampling where the sample is determined based on certain considerations (Jakni, 2016). The data collection technique for student mastery of concepts is through a posttest, the value of the posttest is calculated based on the total score for each item obtained by the student and converted on a scale of 0-100 (Nadhifatuzzahro, et al, 2015). The following is the formula for calculating scientific literacy scores:

$$\boldsymbol{NS = \frac{Score\ obtained}{Total\ score}\ x\ 100}$$

Keterangan *:* $\boldsymbol{NS = Student\ scores}$

Then, the data is adjusted in the following category table:

Table 1. Level of score achievement on the concept mastery variable

Score Achievement Level	Category
81-100	Very high
61-80	High
41-60	Medium
21-40	Low
0-20	Very low

The quantitative research data is analyzed using descriptive analysis and inferential analysis (Sugiyono, 2017). Descriptive analysis seeks to provide a detailed description of the collected data without making any overarching conclusions. There are two forms of inferential analysis: parametric and non-parametric statistics. Prior to doing these two types of statistical analyses, it is necessary to assess the data for normality and homogeneity using appropriate tests. The data analysis was conducted using the SPSS v26 software.

The Shapiro-Wilk test was used to assess the normality of the data from the concept mastery test instrument for both the experimental and control class students. The test revealed significant values greater than the predetermined threshold α (0.05), namely 0.185 and 0.419. The homogeneity test of the concept mastery test instrument data for students in the experimental and control classes yielded a significant value greater than the predetermined threshold α (0.05), which is 0.182. The data is classified as having a normal distribution and being homogenous. The hypothesis is tested using parametric testing, specifically the Independent sample t-test. The choice is made based on the significance value: if it is more than 0.05, the null hypothesis (H0) is accepted and the alternative hypothesis (Ha) is rejected.

Conversely, if the significance value is less than 0.05, the null hypothesis (H0) is rejected and the alternative hypothesis (Ha) is accepted.

FINDINGS AND DISCUSSION

According to the obtained data, it was discovered that all data normality had a significance value greater than α (0.05). Specifically, the experimental class had a significance value of 0.185, while the control class had a significance value of 0.419. Therefore, it can be inferred that the data regarding students' concept mastery followed a normal distribution.

The data analysis reveals that the homogeneity test findings indicate a significance level of 0.182, which is higher than the threshold of 0.05. The conclusion is that there is variation in students' concept mastery within the same group, as evidenced by the results of the homogeneity test, which yielded a significance value greater than 0.05.

Parametric statistical tests are used for hypothesis testing when the acquired data is normally distributed and homogenous. The current test being utilized is the independent sample t-test, with a significance threshold set at 0.05. The following are the findings of the independent sample t-test hypothesis test calculation.

Table 2. Independent sample t-test results

Data	Sig.	α	Conclusion	Decision
Concept Mastery	0,026	0,05	Ha Accepted	Significantly Different

The data from the table above indicates that the two-tailed significance value of the hypothesis test findings is 0.026, which is less than the critical threshold of 0.05. According to the decision-making criteria, since the significance value is less than 0.05, the null hypothesis (H0) is rejected and the alternative hypothesis (Ha) is accepted. Therefore, it can be inferred that there is a substantial difference in students' understanding of ideas between the experimental class and the control class regarding the human reproductive system material.

After carrying out the Posttest, data was obtained on students' mastery of concepts in the control class and experimental class on the Human Reproductive System material for class XI at SMA Diponegoro Panti Jember, as follows:

Table 3. Frequency distribution of control class concept mastery

Category	Total	Percentage
Very high	5	19%
High	12	46%
Medium	9	35%
Low	0	0%
Very low	0	0%

Based on Table 3 above, students with concept mastery in the control class have three categories, namely very high with 5 students with a percentage of 19%, high

with a total of 12 students with a percentage of 46% and sufficient with a number of 9 students with a percentage of 35%.

Table 4. Frequency distribution of experiment class concept mastery

Category	Total	Percentage
Very high	10	38%
High	14	54%
Medium	2	8%
Low	0	0%
Very low	0	0%

Based on table 4 above, students with concept mastery in the experimental class have three categories, namely very high with 10 students with a percentage of 38%, high with 14 students with a percentage of 54% and sufficient with 2 students with a percentage of 8%.

By data analysis, it was determined that there was a notable disparity in the level of understanding of concepts between the experimental class and the control class. The distribution of the frequency of mastery of experimental class concepts reveals three categories among students. In the very high category, there are 10 students, accounting for 38% of the total. In the high category, there are 14 students, representing 54% of the total. In the moderate category, there are 2 students, making up 8% of the total. There are no students in the low and very low categories. In the control class, there were 5 students classified in the very high category, with a percentage level of 15%. Additionally, there were 12 students in the high category, with a percentage level of 46%. In the moderate category, there were 9 students, with a percentage level of 35%. However, there were no students in the low and very low categories. The experimental class had an average concept mastery score of 75.77, whereas the control class achieved an average concept mastery score of 70.96. The experimental class exhibits a remarkable level of proficiency in students' understanding of ideas, which can be attributed to the utilization of Biocard media for learning. This approach empowers students to take an active role in their learning process.

The findings of the hypothesis test indicate a substantial disparity in students' comprehension of ideas between the control classes and the implementation of the Biocard learning media class. The obtained significance value is 0.026, which lower then the threshold of 0.05. Therefore, the null hypothesis (H0) is rejected, and the alternative hypothesis (Ha) is accepted. These findings indicate that Biocard media has an impact on students' comprehension of ideas related to the human reproductive system in the IX Science class at Diponegoro Panti Jember High School during the 2022/2023 academic year.

The impact of utilizing Biocard on the acquisition of this idea aligns with the findings of Purwaningsih's research (2020), which demonstrates an augmentation in students' learning outcomes and proficiency through the utilization of Biocard media. Biocard media offers a comprehensive collection of visual media that

includes articles or images related to the subject matter, which may consist of concepts or keywords. Keywords stimulate students' curiosity and foster a desire for knowledge and learning. Biocards are a versatile and appealing alternative medium for learning due to their customizable packaging and adjustable content, making them suitable for a variety of uses. In addition, the utilization of cards enables students to acquire knowledge through interactive gameplay, thereby facilitating the application of their cognitive faculties in problem-solving and fostering an enjoyable learning environment.

CONCLUSION

The study and data analysis indicate a difference in concept mastery between the control class students and the experimental class who were taught using Biocard medium. The difference in performance between the control class and the experimental group is shown in the posttest results. The control class achieved an average score of 70.96, whereas the experimental group attained an average score of 75.77.

The difference in students' comprehension level between the control class and the experimental class demonstrates a notable impact of utilizing Biocard media on students' understanding of the human reproductive system in the XI Science class at Diponegoro Panti Jember High School during the 2022/2023 academic year, with a significance value of 0.026.

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