Original Article Research

Analysis of Human Physiology Learning for Semester I Students Using Discovery Learning Applications Based on Anchored Instruction at University

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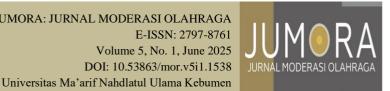*email corresponding author: ratno.susanto@staf.undana.ac.id**

Abstract

The aim of this research is to produce physiology learning using discovery learning based on anchored instruction for first semester students of Physical Education, Health and Recreation at Nusa Cendana University. Human Physiology is a branch of biology that studies the working mechanisms of the human body, including how the body's organs function to support life. Learning Human Physiology requires an understanding of various systems in the human body, such as the nervous system, circulatory system, digestive system, and so on. This research aims to analyze the effectiveness of implementing the Discovery Learning method based on Anchored Instruction in learning Human Physiology for first semester students of Physical Education, Health and Recreation at Nusa Cendana University. The findings of this study indicate that the application of the Discovery Learning method based on Anchored Instruction in teaching Human Physiology to first semester students at universities has proven to be effective. The study is quasi-experimental (quasi-experimental) with pre-test and post-test. A class of first semester students studying Human Physiology at a university was the subject of the study; the researchers used existing classes as experimental groups due to limitations in determining random groupings of students.

Keywords: *Discovery Learning, Human Physiology Learning, Anchored Instruction*

How to cite:

1. INTRODUCTION

Human Physiology is a course that covers the functioning of the human body systematically and in detail. For students in a variety of health-related fields as well as other fields that need a thorough understanding of how the human body functions, this course is crucial(Saputra et al., 2022). Students are introduced to the fundamentals of physiology during the first semester, which serve as the foundation for their future comprehension of the health sciences.

The study of human physiology is a subfield of biology that focuses on how the body's organs operate together to sustain life. Understanding the many bodily systems—such as the circulatory, digestive, and neurological systems—is necessary to learn human physiology. According to (Ririnisahawaitun et al., 2022), the human body is a tremendously complicated system, with careful interactions between numerous organs and systems to maintain internal equilibrium or homeostasis. Therefore, knowing Human Physiology not only requires comprehending theory, but also the capacity to apply physiological principles to occurrences that occur in everyday life. Along with the complexity of the material being studied, students often experience difficulties in understanding concepts in Human Physiology. Research by (Achmad Afandi, 2019).

Nonetheless, the Human Physiology course is frequently regarded as one of the most challenging subjects for novice learners to comprehend. Students may find it challenging to fully comprehend the content due to the intricacy of ideas pertaining to the physiology of the human body, including the nervous system, blood circulation, respiration, and digestion. Thus, instructional strategies that can better support comprehension of these ideas are required(Giriwijoyo, S., & Sidik, 2009).

The Anchored Instruction-based Discovery Learning approach is one way to improve student comprehension. Through investigation and problem-solving, students might uncover ideas or principles through the use of the discovery learning approach. Students are encouraged to actively participate in the learning process, hone their critical thinking abilities, and gain a deeper understanding of subjects with this method. Conversely, Anchored Instruction is a method of teaching that initiates the acquisition of new ideas by using a significant circumstance or setting(Rahman et al., 2023).

The goal of discovery learning is to encourage students to actively participate in their own autonomous investigation and experimenting in order to find and comprehend concepts. Through a process of inquiry and discussion that fosters critical thinking, students can "discover" knowledge through Discovery Learning, according to (Ratno Susanto, 2019). This approach can be applied in the context of human physiology to help students comprehend physiological principles through discussions, real-world simulations, and experiments. According to research by (Pahmi & Albina, 2023), students' comprehension improved when Discovery Learning was used because they actively engaged in the learning process and found it easier to recall the information they encountered. Additionally, discovery-based learning can boost students' curiosity, which will raise their.

A learning technique called "anchored instruction" uses events or contexts that are pertinent and meaningful to start the learning process. Anchored instruction, according to (Susanto & Lestari, 2020), attempts to make learning more relatable to real-world situations or

experiences in order to increase student attention and facilitate comprehension of the material. Students are encouraged to answer issues in a pertinent context under this methodology, which facilitates more organic and significant concept development. Using case studies or simulations pertaining to the state of the human body in daily life is one way to apply Anchored Instruction in the study of human physiology. For instance, students can be asked to work through issues pertaining to medical conditions or bodily processes that they could come upon in.

When learning human physiology, combining discovery learning with anchored instruction offers a more thorough and engaging method. According to study by (Maulid, 2021), combining these two methods can make complex information easier for students to learn and more pleasurable. Students may be more inclined to look for solutions and use what they have learned in practical settings if Anchored Instruction is used as a framework or problem that needs to be resolved. In the meantime, students can actively look for answers and ideas pertaining to the subject matter being taught thanks to Discovery Learning.

According to (Setiawan et al., 2024) research, tertiary biology students' critical thinking abilities and conceptual knowledge can be enhanced by the use of Discovery Learning, which is based on Anchored Instruction. Pupils who get instruction in this manner demonstrate a deeper comprehension and the capacity to relate abstract ideas to actual occurrences. This is also consistent with the findings of (Lestari et al., 2023), who claimed that using these two methods to teach human physiology can improve students' comprehension of the body's workings in a practical setting. In addition, using educational technology that facilitates these two methods can improve learning outcomes. The utilization of human-related software, simulations, and interactive movies.

It is intended that by combining these two methods, students would be able to comprehend the content on human physiology more readily and in a way that is more relevant and contextual. Students who get instruction that emphasizes inquiry and problem-solving in authentic settings will be better able to relate the concepts they learn to their daily lives and make the connection between theory and practice.

The author of this study will look at how the university uses Discovery Learning, which is based on Anchored Instruction, to teach human physiology, particularly to first-semester Health and Recreation Physical Education students. The purpose of this study is to ascertain how well this approach increases students' comprehension and enthusiasm for studying human physiology.
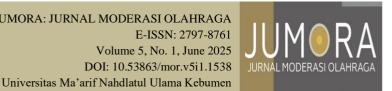
2. METHOD

The purpose of this study is to evaluate how well university first-semester students understand human physiology when using the Discovery Learning approach, which is based on Anchored Instruction. This study employs an experimental research design and a quantitative methodology to accomplish this aim. A thorough description of the research techniques employed is provided below:

2.1 Participants

First-semester Human Physiology students at the university under investigation served as the research subjects. Purposive sampling, which selects groups of students with similar characteristics to prevent bias, was used in this study, and there were about 60 samples total, split into two groups: the experimental group and the control group, each of which had 30 students.

2.2 Research Design

This study used a quasi-experimental research design with a pre-test and a post-test. This study was carried out in a university class of first-semester Human Physiology students. Due to problems in randomly assigning students to classes, the researchers decided to employ the quasi-experimental method, using existing classes as experimental groups(Lestari et al., 2023).

This research consisted of two groups is Experimental group: Students taught using the Discovery Learning method based on Anchored Instruction. Control group: Students taught using conventional learning methods.

2.3 Instruments

The instruments used in this research are as follows is Initial test (pre-test): A test used to gauge pupils' initial comprehension of the Human Physiology content before instruction starts. This test includes discussions of fundamental concepts in human physiology together with multiple-choice questions. Final exam (post-test) is An assessment conducted following completion of instruction to gauge how well pupils have understood the subject matter. Though it contains more in-depth questions based on content studied during the experimental period, this test is comparable to the pre-test.

Questionnaire on learning motivation: This survey gauges how motivated and involved students are in the learning process, both in the experimental and control groups. An observation sheet is used to record ongoing educational activities, particularly those involving the use of the Anchored Instruction-based Discovery Learning approach. The purpose of this observation was to determine how engaged the students were in the learning process and how they collaborated to solve the assigned issues(Febryan et al., 2023).

2.4 Procedures

This research was carried out through the following stages: Preparation is Develop a learning plan that is in accordance with the Discovery Learning method based on Anchored Instruction. Developing relevant Human Physiology learning materials and preparing pre-tests and post-tests. Divide students into two groups: experimental group and control group.

Implementation of Learning is Experimental group: Students in the experimental group receive instruction using the Anchored Instruction-based Discovery Learning method, which involves presenting contextual problems related to Human Physiology topics and requiring students to work together to solve them. This approach allows students to learn concepts through experimentation, discussion, and exploration.

Control group: Students in the control group participated in instruction using a traditional method, which involved lectures from lecturers with minimal engagement or experimentation. Learning is more concerned with theoretical justifications than with any relevant circumstance or context.

Outcome Measurement is Pre-test and post-test: To gauge how well students have understood the Human Physiology content, tests are administered at the start and finish of the learning session. Motivational questionnaire: After the learning process is complete, students are asked to fill out a questionnaire that measures their level of motivation and interest in the Human

Physiology course. Observation: The researcher observed the class to document the degree of student engagement, group dynamics, and problem-solving techniques used in Anchored Instruction-based learning.

2.5 Data Analysis

The data collected in this research will be analyzed using the following statistical analysis techniques. Normality test: To evaluate the distribution of pre-test and post-test data from both groups (experimental and control), a normality test was utilized. If the data is regularly distributed, then the investigation continues with parametric tests.

T test: The t test was applied to paired samples (paired t-test) in the same group (before and after training) in order to assess significant differences between the pre-test and post-test results in the two groups. Additionally, the experimental group's and the control group's results were compared using an independent t-test. Analysis of the motivational questionnaire: To ascertain the degree of student motivation for learning, data from the motivational questionnaire was examined using descriptive analysis methods. The pre-test and post-test utilized in this study will undergo a validity test stage, which will involve consulting with experts in the domains of human physiology and education to guarantee the instrument's validity. Furthermore, the test instrument's dependability is assessed utilizing reliability.

3. RESULTS

In this section, study results are presented addressing the application of the Discovery Learning approach based on Anchored Instruction in learning Human Physiology for first semester students at universities. The purpose of this study was to examine how well this approach increased students' comprehension of the subject matter and motivation to learn. The following are specific research findings based on information gathered by pre-test, post-test, motivation questionnaire, and observation.

3.1 Pre-test and Post-test results

a. Experimental Group (Discovery Learning Method based on Anchored Instruction)
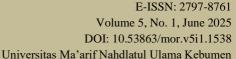
The following table shows the average results of the pre-test and post-test of experimental group students:

Group	Pre-test Average	Post-test Average	Difference (Increase)
Experimental Group	60,5	85,2	24,7

It is evident from the above table that the experimental group's size significantly increased following the adoption of the Anchored Instruction-based Discovery Learning approach. The rise in the average score of 24.7 indicates that after adopting this approach to learn, pupils have made significant progress in comprehending the idea of human physiology.

b. Control Group (Conventional Method)

The following table shows the average pre-test and post-test results of control group students who were taught using conventional methods (lectures and traditional learning):

Group	Pre-test Average	Post-test Average	Difference (Increase)
Control Group	61,0	73,5	12,5

Although the control group's knowledge increased between the pre-test and post-test, it increased by a lower amount—just 12.5. This lesser rise suggests that traditional teaching approaches have little effect on students' comprehension of the subject matter.

Statistical Test: An independent t test was used to ascertain whether there was a significant difference between the experimental and control groups. According to the test findings, the experimental group and the control group differed significantly in their increased comprehension of the subject matter, as indicated by the p value = 0.000, which is less than 0.05.

3.2 Results of the Learning Motivation Questionnaire

To gauge students' enthusiasm for studying human physiology, a learning motivation questionnaire is administered. Ten elements make up this survey, which evaluates students' motivation both internally and externally. The findings from the examination of the learning motivation survey are as follows:

a. Experimental Group (Discovery Learning Method based on Anchored Instruction)

Average motivation score: 80.3 (on a scale of 100)

Because the learning was grounded in real-world situations and allowed for active investigation of concepts, the majority of students reported feeling more motivated and engaged in studying human physiology. Additionally, they feel more engaged in problem-solving and group conversations.

b. Control Group (Conventional Method)

Average motivation score: 65.8 (on a scale of 100) Even if they grasped the topic, students in the control group reported feeling that learning was less engaging and that they tended to be inactive. Because the approach is more one-sided (the lecturer delivers a lecture), the majority of students feel less motivated.

According to the results of the motivation questionnaire, the experimental group that employed the Anchored Instruction-based Discovery Learning approach was more motivated than the control group. This demonstrates that this approach raises students' interest and motivation to learn in addition to their comprehension of the subject matter.

3.3 Learning Activity Observation Results

Observations are carried out during the learning process to see the level of student participation and interaction in learning. The observation results show that:

Experimental Group:

Students participate more actively in group discussions and problem solving.

They actively seek information, discuss and share knowledge in contexts that are relevant to real life.

Contextual problem-based learning facilitates students to connect theory with real applications, so that learning becomes more meaningful.

Control Group:

Students are more passive and tend to only listen to lecturers' explanations.

Although there is some interaction, most students are not actively involved in learning and are more focused on the lecturer's notes and explanations. This observation shows that students in the experimental group showed a higher level of involvement and collaborated more in understanding the material.

3.4 Discussion of Research Results

The use of the Anchored Instruction-based Discovery Learning approach has significantly improved students' comprehension of the Human Physiology curriculum, according to the results. This is demonstrated by the fact that the experimental group's post-test scores increased more than those of the control group. Additionally, the experimental group's degree of student enthusiasm and involvement in the learning process was higher, demonstrating that this approach is successful in raising students' interest in learning as well as their comprehension of the subject matter.

Students in the experimental group were more engaged, demonstrating that the Anchored Instruction-based Discovery Learning approach helps students better connect theory to practical applications. Contextual problem-based learning gives students a deeper understanding of the material, making it easier for them to comprehend and retain it. Nevertheless, the observed gain in comprehension indicates that learning still contributes to student knowledge, although in a more limited manner and with less active student participation, even when conventional approaches produce lower outcomes.

4. DISCUSSIONS

This study examines how the Anchored Instruction-based Discovery Learning approach is used to teach Human Physiology to first-semester university students. It is evident from the findings of the pre-test, post-test, motivation questionnaire, and learning activity observation that using this approach improves students' comprehension of the subject matter and motivation to learn. A discussion of the findings from the research is provided below.

4.1 Increased Understanding of Material (Pre-test and Post-test)

Pre-test and post-test results indicated that the experimental group, which employed the Discovery Learning approach based on Anchored Instruction, had significantly improved comprehension of the subject matter. This strategy is more effective in improving students' comprehension of Human Physiology subject, as evidenced by the experimental group's average score rise of 24.7 compared to the control group's 12.5 increase.

This is consistent with findings from earlier studies that demonstrate how an active process of concept discovery in Discovery Learning can aid students in developing a deeper understanding of the subject matter (Kuncoro et al., 2023). With this approach, students actively explore and experiment to uncover the physiological principles behind the human body's functions rather of merely passively absorbing knowledge. By tying theory to practical applications, contextual problem-based learning (also known as "anchored instruction") enhances

this process and aids students in comprehending the subject matter and applying it to pertinent circumstances.

4.2 Student Learning Motivation

In this study, the experimental group also saw a significant boost in student motivation for learning. The experimental group's average motivation score was 80.3, compared to 65.8 for the control group. Because the learning was exploratory and grounded in real-world issues, students who received instruction utilizing the Discovery Learning approach based on Anchored Instruction expressed greater interest and involvement in the process.

According to motivation theory, learning that gives students the chance to actively identify and resolve difficulties is more likely to boost their intrinsic motivation, which explains this rise in motivation (Susanto & Riyanto, 2020). Students feel more in charge of their learning process and are more engaged and motivated to study when they have the chance to investigate the content and apply what they have learned to real-world scenarios.

On the other hand, the control group taught with conventional methods showed lower motivation scores. This shows that learning that is more passive, such as lectures, is less able to motivate students to be actively involved in learning. Methods that do not involve active student interaction in the learning process tend to reduce their interest and motivation to study the material further.

4.3 Student Involvement in Learning

The observation results showed that pupils in the experimental group were more actively immersed in learning. Students work together in groups, discuss and discover answers to assigned challenges, and share their knowledge and expertise with each other. Students feel more motivated and engaged in their studies when they can relate the theory they study to actual circumstances thanks to Anchored Instruction's use of problem-based learning.

On the other hand, the control group tended to be more passive, with most students only listening to the lecturer's explanation without interacting much. Their learning engagement is impacted by this limited interaction, which in turn impacts their motivation and comprehension. Through active engagement in learning based on Discovery Learning and Anchored Instruction, students are able to solve issues, combine theoretical knowledge with practical experience, and build critical thinking abilities.

4.4 Effectiveness of Learning Methods

In general, the utilization of the Anchored Instruction-based Discovery Learning approach has demonstrated greater efficacy in augmenting comprehension of Human Physiology content in contrast to traditional learning approaches. Both test scores and the degree of student enthusiasm and involvement showed more notable gains in the experimental group. Students can more readily comprehend abstract ideas in human physiology and make the connection between theory and real-world applications when real-world settings are used as an anchor for learning.

This study is in line with findings from several prior research which suggest that learning based on contextual and active challenges such as Discovery Learning based on Anchored Instruction can boost knowledge of topics in a deep and durable manner. This strategy provides opportunity for students to not only gain knowledge, but also to build abilities in critical thinking and problem solving (Ratno Susanto, 2019).

4.5 Implications for University Teaching

The study's findings suggest that using the Discovery Learning approach, which is based on Anchored Instruction, can be a useful substitute for raising the standard of education at colleges, particularly for courses like Human Physiology that call for comprehension of difficult and abstract ideas. Consequently, it is advised that this approach be used more extensively in a variety of different university courses, including those in the sciences and health.

The use of technology and other resources that support Anchored Instruction and Discovery Learning can also improve student learning experiences and boost learning effectiveness. Moreover, lecturers should think about ways to make learning more meaningful and relevant for students.

4.6 Research Limitations

This study has a number of limitations, even if its findings demonstrate that Discovery Learning based on Anchored Instruction can improve students' comprehension and motivation to learn. The findings may not apply to other universities or courses because this study was limited to students enrolled in Human Physiology courses at a single university. In addition, this research does not test long-term learning efficacy, namely if the understanding gained by pupils can be maintained over a lengthy period of time(Anggriawan, 2015).

4.7 Suggestions for Further Research

Additional research can be conducted by measuring the long-term effectiveness of learning based on Anchored Instruction and Discovery Learning, extending the research sample to include universities or other study programs, and investigating other factors that affect the success of implementing this method, such as student characteristics, lecturer readiness in implementing this method, and the use of technology in learning.

5. CONCLUSIONS

Based on the findings of the study, it can be said that using Discovery Learning, which is based on Anchored Instruction, to teach Human Physiology to first-semester university students has a favorable and noteworthy effect on improving comprehension of the subject matter, learning motivation, and student engagement. In order to improve learning effectiveness and student engagement, it is advised that this approach be used more extensively in other collegiate courses.
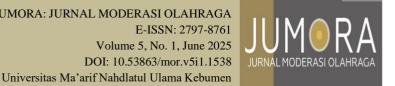
In order to improve the quality of learning, it is advised that the Discovery Learning method, which is based on Anchored Instruction, be used in a variety of courses and other educational institutions. It has been shown to be successful in improving students' comprehension of the material, learning motivation, and involvement in the learning process when applied to first semester university students studying human physiology. This approach not only improves students' academic results but also increases their interest and motivation to be more active in learning.

Acknowledgment

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