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Tracking Perception of the Discovery Learning Model and Motivation to Learn Biology: Impact on Students' Achievement

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Annotation. This study examines the influence of student motivation and educational frameworks on high school biology achievement in Cirebon, Indonesia. It uses questionnaire statements and multivariate regression analysis to explore the relationship between students' perceptions of learning models, motivation, and grades. Effective learning improves student engagement and comprehension. The study's reliable instruments highlight the importance of structured learning and motivation for academic success.

Keywords: *learning model, student motivation, biology education, academic achievement, educational effectiveness.*

Introduction

The Worldwide Organization for Economic Co-operation and Development (OECD) announced its findings of the International Student Assessment, or PISA, based on information gathered between 2009 and 2015. According to the poll, Indonesia's educational attainment is below average compared to other nations, especially in reading, science, and math. In addition, the data showed that students in Indonesia have a very low level of ability in science and technology (Shofiyah, 2015). The OECD's PISA program is a triennial international survey that tests students' 15-year-old skills and knowledge in order to assess educational systems around the world. In the latest PISA test (2018), Indonesia's ranking in mathematics and science was below average, coming

in at 75th and 72nd out of 79 countries, respectively. The average mathematics score for Indonesia is 397, science is 401, and reading is 402 (OECD, 2019).

Perception is how an individual receives and interprets stimuli through their senses (Rahmat, 2011; Slameto, 2010). It plays a crucial role in how we interact with the surrounding environment, enabling us to comprehend the extensive information our minds continuously receive and respond appropriately to different situations. A learning model is a methodology or framework that directs the creation and delivery of instructional materials and activities. This framework describes the proper organization of material presentation and acquisition and offers ways to evaluate students' understanding and development. Problem-based learning, constructivism, and direct instruction are a few educational learning methods. Conversely, a student's experience interacting with instructional materials and activities is called the learning process. The prior knowledge, motivation, and involvement of the student, as well as the instructor's techniques and instruction strategies, all impact this process (Bransford et al., 2000).

According to Regulation No. 103/2014 of the government's Ministry of Education and Cultural Affairs of Indonesia about learning in elementary and middle schools, a learning model includes inquiry, project, problem, and discovery learning along with their respective titles, characteristics, locales, and cultural contexts. From an operational perspective, the learning model is a method the teacher uses to attain optimal educational results throughout the teaching and learning process. To gain new knowledge and skills, students must engage in an educational experience that ultimately impacts their ability to accomplish academic objectives.

Perceptions of learning refer to how students view their understanding and progress (Hosnan, 2014). One effective model often used in schools is the discovery learning model, proposed by Jerome Bruner (Hosnan, 2014). This model encourages students to actively explore, question, and draw conclusions. It also aims to empower learners to exercise control of their own learning while achieving greater independence. According to theoretical references, the perceptions of the learning model can be used to effectively communicate with students to stimulate their thoughts, attention, and interests, improving learning achievement.

Motivation is a critical factor in influencing how someone behaves and achieves their goals, and learning motivation refers explicitly to the driving force students feel in their educational pursuits (Sadirman, 2015; Purwanto, 2007; Usman, 2011). Factors influencing a student's learning achievement include the quality of lecturers and achievement motivation (Crow & Crow, 1988). According to Riswanto and Aryani (2017), assessing a student's knowledge, abilities, and overall educational experience can help determine their level of achievement. Thus, a student's motivation can significantly impact how effectively their learning process progresses and how successful their achievements are.

STEM education in biology is mostly about hands-on, inquiry-based learning in which students engage in experiments, model biological processes, and use technology to analyze data. This method improves their comprehension of biological ideas and fosters the skills in problem-solving and critical thinking required for studies in science. Studies have shown that students engaged in STEM-based biology learning demonstrate enhanced cognitive abilities and a deeper understanding of the subject matter (Beluan et al., 2018). It can involve real-world problems like ecosystem management and genetic research, making learning more engaging (Hidayah et al., 2021).

Different learning models are commonly used in education to instruct students. These include inquiry-based learning, in which students must undertake their investigation to uncover the answers to the questions their teachers raise and the resources and guidance they offer; direct instruction, in which the instructor acts as the primary information source; project-based learning, in which students use their analytical and problem-solving skills to complete a project; collaborative learning, in which students exchange information and expertise and gain knowledge from one another; game-based learning, which can captivate students and add fun to the educational process; flipped classroom, which promotes more personalized instruction and dynamic classroom learning; self-directed learning, in which students oversee their education while receiving direction and assistance from their teachers; and problem-based learning (PBL) involves learners addressing a specific problem or scenario to acquire new knowledge and skills. PBL (Project-Based Learning) is an educational methodology that prioritizes student engagement and responsibility in the learning process. Students are tasked with implementing what they have learnt, thereby enhancing their analytical and creative abilities. PBL has been regarded as an effective educational method as it enables students to utilize their acquired knowledge in real-world contexts (Barrows, 2016).

The Kemp Learning Model, developed by Jerol E. Kemp, guides individuals to consider everyday problems and instructional goals and enables instructional design developers to evaluate students' characteristics and determine appropriate learning objectives (Irviana, 2020). Another student-centered learning paradigm is RICOSRE. "RICOSRE" is an acronym for "reading, problem identification, solution construction, problem solution, review, and extension" (Mahanal et al., 2019). The biology curriculum in Indonesia has adopted the revised edition of the 2013 curriculum, which incorporates learning models such as cooperative learning and discovery learning. However, the results of this approach have yet to be fully realized, as students have struggled to ask questions correctly and to communicate and connect concepts to various scientific topics.

Learning through inquiry and addressing problems is similar to discovery learning. While resolving difficulties focuses on how to solve problems, inquiry demands that students use all of their ideas and abilities to find answers to obstacles through investigation. In contrast, discovery learning focuses on the discovery of concepts or

principles that were previously unknown. It is also a learning problem designed by the teacher (Hosnan, 2014).

A typical structure of a discovery learning model comprises several phases, such as: *Exploration phase*, when learners are presented with a problem or situation and are encouraged to explore and manipulate their environment to gather information and gain understanding (Bruner, 1961); *Concept formation phase*, when learners use information collected during the exploration phase to form concepts and ideas about the problem or situation (Jonassen, 1991); *Testing and validation phase*, when learners test their hypotheses and validate their concepts by gathering additional information and data (Papert, 1980); *Reflecting and revising phase*, when learners reflect on their learning and change their understanding based on new information and feedback (von Glasersfeld, 1989).

In general, discovery learning is an active, self-directed process that enables learners to explore, manipulate, and make sense of their environment to gain new understanding and knowledge. It is also a student-centered approach when the educator adopts an advisory role instead of an educator.

Incorrect implementation of a learning model can often result in students feeling bored, sleepy, or needing help understanding the material being taught. Some learning models can be tedious, resulting in forced listening (Deepublish, 2021), limited interaction, and a need for new student experiences (Yudasmara & Purnami, 2015). Therefore, the proper application of learning models can positively impact student engagement and understanding due to factors such as tediousness, lack of interaction, and lack of new experiences.

A study on motivation is critical as it can significantly impact student learning outcomes (Ariyanti et al., 2018; Opit, 2014; Bakar, 2014). Furthermore, it can provide insights into how students respond to failure and how to help them develop better strategies for success (Filgona et al., 2020; Usman, 2011). In addition, research has shown a strong and positive correlation, with a positive association of 11.5 percent, between learning motivation and the productive abilities of vocational high school students in West Sumatra, Indonesia. Therefore, student motivation must be considered to guarantee that every student receives the most advantage from this learning paradigm.

Thirty-eight percent of students in Indonesia reported feeling unguided by their professors during the COVID-19 pandemic when they were forced to study from home (Kasih, 2020). In order to enhance student competence, the standard process for primary and secondary education units is to plan and implement the learning process, assess learning outcomes, and monitor the learning process, as outlined in the Indonesian Minister of National Education Regulation No. 41 of 2007 (Masbahah et al., 2014). According to Trianto (2013), the term "learning model" describes the method used in instruction, which includes the learning objectives, learning activity stages, learning environment, and classroom management. This model allows students to choose

appropriate learning strategies and control their learning process, increasing motivation to complete their studies (Maryati, 2018). However, some students may struggle with abstract and inapplicable materials, as 75 percent of students were found to have difficulty understanding biodiversity in biological materials due to the requirement of memorizing scientific names, which are easily forgotten (Kusuma et al., 2017; Priyayi et al., 2018).

The traditional lecture learning style can leave students disinterested and disengaged in class. To combat this, learning models need to be interactive and offer new experiences for learners. The conventional lecture style relies heavily on memorisation rather than visualisation and can be monotonous, leading to a need for greater student engagement in exploring their knowledge and honing analytical skills (Yudasmara & Purnami, 2015; Sutrisna, 2021). Motivation is vital in influencing a student's learning outcomes' success, as motivated students prefer to put in more effort to get better results (Ariyanti et al., 2018; Opit, 2014; Bakar, 2014). Encouragement can encourage effort and thus enhance learning outcomes (Sudjana, 2009; Firgona et al., 2020).

Learning model and motivation studies are very important to improve training and education programs and learn more about how someone's learning style and drive affect others. This is a very important topic because technology is being used increasingly in schools, and new ways of teaching are being developed that use ideas from cognitive and neuroscience. To solve educational problems, you must know what's wrong with teaching and learning in Indonesian junior high schools. Ensure the focus is on giving students a good education that helps them grow and succeed.

This study looks into how the discovery learning paradigm is viewed in Indonesia and how motivation and learning biology are related to it. The following research questions are addressed to close the knowledge gap on the topic:

1. How does the learning model affect students' focus during teaching and learning?
2. What are the most effective methods for becoming proficient in learning biology?
3. How does a learning model enhance the efficacy of biology instruction and comprehension?
4. What are possibly the most effective communication strategies for interactive biology learning?
5. What are the most effective ways to maintain good student motivation in learning biology?

This study aims to ascertain how the Islamic Senior High School in Cirebon, Indonesia, approaches biology education with regard to students' motivation and perceptions of the learning paradigm. There has been an ongoing attempt to improve school curricula, and this study is expected to significantly influence education in Indonesia. If we want to know how to make educational programs work better and what motivates people to learn and stay motivated, we need to study the learning model and motivation. This study investigates how the learning model as well as motivation can improve

biological science academic results. It is expected that higher scores on perception of the learning model and learning desire would predict students' biological achievement.

Method

This research used a cross-sectional method of survey to investigate the correlations among students' perceptions of the approach to learning, motivation, and biology learning results. The analysis used multivariate linear regression to evaluate the predictive relationship between the independent factors (learning desire and perception of the learning model) and the dependent variable (biology learning achievement).

Before conducting multivariate regression, several assumptions were tested to ensure the validity of the analysis. The variables will be tested for normality, linearity, and collinearity. The data for the three composite variables (perception of the learning model, learning motivation, and biology learning achievement) should follow an approximate normal distribution. A linear relationship exists among the variables that are both independent and dependent. Which has been verified using a linearity assessment. There must be no substantial association among the independent variables, as verified by tolerance and VIF values.

Population and Sample

The study's population, with a total of 518 students, was made up of students from three private schools in the Cirebon District for the 2020–2021 academic year: Islamic Junior High School (Madrasah Aliyah/MA). The representative size (n) for this study, determined using Yamane's approach (Israel, 1992), was 84 students. The sample was chosen utilizing a probability-stratified technique of sampling to guarantee proportional representation of each institution in the sample. The proportions of the net sample were 31% from School A, 34% from School B, and 35% from School C. The survey included only Grade Ten students from each of the three schools, which is crucial for constructing the test to reflect achievement in biology and evaluating the results comprehensively. The demographic characteristics of the students in the sample, such as age and gender, were not collected. However, it is essential to note that the Cirebon District typically consists of a diverse student body, with students ranging from 15 to 16 years old and a balanced gender distribution.

The selected private schools in the Cirebon District were identified for embodying prevalent educational challenges within the area. With a 2015 OECD science literacy ranking of 62nd out of 70, Indonesia scores poorly nationally on PISA tests, underscoring serious problems in science education. Conventional lecture techniques are prevalent, resulting in passive learning with few opportunities for active learning, insufficient teaching resources, little student involvement, and a narrow grasp of biology. Resolving these problems is essential to raising academic achievement and biology instruction.

Research Design

The study used a cross-sectional approach to collect data at a certain point in time to examine the links between students' thoughts on the learning model, their motivation, and how well they learnt biology. No treatments or changes to the experiments were included. Questionnaires, tests, and other realistic ways of gathering data are used in the study.

Bruner came up with the discovery learning model used in the study. This model pushes students to actively explore, question, and draw conclusions. To improve the ability to think critically and use what you've learned. In biology classes, discovery learning was used. The goal was to discover how well it worked to get students more involved and help them learn. The model comprises steps such as exploring, coming up with ideas, trying and confirming, reflecting, and revising. To encourage active learning and self-discovery, teachers act as guides and help students move through the stages.

The instrument utilized a questionnaire utilizing the Likert scale with four categories: always = 4, often = 3, sometimes = 2, and never = 1. The questionnaire assessed perceptions of the learning model with six indicators based on Chairunnisa (2011), namely: (a) The ability of the teacher in the field of study to teach effectively; (b) The teacher's proficiency in the field of study in mastering the learning material; (c) The ease of learning provided by the learning model; (d) The diversity of the learning model used; (e) The teacher in the field of study's ability to create interest in the subject, leading to students being enthusiastic about learning; and (f) The ability of the teacher in the field of study to make assignments correctly and adequately. The values of these indicators were summed to form a composite score for the perception of the learning model.

The perception of learning motivation was assessed using several indicators, as outlined by Marx and Tombuch in Riduwan (2013), which are: (a) Diligence in learning and having a specific goal, which measures the student's commitment to learning and the goals they have set for themselves; (b) Tenacity in adversity measures the student's persistence in facing difficulties; (c) A student's interest and ability to pay close attention while learning show their involvement and focus during the learning process; (d) A student's drive to do well in school is shown by their desire to achieve. It shows how motivated the student is to do well in school and how dedicated they are to meeting their educational goals; (e) Independence in learning measures students' ability to work independently and take responsibility for their learning. The values of these indicators were summed to form a composite score for the perception of learning motivation.

The study employed multiple-choice questions as they are deemed more efficient and reliable, taking less time to complete and evaluate than constructed response questions, according to Paramartha (2017). The Biology Achievement Test was carefully constructed to measure specific knowledge and skills in biology. The test assessed students' understanding of biological concepts, ability to apply knowledge to new

situations, and reasoning skills. The exam's multiple-choice questions spanned many different areas of study. The instrument utilized to measure biology learning outcomes used multiple-choice questions with indicators such as: (a) the capacity to elucidate the overall traits of Spermatophyta plants, (b) the capacity to characterize the features of Gymnosperm plants, (c) the ability to comprehend the life cycle of Gymnosperms and the reproductive organs, (d) the ability to classify Gymnosperm plants, (e) the ability to understand the role of Gymnosperm plants, (f) the ability to differentiate the characteristics of Angiosperm plants, (g) the ability to understand the life cycle of Angiosperms and the reproductive organs, (h) the ability to classify Angiosperm plants, and (i) the ability to comprehend the role of Angiosperm plants. The measurement of biology learning outcomes was constructed from these multiple-choice questions, with the composite score obtained by summing the correct responses. All surveyed schools followed the same biology curriculum, and the topics were analyzed during the same period. The test's reliability was evaluated by applying the Cronbach's Alpha formula (Arikunto, 2012), and the validity test of each question is based on Arikunto (2012).

Assumptions Testing for Regression Analysis

Data Analysis Procedures: The Kolmogorov-Smirnov test confirmed that the data for the three composite variables (perception of the learning model, learning motivation, and biology learning achievement) followed an approximate normal distribution. Visual assessment further supported this conclusion. Constructing these composite variables involved summing the values of subscales to form a composite score. For example, the measurement of biology learning outcomes was constructed from multiple-choice questions, with the composite score obtained by summing the correct responses.

Reliability and Validity: The Cronbach's Alpha formula was used to assess the test's reliability (Arikunto, 2012). High reliability was shown by the instruments used to measure biology students' perceptions of the learning model, motivation to study, and academic accomplishment; their respective coefficient alpha values were greater than 0.70 (0.897, 0.838, and 0.939). The instrument validity test showed that 20 questions on biological learning achievement, 21 questions on learning motivation, and 22 questions on perception of the learning model were valid out of the 30 questions in the questionnaire for each variable.

A linearity test was conducted to verify the connection across the variables that are independent (learning motivation with perception of a learning model) and the dependent variable (biology learning achievement). The results met the linearity requirements, indicating a linear relationship between these factors and biology learning outcomes.

A collinearity test was also performed to ensure no significant correlation between the variables that are independent. The value for tolerance exceeded above 0.10, while the value of the VIF values was less than 10, indicating that variables that were independent exhibited low correlation.

The study examined the connection among the factors using multiple regression techniques utilizing SPSS version 22.0. The instruments of both independent and dependent variables were gathered through questionnaires, and their relevance to the study was then analyzed. The study's findings were then discussed, and a greater understanding was attained by comparing them with pertinent literature.

Results

The study found a strong positive association between perceptions of the learning model, learning motivation, and biology learning achievement. The study's results indicated where stronger motivation is associated with improved biology learning outcomes, and a positive evaluation of the learning model also contributes to better learning results. The results presented imply that effective learning models are important for academic success, and motivation is a key factor influencing students' academic performance.

The learning model significantly impacts students' biology achievement, and motivation also plays a key role in influencing this achievement. However, no evidence is provided on the detailed aspects of the individual research questions. Therefore, this paper will include the results for each dimension of the questionnaires used to address the specific research questions.

The mean values based on the data collected are as follows: The perception of the learning model is 68.39, the learning motivation is 67.64, and the biology learning achievement is 21.56 (see Table 1). These mean values reflect the central tendencies of the data, indicating a normal distribution as represented by the bell-shaped curve datasets.

The mode (most common value) of the perception of the learning model is lower than it's average (mean). However, both the mode of motivation in learning motivation and the biology achievement in learning are higher than their respective averages (means). It means that the most common value for the perception of the learning model is lower than the average. In contrast, the most common values for learning motivation and biology learning achievement are higher than their averages.

The instruments in this investigation demonstrated being very reliable, as indicated by Cronbach's alpha values above 0.70 for each composite variable. The data distribution for the perception of the learning model, learning motivation, and biology learning achievement was found to be normal based on the Kolmogorov-Smirnov test.

For the perception of the learning model, learning motivation, and biology learning achievement, Table 1 displays the asymptotic p-value of the Kolmogorov-Smirnov test as 0.200, 0.079, and 0.200, respectively. When the result of each variable exceeds 0.05, the data are regarded as a normal distribution. It shows that the data for each variable is symmetric about the mean, with most data points concentrated around the mean

by a normal distribution pattern and fewer data points at the extremes. Table 1 also includes Cronbach's alpha, mean, standard deviation, maximum and minimum values, as well as mode for the specified factors.

Table 1

Summary of Composite Variables

Variable	Cronbach's Alpha	Min	Max	Kolmogorov-Smirnov (p-value)	Mean	Std. Deviation	Mode
Perception of the Learning Model	0.897	53	80	0.200	68.39	7.016	67
Learning Motivation	0.838	53	80	0.079	67.64	6.504	70
Biology Learning Achievement	0.939	12	30	0.200	21.56	3.946	22

The instruments implemented for the present research demonstrated high accuracy, indicated by Cronbach's alpha values above 0.70 for each composite variable. The linearity test discovered the association between factors and biology learning outcomes. The results show a 0.081 correlation between the impression of the learning model and learning achievement and a 0.297 relationship between learning motivation and achievement. These values are more than 0.05, indicating that the linearity requirements have been met. It suggests a linear relationship between these factors and the learning objectives for biology.

The tolerance value, which gauges how strongly variables are correlated, is 0.522 for the learning model's perception and motivation regarding learning achievement in biology. A result greater than 0.10 indicates no significant correlation between these two variables. Furthermore, the figure of 1.916 is the VIF (Variance Inflation Factor), which calculates the effect of one variable on another. This number is less than ten, indicating that learning achievement in biology is uncorrelated with perceptions of the learning model and learning motivation. When evaluating biology learning accomplishment, these two elements are considered autonomous and do not significantly influence one another.

The regression analysis results (see Table 2) show a significant correlation between the perception of the learning model, learning motivation, and biology learning achievement. The R Square value indicates that these factors explain 80.5 percent of the variance in biology learning achievement. The significance levels for both the perception of the learning model and learning motivation were less than 0.05, indicating that both factors significantly impact biology learning achievement.

The statistical test results show a substantial correlation between learning desire, biology learning achievement, and perception of the learning model, with a p value of $p < 0.001$ (see Table 2). It implies that perceptions of the learning model and motivation significantly influence learning achievement in biology, separately and together. When evaluating biology learning achievement, these aspects must be taken into account.

These results demonstrate that increased perception of the learning model and higher motivation lead to increased achievement in biology learning. The B coefficients indicate that for every unit increase in perception of the learning model, biology achievement increases by 0.299. For every unit, learning motivation and biology achievement increase by 0.269. This illustrates the magnitude and trend of the connections among the various factors**.** According to the data in Table 2, the regression coefficient (B) for the perception of the learning model (B = 0.299) is higher than the coefficient for learning motivation (B = 0.269), implying that the perception of the learning model has a stronger relationship with biology learning achievement than learning motivation.

Table 2

Multiple Regression Coefficients Test of Perception of the Learning Model and Learning Motivation in Biology Learning Achievement

Model	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
(Constant)	-17.092	2.134		-8.008	<.001
Perception of the Learning model	.299	.038	.532	7.838	<.001
Learning Motivation	.269	.041	.443	6.533	<.001
N	84				
R	.897				
R Square	.805				
Adjusted R Square	.800				
F Test	167.483				
p-value of F Test	<0.001				
Significance Notes	****p<.001				

According to the study, focusing strongly on motivation and effective learning models, such as discovery learning, can significantly improve student learning results. Discovery learning represents a specific learning model which promotes student

engagement in solving real-world problems, enhancing their critical thinking and application skills.

The evaluation of these tools employed the Likert scale, with 1 representing minimal knowledge and four the most. An average score of 3.01 for the perception of the learning model instruments indicates that students benefit from the learning model used in this study. Observing the highest score of 3.42 suggests that students derive the most significant advantages from the learning paradigm. The highest score recorded was 3.40, indicating that learning motivation is more beneficial to some kids than others. These interpretations underscore the efficacy of a learning model and motivation to promote students' engagement and achievement in biology.

The study included various tests to measure learning motivation, including achievement, learning independence, interest and attention span, persistence in the face of adversity, and stubbornness. A Likert scale was used to evaluate these instruments, with 1 denoting the most minor level of agreement and 4 denoting the most significant level of understanding. The students are sufficiently motivated to learn biology, as evidenced by the average score of 3.26 on the learning motivation tests. The highest score recorded was suggesting that learning motivation is more beneficial to some kids than others.

Discussion

The study found that perceptions of the learning model and learning motivation have strong correlations with biology learning achievement. This study expected that higher scores on perception of the learning model and learning motivation would predict students' progress in biology. The results highlight the significance of successful teaching strategies as well as student motivation in enhancing academic outcomes.

This study employed six indicators of perception of the learning model (Chairunnisa, 2011) and learning motivation indicators from Marx and Tombuch (in Riduwan, 2013) to measure the contribution of these factors to educational achievement in biology. Statistical analysis results show that the learning model and motivation significantly impact students' academic performance in biology. Achieving quantifiable academic success is the ultimate aim of the teaching and learning process, as evidenced by students' grades (Gull & Shehzad, 2015). Students must try to use their knowledge, abilities, and values to do this (Makmur, 2012).

Learning Model Aspects

This study employed the Discovery Learning model, which focuses on addressing the learning difficulties faced by students and is designed by the teacher. A set of indicators created by Chairunnisa (2011) was utilized to evaluate how the learning model affected students' learning. These indicators include the teacher's capacity for

instruction, aptitude for creating instructional materials, and the degree to which the learning model facilitates students' comprehension of the material. This study aims to assess how well the Discovery Learning model improves student learning; hence, it may be necessary to more broadly generalize the findings to other learning models or teaching strategies.

It is worth noting that in this study, two of the six indicators of perception of the learning model instruments, namely the varied learning model and applying technology, are relevant to the role of digital technology, as stated by Kirschner & van Merriënboer (2013). They argue that students are more successful as learners of digital technology when they have specific ways of studying and are independent learners of internet-based information. However, this study did not measure other remaining factors as identified by Kirschner & van Merriënboer.

Addressing research question 1, the regression analysis demonstrated that the perception of the learning model significantly contributes to biology learning achievement ($B = 0.299$, $p < 0.05$). Effective learning models improve students' focus and engagement, improving academic results, according to a thorough review of the six indicators of the learning model. Student interest and concentration are both boosted by effective learning methods. When students are more invested and focused, they do better in school. Teachers may substantially profit from learning models by enhancing their own teaching practices and providing students with enough resources. Using the right learning models will make students more invested in their education. Improving student learning outcomes is only possible by using effective instructional tactics, and the key to getting better results is to use these strategies comprehensively.

Results from the second study question's standardized coefficient analysis showed that the learning model and learning desire positively affected students' biology learning accomplishment. Some essential motivators studied were interest, concentration, ambition, autonomy, tenacity, and resilience. According to the findings, motivated students outperformed their less motivated counterparts in biology classes. Students' performance in biology is improved when these motivating aspects are incorporated into teaching procedures. The results show how important it is to improve education by adopting successful teaching approaches. Teachers are indispensable when it comes to developing and executing educational techniques and producing and utilizing instructional materials. Using learning styles will also make biology classes more interesting and enjoyable. This study illustrates that selecting suitable learning models can markedly improve the value of the educational process.

In response to research question 3, a beneficial relationship between students' perception of the learning model and their biology learning achievement contributes to the fact that when students have a better perception of the learning model, their learning outcomes tend to improve. Lessons are better taught and learnt based on a well-structured model. The results of the six indicators of the learning model show

the significance of varied and interesting methods of instruction. The findings stress the need for students to use learning techniques to comprehend and retain biological ideas better. According to this paradigm, children learn best when teachers tailor their lessons to their specific needs and interests while also setting both difficult and attainable goals. Incorporating these factors will improve the effectiveness of biology education and students' learning outcomes. Students' enthusiasm for the educational process is significantly increased by these materials, which also improve learning and spark interest in the subject.

In response to study question 4, the results indicate that communication tactics that improve these perceptions can be successful, even if the regression analysis concentrates on the learning model and motivation. The results imply that student-centered and interactive methods, such as group projects and conversations, improve interaction and biology learning engagement. An efficient communication strategy is crucial to the learning paradigm, which aims to improve interactive biology learning. The approach promotes the use of tried-and-true techniques of education by educators. It is of the utmost importance to provide high-quality educational materials that engage pupils in the material and encourage a lifelong love of learning.

Learning Motivation Aspects

This research emphasizes the qualities that motivate biology majors to excel. Some examples of these traits are an interest in learning new things, paying close attention in class, wanting to do well academically, being able to work independently when studying, being able to bounce back from setbacks, and pushing through difficult times. Importantly, this research has yet to incorporate grades or other forms of individual evaluation of performance in the classroom (Bahar, 2016). A strong desire to study is essential for increasing efficiency, reaching goals, and excelling in school. These things work together to help students succeed in school (Bakar, 2014). Promoting comprehension and stimulating learning motivation can substantially enhance students' performance and success in biology.

This study supports the claims made by Sudjana (2009), Firgona et al. (2020), and Puspitarini & Hanif (2019) that teacher-provided stimuli can encourage students to study. The term intrinsic motivation refers to the drive to engage in an activity for its own reasons based on the inherent pleasure, as proposed by Deci & Ryan (1985) and Sardiman (2012). Extrinsic or internal influences inspire students to learn. Intrinsic motivation is driven by a person's interest in or enjoyment of a task or activity; it is internal. On the other hand, external factors like rewards and penalties are the source of extrinsic drive. For sustained engagement and long-term task mastering, intrinsic motivation may be a more reliable and practical component. Overall, this study's results show that using a suitable learning model can significantly improve the process of learning and instruction. Extrinsic drive, however, has the potential to be helpful in

the short run for accomplishing particular objectives. However, it sometimes undermines intrinsic motivation, which can have negative long-term implications. To best encourage engagement and long-term performance, it is generally accepted that a balance between internal and extrinsic motivation is necessary. According to Vansteenkiste et al. (2004), intrinsically motivated students typically set more significant goals for themselves, are more involved in their education, and have a stronger feeling of self-determination.

According to this study, teachers may significantly increase students' enthusiasm for education by providing essential resources and supporting their learning (Dinsdale, 2017). It pointed out that intrinsic motives had a more significant impact on students' success in learning than extrinsic motivations (Kum, 2022). Motivation is necessary for students to achieve their learning goals (Filgona et al., 2020). Usman (2011) found a positive relationship between learning outcomes and students' motivation levels. Tanveer et al. (2012) found a strong relationship between students' motivation to learn and their teachers' conduct and instruction methods. In addition, students' learning outcomes have increased due to increasing motivation and using a problem-based learning method (Ariyanti et al., 2018; Opit, 2014). The focus here is on helping students understand and develop their learning motivation so that they may do better in biology class.

Students' ability to absorb and apply their biology teacher's information is highly predictive of their final grade. Regan and Noë (2001) assert that when students acquire knowledge from an instructor, their brains generate an internal representation that facilitates information processing through several modalities, including observation, auditory perception, olfaction, tactile sensation, and kinesthetic interaction. Slamento (2010) and Alvarado et al. (2011) also found that this process of perception and interpretation plays a crucial role in promoting educational achievement in biology. Furthermore, Robbins (2003) suggested that the student's understanding, the object being observed, and the context of the situation all influence the perception of the information. Therefore, it is essential to take the student's motivation and perception into account while developing a learning model to improve biology education accomplishment.

The fifth research topic concerns best practices for boosting biology students' intrinsic motivation. Academic success is linked to strong levels of intrinsic motivation to study, and success in any pursuit requires high levels of intrinsic motivation. Encouraging students to set clear goals boosts their chances of success, builds resilience, and keeps their interest in the material high. One way to boost motivation is to foster a love of studying and an ambition for academic achievement. Research endorses these statements, including studies by Sudjana (2009), Firgona et al. (2020), Puspitarini & Hanif (2019), Zaccone & Pedrini (2019), Deci & Ryan (1985), Sardiman (2012), and Dinsdale (2017).

However, this research presents a few constraints**.** The study's overall dimensions had been limited, potentially restricting the ability to generalize results. The investigation took place within Indonesia's unique cultural as well as educational context, which may not apply to other regions or countries. This research utilized information that participants provided that could be prone to biases. The next study has to tackle these obstacles by utilizing larger, broader samples along with a range of gathering information methods to validate the results.

Conclusion

This research took out the second semester of 10th grade across three schools, within the subject of biology, specifically focusing on the chapter on Plantae (plants). The study, conducted among Madrasah Aliyah students in the Cirebon Regency of Indonesia, has yielded significant findings. Several learning incentive indicators, including curiosity, independence, perseverance, tenacity, and discovery learning models, affect biology classrooms. These results stress how crucial the learning model and internal drives are. If you want your biology scores to go up, here is what you must do. Researchers, teachers, and lawmakers may all benefit from this information.

Teachers must be actively involved to help kids develop greater intrinsic motivation and to create a welcoming classroom climate. Students are more engaged and learn more effectively in the long run using this approach. The study demonstrated that motivating students and implementing effective problem-based learning models, such as discovery learning, may substantially enhance their learning outcomes. One way to improve one's biology grades is to study more about the learning model and what drives people to learn. A motivated student with a good learning model is likely to succeed in biology. The study emphasizes the need for additional research in this area to guarantee that broader results are applicable.

Having this study gave useful insights, further research in this area is required. Variations in study tools, subject matter, and location may result in different outcomes; therefore, the conclusions of this study may need to be more universally applicable. It emphasizes the need for more research, a call to action for educators, researchers, and politicians who want to improve biology teaching.

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Atrasto mokymosi modelio suvokimas ir motyvacijos mokytis biologijos stebėsena: poveikis mokinių pasiekimams

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Santrauka

Šiame straipsnyje pateikiami 2020–2021 mokslo metais atlikto biologijos mokymosi rezultatų tyrimo rezultatai. Tyrimas buvo organizuotas islamo vidurinėse mokyklose (Madrasah Aliyah) Indonezijos Kirebono rajone, reaguojant į Ekonominio bendradarbiavimo ir plėtros organizacijos (EBPO) iškeltus prastus Indonezijos matematikos ir gamtos mokslų mokymo rezultatus. Tyrime nagrinėtas mokymosi modelių suvokimas, mokinių motyvacija mokytis biologijos ir jų įtaka biologijos pasiekimams. Tyrime buvo naudojamas uždaro tipo klausimynas, daugiamatė regresinė analizė ir klausimai su keliais atsakymų variantais. Tyrime dalyvavo 84 mokiniai, atrinkti proporcingos klasterinės atsitiktinės atrankos būdu. Duomenims apdoroti naudota SPSS statistinė programinė įranga. Nustatyta didelė mokinių motyvacijos ir mokymosi modelių suvokimo, darančio reikšmingą įtaką jų biologijos pasiekimams, koreliacija. Gauti rezultatai parodė tinkamų mokymosi modelių ir mokinių motyvacijos svarbą akademinei sėkmei, patvirtino naudotų priemonių pagrįstumą ir patikimumą.

Esminiai žodžiai: *mokymosi modelis, mokinių motyvacija, biologinis ugdymas, akademiniai pasiekimai, ugdymo veiksmingumas.*

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