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The Effectiveness of Using Discovery Learning Model Assisted by Torso Media on the Topic of Skeletal System towards Learning Outcomes of Grade XI Students at SMAN 3 in Bengkulu City

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Abstract: This study aims to determine the effectiveness of using the Discovery Learning model with torso media in improving students' learning outcomes in solving multiple-choice skeletal system problems. The research employed a quantitative approach with a quasi-experimental method. The subjects were 48 eleventh-grade students at SMAN 3 Bengkulu City. The research instrument used was a test sheet consisting of multiple-choice questions. Data analysis techniques included normality test, homogeneity test, hypothesis testing, and conclusion drawing. The study was conducted at SMA Negeri 3 Kota Bengkulu from February to November 2023. Based on the research results, it was found that a significant number of students had inadequate learning outcomes, particularly in the Skeletal System material. Out of 24 students in the experimental class, only 1 student scored 80 in the posttest, while in the control class, only 1 student achieved a score of 80. Factors contributing to the low student learning outcomes were assumed to be due to students' lack of precision in learning, difficulties experienced resulting in varying answers from those required, and rushing through the questions leading to errors in problem-solving. Additionally, students' lack of carefulness in reading the given questions also resulted in difficulty in understanding the question's intent, thus hindering their ability to determine the necessary problem-solving steps.

Keywords: Discovery Learning, quantitative approach, skeletal system, student learning outcomes, torso media

1. Introduction

According to Law No. 20 of 2003, education is a conscious and planned effort to create an environment and learning process in which students actively develop their own potential to have religion, self-control, personality, intelligence, noble morals, and skills necessary for themselves, communities, nations, and nations (Hidayat & Abdillah, 2019). Teaching learning is a process that consists of various actions of teachers and students carried out mutually in an educational environment to a specific goal (Perkins & Unger, 2013). Teacher-student interaction, also known as mutual relationships, is an important part of the teaching learning process (Johnson, 1981). Interactions in teaching-learning events include more than just the

relationship between teacher and student; it also includes educational interactions. It not only conveys lessons, but also instills perspectives and values in students (Festiawan, 2020; Inah, 2015).

Biology, as a subdiscipline of natural sciences, has unique characteristics. Learning biology means learning to know the living creatures and their life processes in their environment, so it requires approaches and models that provide the basis of work and characteristics to develop ideas (Cimer, 2012). Basically, learning biology is not limited to one model that is considered effective for each type of matter. However, each material has unique features and requires a learning model that matches those features (Shadmehr & Mussa-Ivaldi, 2023).

In every learning process, there are always problems, both from the teacher and the students. Furthermore, the results of Juliya & Herlambang, (2021) dan Ota et al., (2021) stated that the problems found in schools include not liking the learning environment, disliking certain subjects, difficulty in focusing during lessons, frequent disturbances or being disturbed by classmates during learning sessions, unsatisfactory learning outcomes or grades, lack of time for studying, difficulty in understanding the content of textbooks, and arriving at school on time but being late for class.

Some of the above problems were also found during initial observations at SMAN 3 Kota Bengkulu. The observation results show that the teaching and learning process at SMAN 3 Kota Bengkulu in biology education is still dominated by a classroom condition that focuses mainly on the teacher as the primary source of knowledge. Lectures are still the preferred choice of teaching method by teachers, while the science process has not been fully developed in the learning process. Additionally, the learning process is still monotonous without using tools or media. This causes students to be passive and less motivated to participate in learning, which ultimately affects the learning outcomes obtained by students, which will be a benchmark for the success of the learning system provided by teachers at the school.

One of the subjects that must be taught is the skeletal system. The main material of the skeletal system is one of the complex topics due to the complexity of the material to be delivered. Furthermore, this material involves studying the internal organs of the human body and requires memorization of various organs that make up the skeletal system.

In implementing the learning process, suitable and optimal methods are needed so that students understand and easily learn the material presented by the teacher, thus realizing the learning objectives. Permendikbud no. 65 2023 states that centered on the teacher becomes a pattern of learning centered on the learners, one-way learning pattern becomes interactive, and passive learning pattern becomes active learning (Sucita et al., 2020). In this regard, the teacher only serves as a guide and facilitator for students to develop their potential optimally. One of the learning models that is able to develop the role of the teacher as a guide and facilitator to develop students' potential is the discovery learning model (Novianti & Ferianto, 2023).

Dean (1996) states that discovery learning is a model or type of learning where students construct their own knowledge by conducting an experiment and discovering a principle from the results of the experiment. Additionally, Castronova (2002) and Suryosubroto (2004) explaine that discovery learning is a component of educational practice that encompasses teaching methods that promote critical, active, process-oriented, self-directed, and reflective learning. Suitable teaching models for the delivery process of materials, instructional media also greatly influence the learning process. Instructional media are tools that can aid the teaching-learning process and can be used to facilitate students in achieving competency, clarify a message, and facilitate the delivery process of course materials, thus enabling better and more perfect learning outcomes (Hammer, 1997; Kurniawati et al., 2021).

The use of appropriate and varied instructional media can overcome students' passive attitudes, especially in the topic of the respiratory system. Since the respiratory system is a subject that involves learning about internal organs in the

human body, it requires a suitable instructional model and effective aids that can closely resemble the organs being taught to students in the learning process. This instructional media is called a torso model (Marsuki & Herunata, 2022). The torso model referred to is a three-dimensional media used as a tool or aid in the science learning process in the classroom (Khairunnisah et al., 2021). In other words, the torso is a teaching aid designed to represent the human body and display various supporting organs to provide a complete picture of their functions. The torso is used to provide a realistic depiction of both the internal and external parts of the human body and is typically made of metal or similar materials. In this research, the torso is a teaching aid used to convey information in the teaching and learning process.

The existence of teaching models and learning media is expected to motivate teachers to vary their teaching media and achieve good learning outcomes.

2. Method

This research adopts a quantitative approach. According to Arikunto (2013), quantitative research is a study that fundamentally employs a deductive-inductive approach aimed at testing hypotheses from collected data in accordance with previous theories and concepts. The research method used is quasi-experimental, which closely resembles a true experiment where it is not possible to control all existing variables (Sugiyono, 2019; Sukmadinata, 2017).

This research was conducted during the odd semester of the 2022/2023 academic year. The location of this research was SMAN 3 Bengkulu City. In this research process, two groups are involved: the experimental group and the control group. The experimental group received treatment through discovery learning-based torso media, while the control group utilized conventional methods. The research design employed is a control group pretest-posttest design. The population used in this research consists of all 48 students of class XI IPA. The sample for this research includes 24 students from class XI/A as the experimental

group and 24 students from class XI/B as the control group. The sampling technique used in this research is purposive sampling.

Data collection techniques in this research were obtained by conducting tests. The written test was administered at the beginning and after the learning activities, consisting of 20 multiple-choice questions given to each student, with a score of 5 for each correct answer. If a student can answer all questions correctly, their total score is 100.

The data analysis technique used in this research includes prerequisite tests such as data normality and homogeneity. After fulfilling the normality and homogeneity tests, hypothesis testing is conducted to determine whether the hypotheses proposed in this research are accepted or rejected. Hypothesis testing is performed using T-test analysis.

3. Result and Discussion

The data obtained in this study were collected from tests given to eleventh-grade students before and after the instruction. The data description that can be analyzed is as follows:

Normality Test Results

The normality hypothesis of the research was tested using the Lilliefors test. The results of the normality test can be seen in the following table:

Tabel 1. Normality Test Results for the Experimental Grup Post-Test

X_i	Z	F(z)	S(z)	F(z)-S(z)
40	-1.298028	0,0985	0,416666	-0,31816
45	-1.297894	0,0985	0,08333	-0,0151
50	-277567	0,0985	0,333333	-0,2348
55	-.297624	0,0985	0,375	-0,2765
60	-1.2974901	0,0985	0,66666	-0,5681
70	-1.297220	0,0985	0,916666	-0,81816
75	-1.29691160	0.0985	0,958333	-0,8598
80	1.29695675	0,0985	1	-0,9015

Based on the normality test results for the experimental class's post-test scores above, it is known that the post-test scores of students in the experimental class on the respiratory system material are normally distributed. The maximum L-value obtained is -0.9015, and its corresponding Ltabel value is 0.190. Therefore, with

these results, H_0 is accepted because the L-value of -0.9015 is less than or equal to the Ltabel value of 0.190.

Tabel 2. Normality Test Results for the Control Grup Post-Test

X_i	Z	F(z)	S(z)	F(z)-S(z)
25	-2.9015	0,019	0,416666	-0,39766
35	-2.0029	0,228	0,08333	-0,6053
50	-0.65513	0,2578	0,333333	-0,0755
55	-0.20585	0,4207	0,375	0,0832
60	0.24341	0,4443	0,66666	-0,2223
70	1.141971	0,1271	0,916666	-0,78956
80	2.04052	0.207	0,958333	-0,75133

Based on the normality test results for the posttest scores of the control group above, it is known that the posttest scores of the control group on the respiratory system material are normally distributed. The maximum L value obtained is 0.0832, and the corresponding critical value (Ltabel) is found to be 0.190. Therefore, with these results, we fail to reject the null hypothesis (H_0) because the calculated L value of 0.0832 is less than or equal to the critical value of 0.190.

Homogeneity Test Results

The results of the homogeneity test calculation using the Fisher test can be seen in the following table:

Tabel 3. Homogeneity Test

X_i	Experiment Posttest	Control Group Posttest
Mean	59.79	57.291
Variant	10.37	13.30
F-test	1.002	

The homogeneity calculation using Fisher's test is based on the calculation, resulting in an F value of (1.002). The condition for data to be considered homogenous is if the calculated F value is smaller than the F-table value (2.178). The obtained F value is 1.002 (1.002 < 2.178), thus it can be concluded that the data in the control and experimental groups are homogenous.

Hypothesis Testing Results

The collected data were analyzed using the T-test formula. This T-test aims to determine whether there is a difference in final abilities between the two groups by testing the mean scores of the posttests in each group. The analysis used was the Pearson correlation, and the results can be seen in the following table.

Tabel 4. Hypothesis Test Results

X	Experiment Posttest	Control Group Posttest
Group mean score	59.70	57.29
Standard deviation	10.37	13.30
Sample size	24	24
T-test result	0.5391	

The results of the hypothesis test show that the average posttest scores obtained by the experimental group are 59.70 and by the control group are 57.29. The result of the t-test for the difference in mean learning outcomes yields a t-value of 0.5391, which is greater than the critical t-value (1.714), and the significance value is less than 0.05 ($p = 0.537 > 0.05$). If the calculated t-value is greater than the critical t-value at a significance level of 5% with degrees of freedom (df) = 23, then the alternative hypothesis (Ha) is accepted, and conversely, if the calculated t-value is less than the critical t-value, then the null hypothesis (Ho) is accepted. Thus, it can be concluded that the alternative hypothesis (H1) stating "There is a difference in student learning outcomes before and after learning using the discovery learning model" is rejected.

The presented results indicate that there is an insignificant difference between the average posttest scores of the experimental group and the control group. Although the average posttest score of the experimental group is slightly higher than that of the control group, the difference is not statistically significant. The use of the t-test aims to determine whether the difference between two groups is due to normal variation or whether the difference is large enough to be considered statistically significant. In this case, the calculated t-value (0.5391) is smaller than the

critical t-value (1.714) at a significance level of 5%, indicating that there is not enough statistical evidence to reject the null hypothesis (H0).

The null hypothesis states that there is no significant difference in student learning outcomes before and after learning using the discovery learning model. Therefore, based on the t-test results, we cannot conclude that there is a significant difference in student learning outcomes before and after learning.

This suggests that the use of the discovery learning model may not have a significant impact on improving student learning outcomes in the tested context. Other factors such as timing, teaching methods used, or student characteristics may also influence the observed results. Therefore, further research is needed to explore these factors and evaluate the effectiveness of the discovery learning model in different contexts.

In a more detailed discussion, several factors can be identified that may have contributed to the finding that the discovery learning model with torso media did not significantly affect student learning outcomes such as a) the effectiveness of the discovery learning model heavily relies on how it is implemented in the classroom. It is possible that the use of the discovery learning model with the assistance of a torso was not sufficiently effective in helping students understand the taught material. There may have been challenges in integrating independent discovery with the content presented through the torso; b) the material taught in lessons using the discovery learning model with the assistance of a torso may have been too complex for students to grasp using this approach. Utilizing anatomical aids such as a torso requires a deep understanding of human body structures, and students may have struggled to connect these concepts with the learning material; c) employing the discovery learning model with the assistance of a torso may have required more time than other teaching methods. This could have resulted in insufficient time to cover all the scheduled curriculum material. Consequently, students may not have had enough opportunity to develop a deep understanding of the taught material (Dean, 1996).

Additionally, according to Khairunnisah et al., (2021) and Yusoff & Awang (2018), the effectiveness of the discovery learning model heavily relies on the teaching skills of the instructor in guiding students through the exploration and discovery process. And also variations in students learning abilities, interests, and motivations among students can also influence the effectiveness of the discovery learning model. Students who are less interested or motivated to engage in independent exploration may not fully benefit from this approach.

Considering these factors, it is essential for educators to conduct a comprehensive evaluation of the implementation of the discovery learning model with the assistance of a torso and consider alternative strategies to enhance student learning outcomes. This may involve adjusting teaching methods, selecting more suitable materials, improving teacher instructional skills, and providing additional support for students in need.

4. Conclusion

Based on the data analysis and discussion of the research above, it can be concluded that the use of the discovery learning model with torso-assisted media does not have a significant impact on the learning outcomes of students in Grade XI at SMAN 3 Kota Bengkulu in the topic of the skeletal system. This conclusion is drawn from the final average scores of the students, where the average score of students with the Discovery Learning model is 59.70, while the average score of students with conventional teaching methods is 57.29. This also indicates that the use of the Discovery Learning model with torso-assisted media does not have a substantial impact compared to conventional teaching methods. The lack of significant improvement in student learning outcomes when using the Discovery Learning model with torso-assisted media can be evidenced by the statistical data analysis using the t-test, where the obtained t-table value is 1.714 and the calculated t-value is 0.5391. Thus, since the calculated t-value is greater than the t-table value, it means that the null hypothesis (Ho) is accepted and the alternative hypothesis (H1) is rejected.

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