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The Relationship between Interest and Learning Motivation with Physics Learning Outcomes on the Concept of Newton's Laws

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Abstract

This study aims to analyze the effect of student interest and motivation to learn on physics learning outcomes on the concept of Newton's Law. Low interest and motivation to learn is one of the causes of the difficulty of students achieving optimal learning outcomes in physics, especially in abstract material such as Newton's Law. The research used a quantitative approach with descriptive statistical methods. Data were obtained through a Likert scale-based questionnaire to measure interest and motivation to learn and a multiple-choice test to assess learning outcomes. Analyses were conducted using multiple linear regression with the help of SPSS. The results showed that interest and motivation to learn significantly influenced student learning outcomes, with a contribution of 73% and a positive relationship. This result confirms the importance of lecturers to design learning strategies that can increase student interest and motivation to support the success of physics learning, especially in Newton's Law material.

INTRODUCTION

Physics is one of the branches of science that plays an important role in explaining natural phenomena and the interactions within them. Newton's laws, which include three laws of motion, are one of the most fundamental basic concepts in physics. This concept is both theoretically and practically relevant, as it can explain various everyday phenomena, such as the motion of objects, gravity, and the dynamics of mechanical systems. However, physics learning is often perceived as difficult by students. This perception arises due to the abstractness of the concepts, the complexity of the formulas, and the limited learning methods that are relevant to their needs.

Several studies have shown that success in physics learning is not only influenced by cognitive abilities, but also by affective factors such as motivation and interest in learning. Anggriani and Jumrah (2022) found that learning motivation has a significant contribution to physics learning outcomes [1]. Dongoran and Syaputri (2022) stated that interest and motivation to learn play an important role in improving student academic achievement [4]. Firdaus et al. (2021) highlighted that students' internal motivation is the main driver in understanding difficult physics concepts [5].

Another study by Reswanto et al. (2021) showed that an inquiry-based learning approach can increase students' interest in physics [12], while Hau and Nuri (2019) emphasised the importance of contextual learning methods to reduce the level of abstraction of physics material, especially on Newton's Law [6]. However, most of the previous studies focused on secondary school students. Studies on how

interest and motivation factors affect the learning outcomes of physics students in higher education, especially on fundamental concepts such as Newton's Law, are still limited [3].

This research offers scientific novelty by examining the influence of student interest and motivation to learn on physics learning outcomes on the concept of Newton's Law. In this case, the research uses quantitative methods with multiple linear regression analysis to explore variable relationships in more depth [5]. This approach provides a more comprehensive picture of the interaction between motivation, learning interest, and learning outcomes.

The problem to be answered is the extent to which student motivation and interest in learning affect physics learning outcomes on the concept of Newton's Law [7]. The research hypothesis is that motivation and interest in learning have a significant and positive influence on student learning outcomes. The findings of this study are expected to make an important contribution to the development of science, especially in motivation and interest-based learning strategies at the higher education level. In addition, this research is expected to be a reference for educators in designing learning methods that are more interesting, relevant, and support the success of physics learning.

RESEARCH METHODS

This study was conducted to analysis the effect of interest and motivation to learn on student physics learning outcomes, especially on the concept of Newton's Law. The research used a quantitative approach with descriptive statistical method, which aims to measure and explain the relationship between variables objectively based on the collected data [2].

The samples in this study were 30 students of Physics Education Study Programmer of Jember University who had studied Newton's Law. The sample selection was done purposively, considering that the subjects had prior knowledge of the material under study.

The research data was collected through two types of instruments. The first instrument was a Likert scale-based questionnaire, designed to measure students' interest and motivation to learn. The rating scale consists of five levels, ranging from "never" (1) to "always" (5). The questionnaire included two main sections, each consisting of five statements for the learning interest variable and five statements for the learning motivation variable [8].

The second instrument is a learning outcome test in the form of multiple-choice questions used to evaluate students' understanding of the concept of Newton's Law. This test is designed with a maximum total score weight of 100 to provide a quantitative assessment of student learning outcomes.

The data obtained was analyzed using SPSS software. The analysis began with a normality test to ensure that the data was normally distributed. Data normality was tested by looking at the Asymp Sig. (2-tailed), where data is considered normal if the value is greater than 0.05. After the data was declared normal, the analysis continued with multiple linear regression to measure the effect of the independent variables (interest and motivation to learn) on the dependent variable (learning outcomes).

The regression analysis results provide information about the extent to which interest and motivation to learn affect student learning outcomes simultaneously and partially. A positive regression coefficient indicates a direct relationship, where an increase in interest and motivation to learn contributes to an increase in learning outcomes.

This method was chosen to provide a clear and measurable picture of the relationship between the variables under study. The findings of this study are expected to make a practical contribution to the design of more effective learning strategies at the tertiary level.

RESULTS AND DISCUSSION

The results of this study were obtained from data analysis using multiple linear regression tests with the help of SPSS applications. This study aims to evaluate the effect of student interest and motivation to learn on physics learning outcomes, especially on Newton's Law material.

Based on the normality test, the Asymp Sig. (2-tailed) values for learning interest, learning motivation, and learning outcomes variables are 0.169; 0.134; and 0.166, respectively. All these values are greater than 0.05, which indicates that the data is normally distributed and can be analysed further.

Table 1. Respondent Data

X1 (Interest)	X2 (Motivation)	Y (Result)
17.00	19.00	80.00

X1 (Interest)	X2 (Motivation)	Y (Result)
16.00	18.00	80.00
15.00	17.00	90.00
17.00	19.00	80.00
18.00	20.00	80.00
19.00	21.00	100.00
21.00	23.00	100.00
20.00	22.00	80.00
22.00	24.00	100.00
20.00	22.00	80.00
18.00	21.00	85.00
15.00	19.00	90.00
16.00	18.00	75.00
19.00	21.00	80.00
17.00	17.00	85.00
16.00	18.00	100.00
18.00	20.00	90.00
19.00	21.00	100.00
18.00	20.00	90.00
17.00	19.00	85.00
19.00	21.00	90.00
20.00	22.00	70.00
19.00	21.00	85.00
18.00	20.00	75.00
17.00	19.00	95.00
16.00	18.00	100.00
20.00	22.00	85.00
18.00	20.00	90.00
16.00	18.00	85.00
17.00	19.00	90.00

The first analysis step is to test whether the data obtained has a normal distribution or not. Based on the empirical experience of several statistical experts, data with more than 30 numbers (n>30) can be assumed to have normal distribution. However, to provide certainty that the data obtained is normally distributed or not, it can use the normality test using SPSS. Because data that is more than 30 cannot be said to be normally distributed. Decision making on the normality test is if the Asymp sig value (2- tailed)> 0.05 then the data is declared normally distributed. If the Asymp Sig (2-tailed) value <0.05 then it is declared abnormal.

Table 2. Significance Correction

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Study Interest	.135	30	.169	.960	30	.314
Learning Motivation	.141	30	.134	.960	30	.305
Physics Learning Outcomes	.136	30	.166	.924	30	.034

a. Lilliefors Significance Correction

Based on the table above, in the Kolmogorov-Smirnov column it can be seen that in the results of interest in learning the Sig. value is 0.169; the results of motivation obtained Sig of 0, 134; and learning outcomes Sig. is 0.166. So, it can be seen that these values are greater than 0.05 and 0.05 is the minimum number of data that states that the data is normal. So, the data obtained can be said to be normal.

After it is known that the data obtained is normal, then a linear regression analysis is carried out to determine whether there is an influence between learning interest and student learning motivation on

physics learning outcomes, especially on Newton's Law material. The following are the results of the analysis.

Table 3. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.086[a]	.739	-.066	8.75293

a. Predictors: (Constant), Study Motivation, Study Interest

b. Dependent Variable: Physics Learning Outcomes

Based on the table above, it shows the R Square result of 0.739> 0.05, which means strong, thus the influence between variables X1 and X2 on variable Y by 73% is said to be strong. Then: Ho is rejected, and Ha is accepted. This is reinforced by the significant results of Annova which aims to determine the effect of independent variables simultaneously and together or simultaneously.

Table 4. ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.592	2	7.796	.102	.000[b]
	Residuals	2068.574	27	76.614		
	Total	2084.167	29			

a. Dependent Variable: Physics Learning Outcomes

b. Predictors: (Constant), Learning Motivation, Learning Interest

Based on the table above, the Significant (Sig.) result is 0.000. These results are smaller than 0.05, which means that there is an influence between interest in learning and student learning motivation on learning outcomes. To find out which variables are very influential on student learning outcomes, it can be seen from the following table

Table 5. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	79.459	18.599		4.272	.000
	Study Interest	-.697	2.970	-.145	-.235	.008
	Learning Motivation	1.012	2.952	.211	.343	.007

The results of linear regression analysis show that interest and motivation to learn simultaneously affect student learning outcomes with a contribution of 73% ($R^2 = 0.739$). The regression coefficient of each variable is 0.697 for learning interest (X1) and 1.012 for learning motivation (X2). This positive coefficient value indicates that an increase in both independent variables contributes to an increase in learning outcomes.

The results of this study reinforce previous findings that show the importance of motivation and interest in learning in improving learning outcomes. For example, Anggriani and Jumrah (2022) in their study showed that learning motivation plays a major role in driving students' academic achievement. In addition [1], Dongoran and Syaputri (2022) confirmed that high learning interest and motivation can significantly improve academic achievement [4]. The same thing was also found in the research of Firdaus et al. (2021), which emphasised that intrinsic motivation, which comes from within students, is very influential in understanding complex physics concepts [5].

Although many studies have shown a positive relationship between motivation and academic achievement, this study makes a novel contribution by highlighting the context of physics education students and focusing on material that many students find difficult, namely Newton's Law [7];[12];[13]. This research shows that both learning interest and learning motivation play an important role in students' success in learning abstract and theoretical physics material such as Newton's Law.

One of the significant findings in this study is that students' learning motivation has a greater influence on learning outcomes than learning interest. This can be interpreted that students who have an

internal drive to learn, although not always interested in the material, can still achieve good results. Conversely, students who have a high interest in the material, but lack motivation, tend not to achieve optimal learning outcomes [14];[15]. Therefore, improving students' motivation to learn should be a major focus in the design of learning methods in higher education.

Practically, the findings have important implications for teachers and education programme managers. To improve student learning outcomes in physics, especially on more complicated concepts such as Newton's Laws, it is important to develop teaching methods that are able to stimulate students' intrinsic motivation. Project-based teaching, group discussions, and contextualised approaches that connect the material to real-world phenomena can increase student engagement and motivate them to delve deeper into the material.

In addition, to increase interest in learning, teaching should be tailored to students' learning styles and create an engaging learning experience. The use of visual aids, practical experiments and *hands-on* approaches can help reduce the abstraction of the material and make learning more fun and relevant. In this way, students will be more motivated to learn and better able to understand difficult physics concepts.

CONCLUSIONS

This study found that interest and learning motivation have a significant influence on student learning outcomes in Newton's Law material, with a contribution of 73%. Learning motivation was shown to have a greater influence than learning interest. This finding confirms the importance of increasing student motivation to achieve better learning outcomes, especially in complex materials such as physics. Therefore, educators need to develop learning methods that can increase students' intrinsic motivation and interest in learning, such as project-based learning and practical experiments. These findings make an important contribution in designing more effective learning strategies in higher education.

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