Analysis of the Impact of Self-Efficacy on Student Learning Outcomes in Electromagnetic Induction Material

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Abstract *- This study aims to analyze the impact of self-efficacy on student learning outcomes on electromagnetic induction material. This research takes the type of descriptive quantitative research, a method that focuses on analyzing numerical data using statistical methods. It was conducted at MA Ali Maksum Yogyakarta with the research subjects of XII MIPA class students totaling 30 respondents. Data collection techniques using cognitive tests and self-efficacy questionnaires assisted by Google Form applications. The results showed that the hypothesis can be accepted, namely there is a correlation between the level of self-efficacy and the results of student learning tests even though the correlation found has a weak category because it only has a share of 8.1%. This shows that the domain of student confidence, especially in terms of solving problems is still at a low level so that there is a tendency for students to solve problems based on memorizing equations. The existence of limitations in conducting research limits it in uncovering other aspects outside of self-efficacy in obtaining learning outcomes. Through the information obtained that self-efficacy on learning outcomes, teachers can apply a varied atmosphere, model, and learning process to optimize student potential which will have an impact on student learning outcomes.*

Keywords: *Self Efficacy; Learning Outcome; Electromagnetic Field*

INTRODUCTION

Physics is a natural science that deals with the structure and behavior of objects (Giancoli, 2013). One of the lessons in science material that requires reasoning abilities and understanding concepts is physics. Students often experience difficulties solving problems in physics subjects (Anugraheni & Handhika, 2018; Suja et al., 2023). In physics, the learning process is mostly carried out by looking, observing, and carrying out practical activities related to daily life (Dwi et al., 2014). Physics subjects need to be given to all students to equip themselves with the ability to think logically, analytically, systematically, critically, and creatively as well as the ability to work together (Natonis et al., 2022). Based on the *National Council of Teacher Mathematics*, there are 5 thinking skills that students should have, namely representation abilities, problem-solving abilities, reasoning abilities, communication abilities, and connection abilities (Markushevich, 1983; Permana & Kartika, 2021).

Among thinking skills, one of the abilities that needs to be mastered in learning physics is students' representational abilities (Lamanepa et al., 2022). Students' ability to master concepts, communicate ideas, and solve problems in physics requires good representation skills (Whelan et al., 2023). Applying appropriate and conceptual forms of representation will teach students not only to remember but also to continue to master the concepts being studied and have the opportunity to reach a higher level of ability (Yanti et al., 2020). This research concentrates on electromagnetic induction materials. The characteristics of the content of this material are the use of images to describe the induced EMF in a wire coil and the induced current, images to illustrate

various relationships between variables, as well as the formulation and application of mathematical equations. On the other hand, the importance of learning electromagnetic induction material in the physics curriculum can help students master concepts, communicate ideas to solve problems in physics with methods that emphasize representation skills.

The ability that supports finding solutions to problems by externalizing something is in the abstract mind called representation (Lutfi & Khusna, 2021). Teaching and learning activities are oriented towards a learning outcome that is formulated in the learning objectives. To obtain optimal results, teaching and learning activities need to be carried out with full awareness and well organized (Ahriana et al., 2017). Bandura and Wood state that *self-efficacy* is a belief in a person's ability to generate motivation (Kaluge, 2019), cognitive resources (Hakim et al., 2023), and the series of actions needed to fulfill the requirements of the situation at hand (Istiyono et al., 2019). The main focus of self-efficacy is on observing students' self-confidence regarding their competence to carry out learning activities and complete assignments (Yuliyani et al., 2017).

Self-efficacy can affect physics learning, especially related to the belief that the self has the ability to understand physics concepts, especially in electromagnetic induction material. self-efficacy also includes self-assessment, where students feel capable or unable to solve physics problems.A student who has high self-efficacy can do assignments and achieve goals well, on the other hand, if the student's self-efficacy is low, the student prefers easy tasks and avoids assignments so that students easily give up when facing these problems. Academic self-efficacy is defined as the belief that an individual has that he or she is able to achieve academic success (Christiana, 2018). Individual beliefs regarding the ability to complete academic assignments (Seto et al., 2020). With self-confidence, students will be more confident in class to obtain better learning outcomes (Hermansyah, 2017; Masrifah & Amiroh, 2023). Student learning outcomes are essentially changes in behavior covering the cognitive, affective, and psychomotor fields

These learning outcomes become a benchmark for achieving learning objectives. Learning outcomes can be declared achieved when they are able to achieve educational goals (Hodosyová et al., 2015). According to Bloom, learning outcomes cover three domains, namely cognitive, affective, and psychomotor (N et al., 2021). Success in achieving learning outcomes is influenced by various factors (Bozkurt & Ilik, 2010; Malik et al., 2022; Pinto et al., 2018). Internal factors that influence learning outcomes, namely within oneself, include physiological factors related to the physical condition and the five senses, as well as psychological factors related to talent, interests, intelligence, motivation, and cognitive abilities. Meanwhile, external factors include surrounding conditions, namely natural and social, as well as instrumental in the form of learning materials, teachers, facilities, and infrastructure (Purwanto, 2007).

RESEARCH METHODS

This research uses descriptive quantitative research, a method that focuses on analyzing numerical data using statistical methods. This research is a correlation study between the level of self-efficacy and student learning outcomes. This research was carried out at MA Ali Maksum Yogyakarta by taking research subjects in the form of XII MIPA students in the odd semester 2022/2023 who had taken physics

and magnetism sub-subjects. The research sample consisted of 30 respondents. Validity testing was carried out using 30 respondents because the test results were close to the normal curve.

Data collection techniques used cognitive tests and self-efficacy questionnaires assisted by the Google Form application. This application is a service from Google which was developed to make it easier for users to analyze data (Arifudin, 2021). Students are given a multiple-choice test that has criteria for visual representation questions and is structured based on the material to be studied, namely electricity and magnetism at the high school level. The questions prepared consisted of 10 questions containing multiple choices A, B, C, D, and E. The answers given by students were analyzed and scored to identify students' tendencies in making representations as a method of solving problems. So it can be seen the influence of visual representation on solving problems in electrical and magnetic materials.

Interpretation of student representation tendencies can be seen from the results of answers based on the equation below:

$$Score : \frac{Sum\ of\ correct\ answers}{Sum\ of\ all\ questions} \times 100$$

The results of the score calculation are then compared with the following value interpretations:

Table 1. Test Score Conversion (Widyoko, 2012)

Score	Criteria
75,1 – 100	Excellent
50,1 – 75,0	Good
25,1 – 50,0	Average
0 – 25	Poor

Obtaining student self-efficacy scores is done by distributing questionnaires after students have worked on the questions. The questionnaire consists of 18 statements, namely negative and positive statements and is distributed via the same application (Google Form). Scoring is based on 4 answer options, starting *STS (Sangat Tidak Setuju) = 1, TS (Tidak Setuju) = 2, S (Setuju) = 3,* and *SS (Sangat Setuju) = 4* for positive statements, and for negative statements using the opposite rule.

Next, the value conversion is carried out with a reference of 100 points. This is done in order to get values with the same range as the score calculation results (Retnawati, 2016).

Table 2. Level of Self-Efficacy

Score	Criteria
0 – 20	Very Poor
20,1 – 40	Poor
40,1 – 60	Medium
60,1 – 80	High
80,1 – 100	Very High

After the data on learning outcomes and self-efficacy scores were obtained, statistical analysis was then carried out using SPSS 24 software using a simple linear regression test technique to determine the involvement of self-efficacy variables on student learning outcomes.

RESULTS AND DISCUSSION

The research results are described first, followed by the discussion section to facilitate understanding and reading. The results and discussion subtitles are presented separately. This section must be at most part, at least 60% of the entire body of the article.

Results

The selection of electromagnetic material is based on the criterion that this material has an abstract concept (Dharma & Sudarti, 2021). The process of preparing the questions begins by dissecting the electromagnetic material, and then

determining that the sub-material used is electromagnetic induction. This sub-material has the criteria of needing students' representational abilities in understanding problems, and analyzing vector directions, and is basic material in understanding the relationship between electricity and magnetism (Ukoh, 2022). Apart from testing students' representational tendencies in solving questions, a self-efficacy questionnaire was also carried out consisting of 18 statements. Statements are arranged based on aspects of magnitude, strength, and generality as components of Bandura's self-efficacy (Sigiro et al., 2017).

Testing and distribution of questionnaires was carried out in class XII MIPA IPA A totaling 30 students who had received electromagnetic induction material. 30 students were taken because the number of class XII students alone was 80 so they were considered representative of the total sample size (Retnawati, 2017). The following are the scores obtained on the student ability and self-efficacy tests that have been carried out:

Table 3. Description of Research Data

Variable	N	Min	Max	Mean	STD
Score Test	30	50	80	60,3	9,9
Self-Efficacy Score	30	55,6	87,5	70,3	7,5

The distribution of research data is interpreted using a bar chart as shown in Figure 1.

The data that has been collected is then processed to show the level of influence of self-efficacy on the selection of test answers. Analysis using IBM SPSS Statistics software with simple linear regression test statistics. The table above explains the variables entered and the methods used. The variables included in this test are self-efficacy variables as independent variables and values as dependent variables. The method used is the Enter method.

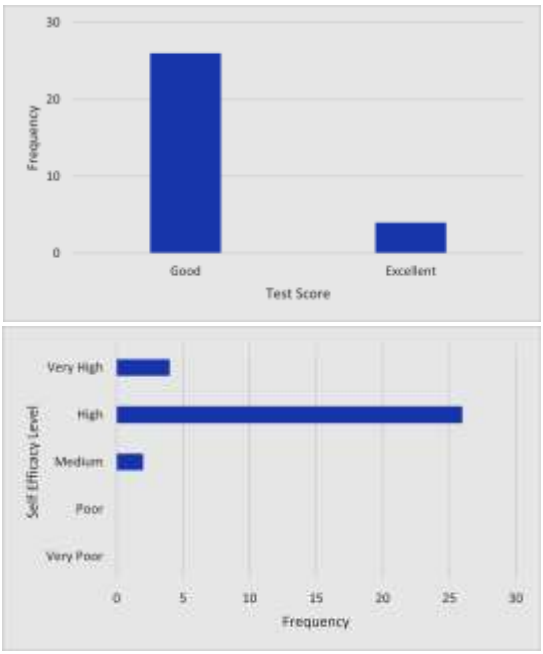

Figure 1. Frequency of Test Scores and Questionnaire Scores

Table 4. Output of Summary Analyze

Model	R	R Square	Adjusted R Square	Std Error of the Estimates
1	0.285[a]	0.081	0.048	9.750

The output image above is the *summary* output. The figure shows that the correlation or relationship value (R) is 0.285. The figure also shows a coefficient of determination (*R Square*) of 0.081, which indicates that the influence of the independent variable (*self-efficacy*) on the dependent variable (*score test*) is 8.1%. This low percentage shows that there is no significant relationship between students' level of self-efficacy and their problem-solving abilities.

The output above shows that the *Constant (a)* value is 33.582, while the self-efficacy value (*b/regression coefficient*) is 0.381. The regression coefficient from the statistical test results is positive. So it can be

concluded that the direction of influence of the self-efficacy variable on test results is positive. Based on the significance value in the output, it shows 0.127 > 0.05, meaning that the influence of self-efficacy on student learning outcomes is classified as weak. Then based on the *t* value in the output it shows T_{count} 1.572 < T_{table} 2.048, meaning there is no significant influence between self-efficacy on student learning outcomes

Table 5. Simple Linear Regression Test Output

	Unstandarized B	Coefficients Std. Error	Standarized Coefficients Beta	t	Sig.
	33.582	17.110		1.963	0.060
Self-Efficacy	0.381	0.242	0.285	1.572	0.127

This research aims to determine and reveal whether or not there is a correlation between self-efficacy and student learning outcomes, especially in physics lessons. Many studies have proven that the domain level of self-efficacy influences students' ability to interpret their learning outcomes. Students with a high level of self-efficacy will have more comprehensive knowledge because they have a comprehensive learning experience (Fatimah, 2017; Herliana et al., 2022; Shaleha et al., 2022). The level of self-efficacy also influences students' reasoning processes because the concepts formed have been experienced independently (Syahmani et al., 2023; Utami & Anitra, 2020; Yuliyani et al., 2017). Various studies also discuss the influence of student self-efficacy on other aspects of competence, such as learning achievement (Aregu, 2013; Radulović et al., 2023), understanding of concepts (Aprillianti & Dewi, 2022; Shaleha et al., 2022), and several other aspects.

Discussion

However, different results were obtained in this study. There is a conflict between the results of previous research and the results of this research, namely that self-efficacy only has a very small influence on aspects of student competence, especially in obtaining learning outcomes. This is shown by the percentage influence of self-efficacy of only 8.1% on students' ability test results on electromagnetic material. Referring to the self-efficacy aspect, Bandura has the view that self-efficacy is formed by 3 aspects, namely *Magnitude*, *Strenght*, and *Generally* can be developed through performance experience, vicariousness, social situations, and student's psychological condition. The recapitulation of the three aspects of self-efficacy shows that the *Strength* aspect has the largest percentage among students, namely 24.3% of the total influence of efficacy on learning outcomes of 8.1%. This largest percentage shows that most of the students' self-efficacy is implemented in students' optimism in choosing the right answer and their sense of confidence in their abilities. The "*Strength*" aspect also indicates that students have high hopes to encourage themselves to achieve predetermined targets (Kharki et al., 2021)

This research also provides a new view for the public regarding the results of several previous studies which tend to show that there is a directly proportional correlation. This correlation relationship shows the tendency to obtain high learning outcomes for students with high self-efficacy, and vice versa. There is a difference that can be seen from the positive relationship between self-efficacy and learning outcomes, but it

contributes little, whereas the other contribution (91.9%) comes from other aspects that were not used as variables in this study. This condition is somewhat different from research in general but is in accordance with several studies which state things like this, such as research by Ayu (2017) which shows that self-efficacy has a low influence on learning outcomes, and research by Oktavia and Wiyono (2020) which indicates the self-efficacy aspect has a low positive contribution to learning outcomes.

The correlation value shown in this research analysis is included in the low category because of the value of r = 0.285. The low relationship between self-efficacy and test results is caused by various other aspects that researchers have not been able to study. Observations made on class XII science students showed a low tendency for students to make representations when solving electromagnetic problems. This is proven by the low correlation which is only 8.1%, where the rest is influenced by other aspects that have not been explained in this research.

Physics as a subject supports the progress of science and technology because it integrates theory and implementation in the real world (Hodosyová et al., 2015; Nesi et al., 2022). The emphasis on direct learning will certainly provide good competency development for students, especially in terms of concepts and self-confidence (Fathurohman et al., 2023). Therefore, physics learning should be able to initiate students' self-confidence because they experience direct and hands-on learning experiences (Amin, 2017). This is a strategy to form students with good cognitive, affective, and psychomotor abilities. Apart from that, this step was taken to prepare the younger generation who be able to solve problems and find the right solutions (Winarti & Saputri, 2018). Student participation in learning can also be used as an alternative by teachers in shaping students' mentality (Subekti & Ariswan, 2016). However, physics must be able to raise students' confidence in their potential and abilities, including in dealing with abstract material.

This research shows that the hypothesis can be accepted, namely that there is a correlation between the level of self-efficacy and student learning test results, although the correlation found is in the weak category because it only has a contribution of 8.1%. This shows that the domain of students' self-confidence, especially in solving problems, is still at a low level, so there is a tendency for students to solve problems based on memorizing equations alone. Several other aspects amounting to 91.9% that can influence student learning outcomes include initial cognitive knowledge, stamina, motivation, and hands-on experience. Apart from these internal aspects, it can also come from external aspects, such as the atmosphere of the school environment, teaching media, teacher learning methods, and so on. The existence of limitations in conducting research limits it in uncovering other aspects outside of self-efficacy in obtaining learning outcomes.

CONCLUSION

Based on the results of research using SPSS test statistical analysis, it can be concluded that the impact of self-efficacy on student learning outcomes in electromagnetic induction material is very small, namely around 8.1%. This is caused by external aspects, such as the atmosphere of the school environment, teaching media, teacher learning methods, and so on. The existence of limitations in conducting research limits it in uncovering other aspects outside of self-efficacy in obtaining learning

outcomes. Through the information obtained that self-efficacy on learning outcomes, teachers can apply a varied atmosphere, model, and learning process to optimize student potential which will have an impact on student learning outcomes.

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