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THE INFLUENCE OF SELF-EFFICACY AND LEARNING MOTIVATION OF HIGH SCHOOL STUDENTS ON THE UNDERSTANDING OF THE CONCEPTS OF WORK AND ENERGY

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Abstract :
This research is the first to investigate the relationship between students' self-efficacy, learning motivation, and conceptual understanding of the concepts of work and energy. The research aims to explore how students' beliefs and attitudes affect their comprehension and application of physics concepts in various contexts. This quantitative descriptive study has 106 respondents from Senior High School 7 and 16 in the Bungo Regency. Data collection was conducted using validated questionnaires, interviews, and diagnostic tests. The results show that the average self-efficacy at Senior High School 7 and Senior High School 16 in the Bungo Regency is categorized as "very good." Student learning motivation at Senior High School 7 Bungo is classified as "fair," while at Senior High School 16 Bungo, it is categorized as "good." Students' conceptual understanding at Senior High School 7 Bungo is classified as "fair," while at Senior High School 16 Bungo, it is categorized as "good." The research also reveals an influence between students' self-efficacy and learning motivation on understanding the concepts of work and energy, with a contribution of 67%. The remaining 33% is influenced by other factors not examined in this study. The novelty of this research is that it introduces a new measure of conceptual understanding based on a diagnostic test that covers multiple aspects of work and energy, such as definition, calculation, conservation, and transformation. The research also provides empirical evidence of the positive impact of self-efficacy and motivation on conceptual understanding in physics learning.

Keywords: Conceptual Understanding, Self-efficacy, Student Motivation

INTRODUCTION

Education is an effort to create a learning atmosphere where students actively develop their potential (Astalini et al., 2019; Maison, Darmaji, et al., 2019). Education in schools is expected to shape the next generation that experiences improvements in potential, character, intelligence, and knowledge (Charli et al., 2019; Maison et al., 2021). A good understanding of concepts in the learning

process is the key to acquiring knowledge and understanding results from a teaching and learning process that aligns with established indicators, where students can convey information in their language (Elisa et al., 2017; Cai et al., 2021). Conceptual understanding is a term often used in the field of education, although not yet fully comprehended by educators overall (Irwandani & Rofiah, 2015; Mulyono & Hapizah, 2018; Suryani, 2019).

In achieving competency in physics learning, various obstacles are often encountered, including errors in understanding the concepts taught by teachers (Maison et al., 2020). The level of students' understanding of the lesson material can vary and is related to the possibility of misconceptions. Students with inadequate conceptual understanding are at risk of experiencing misconceptions (Yolanda, 2017; Wicaksana et al., 2021). When they learn a concept, their interpretation can be influenced by experiences and information from the environment (Maison et al., 2020; Maison et al., 2022).

In physics education, misconceptions often occur because students need a mathematical understanding and a conceptual understanding of physical phenomena (Neizhela & Mosik, 2015; Negoro et al., 2018; Trisnawati et al., 2020). Misconceptions in students can hinder learning goals because students who have experienced misconceptions will persist in holding onto the concepts they consider correct (Lestari et al., 2019; Maison et al., 2021). Therefore, a proper conceptual understanding is needed for students to facilitate the application of these concepts in their lives.

Students' self-efficacy and motivation can influence success in the teaching and learning process in the classroom. When students have high levels of self-efficacy and motivation, they tend to achieve better results in classroom learning. Self-efficacy is a factor that influences individuals in making decisions related to themselves (Bandura, 1997; Kapucu, 2017). This belief affects how someone determines the effort needed to succeed, the time required to overcome challenges, and how they respond to failure (Hasbullah et al., 2020; Arcoverde et al., 2022; Calafato, 2023). Students with high self-efficacy tend to have ambitious goals, make structured plans, and are committed to achieving those goals (Kapucu, 2017; Suprapto et al., 2017).

There is a common perception among students and the general public, including teachers, that physics is challenging, affecting students' motivation to learn physics (Wangchuk et al., 2022). Motivation refers to student engagement in learning and their desire to solve emerging problems (Kubsch et al., 2023). However, students often lose their learning motivation and tend to forget the goals behind the learning process.

Physics learning becomes meaningless, boring, or even perceived as challenging, mainly if the learning process is carried out without maximum interaction with learning resources and instructional media (Asma et al., 2020). They merely become participants present in class and follow the routines set by the school. Educators only absorb what students convey, and learning activities become formalities. However, motivation is a crucial component in the learning process. Motivation can enhance students' spirit, happiness, and enthusiasm for learning so they are determined to achieve optimal results (Ghadiri et al., 2018; Rahman, 2021).

Students with high self-efficacy and motivation levels tend to have an easier understanding of physics concepts. This is attributed to their positive mood and ability to process acquired information. Students with high self-efficacy and motivation also demonstrate perseverance and high engagement in efforts to comprehend physics concepts. Based on these issues, the researcher is interested in conducting a study to describe students' self-efficacy, learning motivation, and understanding of concepts and reveal the influence of students' self-efficacy and learning motivation on the understanding of work and energy concepts.

RESEARCH METHOD

The research design used in this study is a descriptive quantitative research design. The subjects used as the population are students of Class XI who have studied the material of work and energy at Senior High School 7 Bungo and Senior High School 16 Bungo. The sampling technique used is total sampling. Total sampling is used considering the relatively small population, and the research aims to make generalizations with a small margin of error (Siyoto & Sodik, 2015).

The data collection technique in this research uses interview sheets, tests, and questionnaires. The research instrument used is a four-tier diagnostic test adopted from (Maison et al., 2020),

consisting of 5 items with a validity score of 0.6 and a Cronbach's alpha value of 0.63.. The four-tier diagnostic test is a test that has two levels of confidence: confidence in choosing an answer and confidence in selecting a reason (Maison et al., 2021)

The self-efficacy and student motivation questionnaire was adapted from the research by Pintrich & A (1991) and Maison et al., (2019). The self-efficacy questionnaire consists of 20 statements with a validity score of 0.716 and a Cronbach's alpha value of 0.872. Meanwhile, the student motivation questionnaire comprises 25 statements with a validity score of 0.863 and a Cronbach's alpha value of 0.915. The categorization of concept understanding is adopted from Fatonah, Maison, and Hidayat (2022), while the researcher processes the categorization of self-efficacy and student motivation questionnaires.

Data analysis used descriptive and inferential statistics. Descriptive statistics were employed to analyze data by providing an overview of the data set without making generalizations (Sugiyono, 2013), while inferential analysis functions to generalize the results of a study sample to the population (Nurdin & Hartati, 2019).

RESULTS AND DISCUSSION

Self-Efficacy

Students' success is influenced by several factors, one of which is an internal factor, namely self-efficacy (Hasanah et al., 2019). If students have a high level of self-efficacy, they are more likely to succeed because students with higher self-confidence tend to be more motivated to achieve set goals and will strive harder to attain them (Kapucu, 2017). On the other hand, if self-efficacy is low, the chances of success in class become smaller (Apriyanah et al., 2018). The results of the descriptive analysis of self-efficacy data are explained as follows table 1.

Table 1**.** Descriptive Statistics of Self-Efficacy

Indicator	Senior High School 7 Bungo		Senior High School 16 Bungo	
	Category	%	Category	%
Expectation Component	Very Good	30	Good	28.26
Resource Management Strategy	Very Good	38.33	Very Good	39
Cognitive and Metacognitive Strategies	Very Good	35	Very Good	28.3

Expectation Component

Based on the descriptive table in Table 1, it is known that the data for the expectation component indicators at Senior High School 7 Bungo are predominantly in the "outstanding" category with a percentage of 30%. For other categories, such as "good," it is 16.67%, "fair" is 23.33%, "not good" is 23.33%, and "very not good" is 6.66%.

Meanwhile, Senior High School 16 Bungo is predominantly in the "good" category (28.26%). For other categories, such as the "very good" category, it is 26.09%, "fair" is 23.91%, "not good" is 15.22%, and "very not good" is 6.52%.

Resource Management Strategy

Based on the descriptive table in Table 1, it is known that the data for the resource management strategy indicators at Senior High School 7 Bungo are predominantly in the "very good" category, with a percentage of 38.33%. In comparison, other categories such as "good" are 5%, "fair" is 21.67%, "not good" is 15%, and "very not good" is 20%.

Meanwhile, Senior High School 16 Bungo is predominantly in the "very good" category at 39.13%. For other categories, such as "good," it is 10.86%; "fair," 19.56%; "not good," 6.52%; and "very not good," 23.91%.

Cognitive and Metacognitive Strategies

Based on the descriptive table in Table 1, it is known that the data on cognitive and metacognitive strategy indicators at Senior High School 7 Bungo are predominantly in the "very good"

category, with a percentage of 35%. For other categories, such as "good," it is 11.7%, "fair" is 15%, "not good" is 15%, and "not very good" is 23.3%.

Meanwhile, Senior High School 16 Bungo is predominantly in the "very good" category at 28.3%. For the "good" category, it is 23.9%, "fair" is 13%, "not good" is 13%, and "not very good" is 21.7%.

This indicates that, on average, students have an adequate level of self-efficacy. Self-efficacy serves as an indicator of academic achievement. Students with high self-efficacy will show better results in academic tasks than those with low self-efficacy (Suprapto et al., 2017). Self-efficacy is related to the assessments made by students about their ability to complete specific tasks. The more confident they are in completing the task, the greater the engagement, perseverance, and effort they make to fulfill the task. However, if they feel unable to complete the task, they will likely lose motivation to continue trying (Arcoverde et al., 2022).

Student Motivation

Motivation can be described as the inner energy or drive within an individual that propels them to achieve their goals. Motivation arises from the need to attain success in life (Muhammad, 2017). The results of the data description analysis are explained as follows table 2.

Table 2**.** Descriptive Statistics of Motivation

Indicator	Senior High School 7 Bungo		Senior High School 16 Bungo	
	Category	%	Category	%
Value Components	Fair	30	Good	30.43
Cognitive and Metacognitive Strategies	Fair	30	Good	30.4
Resource Management Strategies	Fair	30	Good	30.43

Value Components

Table 2 shows that the data indicators of value components in Senior High School 7 Bungo are predominantly in the "fair" category with a percentage of 30%. In contrast, other categories, such as "very good" are 25%, "good" 11.66%, "not good" 6.66%, and "very not good" 26.66%. Meanwhile, in Senior High School 16 Bungo, the most dominant is in the "good" category (30.43%). For the "very good" category, it is 17.39%, "fair" 23.91%, "not good" 0%, and "very not good" 28.26%.

Cognitive and Metacognitive Strategies

Table 2 shows that the data indicators of cognitive and metacognitive strategies in Senior High School 7 Bungo are predominantly in the "fair" category with a percentage of 30%. In contrast, the "very good" category is 25%, "good" 11.7%, "not good" 26.7%, and "very not good" 6.67%. Meanwhile, in Senior High School 16 Bungo, the most dominant is in the "good" category (30.4%). For the "very good" category, it is 17.4%, "fair" 23.9%, "not good" 23.9%, and "very not good" 4.35%.

Resource Management Strategies

Based on Table 2, it is known that the data for the indicator of resource management strategies at Senior High School 7 Bungo is predominantly in the "sufficient" category with a percentage of 30%, while other categories such as "very good" 25%, "good" 11.67%, "not good" 26.67%, and "very bad" 6.66%. Meanwhile, Senior High School 16 Bungo is predominantly in the "good" category (30.43%). For the "very good" category, it is 17.39%, "sufficient" 23.91%, "not good" 23.91%, and "very bad" 4.348%.

These results indicate that students' motivation is average, in the adequate category. Student motivation plays a significant role in the success of science learning (Kubsch et al., 2023).

Conceptual Understanding

Every learner has different experiences, and thus, their conceptions vary. Students' concepts develop from their everyday activities and can change over time, which, in turn, can alter the concepts

they already possess. Students studying physics need to have a good understanding and skills in using procedures and concepts to apply them to solving previously unencountered problems (Boden et al., 2018). The results of the data description analysis are explained as follows table 3.

Table 3**.** Descriptive Statistics of Students' Conceptual Understanding of Work and Energy Material

Category	Percentage (%)	Category
Senior High School 7 Bungo	36.66 (22 students out of 60)	Fair
Senior High School 16 Bungo	28.26 (13 students out of 46)	Good

Based on Table 3, it can be observed that students' conceptual understanding of the material on work and energy at Senior High School 7 Bungo is predominantly in the "sufficient" category (36.66%). For the "outstanding" category, it is 20%, "good" 18.33%, "not good" 20%, and "not very good" 5%. Meanwhile, at Senior High School 16 Bungo, the dominant result is in the "good" category (28.26%). For the "very good" category, it is 13.33%, "sufficient" 23.91%, "not good" 23.91%, and "not very good" 6.52%.

Based on these results, it can be concluded that students have an adequate conceptual understanding. Conceptual understanding plays a crucial role in the learning process and in addressing various problems, both in the context of learning and in everyday life (Irwandani & Rofiah, 2015; Saputra & Mustika, 2022). Conceptual understanding involves mastering the material through theories, formulas, or graphs presented more easily (Putra et al., 2018). Appropriate learning activities can enhance conceptual understanding (Ayu et al., 2023).

The percentage results of students' concept understanding are further detailed in Table 4.

Table 4. Percentage of Student Concept Understanding

School	Item	Conceptual Understanding	(%)
Senior High School 7 Bungo	1	40	66.6
	2	41	68.33
	3	37	61.66
	4	43	71.66
	5	37	61.66
Senior High School 16 Bungo	1	29	67.4
	2	33	76.74
	3	30	69.76
	4	31	72.09
	5	27	62.79

Based on Table 4, it is known that students, on average, have a high understanding of concepts in each question item. Understanding concepts becomes a crucial key in solving specific problems because the solution to these problems depends on understanding the concepts that form the basis of the problem (Agustina, 2016). In science learning, especially physics, understanding concepts becomes a determining factor for success, so it is necessary to memorize formulas and, more importantly, to understand the concepts deeply (Elisa et al., 2017).

The Influence of Self-Efficacy and Student Motivation on Student Conceptual Understanding

Before hypothesis testing, assumptions were tested, including normality and linearity tests. The normality test yielded a significance value of 0.055, indicating that the data is normal. Meanwhile, the linearity test resulted in a significant value for linearity of 0.000, less than 0.05, and a deviation from the linearity value of 0.160 > 0.05, which means the data is linear.

Next, the data was subjected to a correlation test to determine if there is a relationship between self-efficacy and student motivation on student conceptual understanding. The correlation results can be seen in Table 5.

Table 5. Variable Correlation Results

		X1	X2	Y
X1	Pearson Correlation	1	.590**	.545**
	Sig. (2-tailed)		.000	.000
X2	Pearson Correlation	.590**	1	.798**
	Sig. (2-tailed)	.000		.000
Y	Pearson Correlation	.545**	.798**	1
	Sig. (2-tailed)	.000	.000	

Based on Table 5, it is evident that there is a correlation between variables. The significance value between the variables is 0.000 < 0.05, indicating a significant correlation. Furthermore, the calculated Pearson correlation (r) values of 0.545 and 0.798 are greater than the tabulated r value of 0.1909. Additionally, two asterisks (**) indicate a correlation at the 5% significance level (0.05), signifying a relatively strong correlation.

Next, a regression analysis was performed to assess the influence of the dependent variable on the independent variables. For regression analysis, an ANOVA test is presented in Table 6.

Table 6. Results of Regression Analysis in ANOVA

Dependent Variable	Independent Variable	F	Sig.
Self-Efficacy and Motivation	Conceptual Understanding	105.200	0.000

The ANOVA table is used to determine whether there is an influence between the dependent and independent variables. Based on Table 6, the calculated F value is greater than the critical F value, 105.200 > 2.30, with a significance value of 0.000 < 0.05. Therefore, it can be concluded that there is a significant influence on the efficacy and motivation variables on the conceptual understanding variables. Furthermore, the results of the model summary can be seen in Table 7.

Table 7. Results of Regression Analysis in Model Summary

Dependent Variable	Independent Variable	R	R Square
Self-Efficacy and Motivation	Conceptual Understanding	0.819	0.671

Table 7 shows that for X1 and X2 towards Y, the R Square value is 0.671 or equal to 67%, so it can be stated that the influence of variables X1 and X2 on Y is 67%. In comparison, 33% is influenced by other factors not examined in this study, referred to as intervening variables. Furthermore, the coefficient table can be seen in Table 8.

Table 8. Results of Regression Analysis in Coefficients

Dependent Variable	Independent Variable	Variable	Regression Coefficients	t_{value}	Sig.
Self-Efficacy and Motivation	Conceptual Understanding	Constanta	0.498		
		X1	0.211	3.283	0.001
		X2	0.621	10.062	0.000

Table 8 shows that the significance values for X1 are 0.001 < 0.05, and for X2 are 0.000 < 0.05, indicating an influence between variables X1 and X2 on Y. For t-test X1, the t-value is greater than the t-table (3.283 > 1.986), and for X2, the t-value is 10.062 > 1.986, meaning there is an influence between variables X1 and X2 on Y.

The regression equation is $Y = a + b_1X_1 + b_2X_2$, or $= 0.498 + 0.211X_1 + 0.621.X_2$. This means that if each variable X1 and X2 is 0% or does not change, the value is 0.498. Then, for the coefficient value of X1, which is 0.211 (positive influence), it means that if students' efficacy

increases, students' conceptual understanding increases by 0.211, assuming other variables remain constant. Next, the coefficient of X2, which is 0.621 (positive influence), means that if students' motivation increases, students' conceptual understanding increases by 0.621, assuming other variables also remain constant.

From the above explanation, it can be concluded that students at Senior High School 7 Bungo and Senior High School 16 Bungo, on average, have self-efficacy ranging from "sufficient" to "very good," as well as the average learning motivation in the "sufficient" to "very good" categories. Thus, this affects their conceptual understanding.

Understanding concepts is a critical factor in achieving success for students during the physics learning process (Atika et al., 2023). Conceptual understanding is influenced by psychological factors, one of which is learning motivation (Damayanti & Rufiana, 2017; Mirna et al., 2023) and students' self-efficacy (Destiniar et al., 2019; Jannah et al., 2022). Learning motivation affects students' science learning outcomes (Hidayati et al., 2022; Safitri et al., 2023). This is evident from students' behaviors that demonstrate high dedication to learning (Syamsinar et al., 2023), particularly in understanding concepts. Motivation plays a crucial role in how individuals regulate their actions over time and can be used to estimate the extent of their success in these efforts. Motivation to learn is the drive to undergo the learning process (Firdawati et al., 2021).

Belief in one's ability to succeed in a particular task often serves as a motivator (Rosen & Kelly, 2023). This is also closely related to self-efficacy, which refers to an individual's belief in achieving desired outcomes through their actions (Ernawati et al., 2021; Kusumawati et al., 2021; Calafato, 2023). Students with high levels of self-efficacy tend to succeed because they can control themselves and their actions (Bandura, 1997; Shamdas, 2023). The research contributes to the literature on physics education and educational psychology by highlighting the role of self-efficacy and motivation in enhancing students' comprehension and application of physics concepts. The limitation of this research is that it only focuses on one topic and one grade level, and it does not control for other factors that may affect conceptual understanding, such as prior knowledge, interest, or teaching methods. Future research may extend the scope and duration of the study to other topics and grade levels, and include other variables that may influence conceptual understanding.

In this study, it is concluded that the comprehension of physics concepts is intricately connected to students' learning motivation and self-efficacy. Learning motivation, reflecting the impetus to actively participate in the learning process, and self-efficacy, portraying an individual's confidence in achieving positive outcomes through their actions, play pivotal roles in the outcomes of science education. The implications of this research emphasize the significance of formulating targeted teaching strategies to augment learning motivation and instill self-assurance in students as they grapple with physics concepts. Nevertheless, it is crucial to recognize the limitations of this study, which include its specific focus on psychological factors and a restricted number of participants, necessitating cautious consideration when extrapolating the findings. Recommendations for refining the physics curriculum encompass the integration of elements pertaining to learning motivation and self-efficacy, while future research could delve into additional factors influencing students' conceptual understanding. Educators are urged to implement more profound learning approaches to inspire students and enhance their self-efficacy in physics education.

CONCLUSION

In this study, the self-efficacy variable with three indicators, namely the expectation component indicator, has criteria that are very good (Senior High School 7 Bungo) and good (Senior High School 16 Bungo). The resource management strategy indicator has criteria that are very good (Senior High School 7 Bungo) and very good (Senior High School 16 Bungo), and the cognitive and metacognitive strategy indicator has criteria that are very good (Senior High School 7 Bungo) and very good (Senior High School 16 Bungo). The student motivation variable with three indicators, namely the value component indicator, has criteria that are sufficient (Senior High School 7 Bungo) and good (Senior High School 16 Bungo). The cognitive and metacognitive strategy indicator has criteria that are sufficient (Senior High School 7 Bungo) and good (Senior High School 16 Bungo), and the resource management strategy indicator has criteria that are sufficient (Senior High School 7 Bungo) and good (Senior High School 16 Bungo). The student's conceptual understanding variable at

Senior High School 7 Bungo is predominantly in the "sufficient" category, and at Senior High School 16 Bungo, it is predominantly in the "good" category. The research results show that there is an influence between the self-efficacy and student motivation variables on students' conceptual understanding by 67%, while 33% is influenced by other unexamined factors in this study, referred to as intervening variables.

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