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The Relationship of Use of Instruments for Assessment of Problem Solving Ability with Students' Self Efficacy on the Reaction Rate Material

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Abstract: This study aims to find out how the relationship between students' self -efficacy and self -efficacy in the reaction rate material. This type of research is an experimental study with pretest-posttest design. The sampling technique in this study was a random sampling technique, namely by choosing 3 high school (SMA) in Bengkalis Regency, namely SMA Negeri 2 Mandau, 8 Mandau State High School, and IT Al-Kautsar State High School. The correlation test was carried out to find out whether between two variables there was a relationship, and if there was a relationship, how the direction of the relationship and how much the relationship was. Based on the results of the correlation test that there is a positive correlation between the ability to solve problems and self -efficacy in students in high school, medium and low.

Keywords: Assessment instruments; Problem solving skills; Reaction rate; Self-efficacy

Introduction

Problem solving is one of the benchmarks of the quality of students in this modern era (Agustina et al., 2019). This is because in learning and solving questions students will gain experience using the knowledge and abilities that are already owned. This experience then trains students' thinking power into logical, analytical, systematic, critical and creative in dealing with problems (Rahimah, 2019; Saraswati et al., 2020; Zagoto et al., 2018). So, students will be able to solve similar or different problems well because students get concrete experiences from previous problems (D. P. Sari et al., 2018). In addition, the development of problem solving skills in students can have a positive impact on other abilities such as the ability of the science process (Yulianti et al., 2012), critical thinking ability (Zunanda et al., 2015); communication skills (Yavuz et al., 2020), Science literacy (Thummathong et al., 2016), and the ability of entrepreneurship (Kim et al., 2018), so that developing the ability to solve students' problems becomes important by teachers, especially in the learning process. According to Mukhopadhyay (2013) in his research, problem solving activities integrated in the learning process can help students in building new knowledge, so that the ability to solve problems becomes an aspect that must be considered and developed by teachers, especially in chemistry.

Chemistry as a branch of science, has a discussion of the composition, structure, nature, change, and energy that accompanies it. One of the topics in chemistry is the rate of reaction. The topic of the reaction rate is one of the topics in chemistry that can support individuals in problem solving capabilities.

Various problems that exist in the topic of the reaction rate such as the problem of depletion of ozone layers, the problem of the effectiveness of making ammonia fertilizer, or the effectiveness of oil work on motorized machines are some of the problems that can be solved using the concept of reaction rates, so that students can learn the concept of reaction rates properly, Surely it will make students tend to be able to solve

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various problems in the field. In other words, students who can study chemistry well, including in the topic of this reaction rate, will be able to be a good problem solvement in the community (Society Committee on Education, 2012).

The concept of the reaction rate is very important to learn and suitable for use in training the ability to solve students, the reaction rate has a variety of positive and negative roles, the positive role of the reaction rate, for example in the aspect of food and industry, can be used as a reference to multiply products in industrial processes. The negative role for example the occurrence of decay and rusty. These problems require the right solution to avoid losses in industrial processes and other aspects related to the reaction rate, so that the ability to solve problems that must be passed to produce solutions based on the right thought.

Problem Solving In the question of description has steps in solving it, where to solve the description questions, first starts from understanding the problem in the problem then students plan to solve problems based on concepts and materials relating to the problem, after which students carry out problem solving And finally the students re -check the steps that have been done (P. I. Sari et al., 2020). Problems with problem solving are usually in the form of description questions or stories. Problems in the form of description questions are more difficult to solve by students compared to questions that only involve saying or questions that are only related to calculations and numbers (P. I. Sari et al., 2020). In solving problems, students are not enough to just express various kinds of ideas or produce a number of alternative problems. At a certain time, students must be able to decide to choose one idea or problem solving and reject another.

In making choices, students must have relevant reasons or benchmarks to assess the best choices. In these conditions students must be able to consider and make decisions and actions as part of the problem solving activity. Furthermore, it is necessary to realize that the ability to solve problems cannot be developed instantly but rather exercise and habituation of solving problems, components that are also needed are student confidence in their ability to overcome the problems that are found (Erniwati, 2018). One source of belief is our level of self -confidence in our own abilities (self-efficacy). This is supported by Anshari (2017), the ability to solve problems is closely related to the beliefs of students in solving problems, because the beliefs possessed by students in the ability to solve problems will affect student learning outcomes. It appears that to be able to solve the problem, one important component that needs to be possessed by students is self -efficacy. But often students are unable to show their learning outcomes optimally according to their abilities. One of the reasons is that students feel unsure that they are able to complete the tasks assigned to him. This is in accordance with the opinion of Bandura (2002) which says that self -efficacy which is a central construction that will affect the ability of decision making and affect the actions he will take.

Based on this description, the researcher is interested in conducting research with the aim of knowing the relationship of problem solving capabilities and self -efficacy of students on the reaction rate material.

Method

The form of research is an experimental research with design pretest-posttest. Research data collection was conducted in the odd semester of the school year 2023/2024, namely in July-December 2023. The population in the study were all students of class XI IPA SMA Negeri 2 Mandau, SMA Negeri 8 Mandau, and IT Al-Kautsar State High School. The sampling technique in this study was a random sampling technique, namely by choosing 3 high school (high school) in Bengkalis Regency randomly. This study uses a questionnaire to measure students' self -efficacy after working on questions using instruments to assess problem solving skills. To test and prove statistically the relationship between problem solving capabilities and students' self -efficacy in high school, medium and low used Product Moment Correlation Analysis with the help of the SPSS for Windows version 25.0 program. Product Moment correlation analysis is used to determine the correlation between one independent variable and one dependent variable.

The correlation test was carried out to find out whether between two variables there was a relationship, and if there was a relationship, how the direction of the relationship and how much the relationship was. The basis of decision making can be seen from the value, significant, if the significant value is smaller than 0.05 it can be concluded that the relationship is linear or significant. According to Sugiyono (2017) the correlation results are interpreted as in Table 1.

Table 1. Correlation Coefficient Guidelines

Coefficient interval	Relationship level
0.00 – 0.19	Very low
0.20 – 0.399	Low
0.40 – 0.599	Medium
0.60 – 0.799	Strong
0.80 – 1.000	Very strong

Result and Discussion

Self -efficacy data obtained from the results of the questionnaire given to students to determine the level of self -efficacy based on the level of the school category presented in Table 2.

Table 2. The Percentage of Self-Efficacy of Each School Category

No.	Self-efficacy indicator	Percentage (%)		
		High School	Middle School	Low School
1.	*Magnitude*	87	81	81
2.	*Strength*	85	80	80
3.	*Generality*	88	82	80
The average percentage of combined (%)		87	81	80

The average percentage of students' self-efficacy in the high school, medium and low categories has differences. Students from high schools have an average self-efficacy higher than medium and low schools. While students from schools are having an average self-efficacy higher than low schools. The acquisition of students 'scores on the assessment instrument provides information on the average percentage of students' assessment of self-efficacy indicators. Self -efficacy in this study refers to aspects of magnitude, strength and generality developed by Bandura (2002). Table 2 shows that students' self-efficacy in high schools on magnitude indicators (difficulty level) get an average percentage of 87%. These results can be caused because in working on the assessment of the material reaction rate presented by students in high schools have confidence in taking action and overcoming obstacles and positive views of the tasks that are done compared to students from medium and low schools.

Strength indicator (strength level) obtains an average percentage of 85%. The results of the questionnaire on the indicator can be caused because in working on the instruction of the assessment of the reaction rate presented, students in high schools have a strong commitment in completing tasks and not easily give up when experiencing obstacles compared to students from medium and low schools.

Indicator Generality (Level of breadth) obtain an average percentage of 88%. The results of the questionnaire on the indicator can be caused because in working on the assessment of the material reaction rate presented, students in high schools respond more to a variety of situations with a positive attitude, steps to achieve a success and show self -confidence in the entire learning process compared to students from school medium and low.

The level of confidence of students often correlates with learning motivation. The statement is in line with the opinion of Asiyah et al. (2019) that between confidence with the efficacy of being positively influenced. According to Keller (Keller, 2009), feedback and reinforcement are the most important elements, and when students appreciate the results they get, their self -efficacy will increase.

Self -Efficacy Data Normality Test

The normality test is a prerequisite test before the hypothesis test. The purpose of the normality test is to find out whether the data obtained is normally distributed or not. If the data is normal, the hypothesis analysis is carried out with parametric statistics, but if the data is not normal, the hypothesis analysis is carried out with non-parametric statistics.

The normality test was carried out using the SPSS version 24 application by looking at the results on the Kolmogorov-Smirnov test with a significance level of 0.05. The Kolmogorov-Smirnov method is an effective and valid normality test method used for large samples. In the number of samples to be tested, "If the sample tested is> 50, Kolmogorov-Smirnov is used while if the sample tested <50 is used Shapiro-Wilk" (Dahlan, 2010). Data Test Normality Test Interest Data Learning can be seen in Table 3.

Table 3. Self-Efficacy Data Normality Test Results

Self –efficacy data	Kolmogorov-Smirnov		
	Statistic	Df	Sig.
High School	0.175	36	0.061
Middle School	0.136	25	0.200*
Low School	0.147	21	0.200*

Table 3 shows that the value of students' self-efficacy data in high, medium and low schools obtains a significance value of> 0.05 respectively. This means that students' self -efficacy data is normally distributed because it has a GIS value > 0.05.

Linearity Test

Linearity test is used to determine the relationship of problem solving ability data with self -efficacy of linear students or not. The hypothesis for a linearity test is H0 = there is no linear relationship between the ability to solve problems and students' self -efficacy. H1 = There is a linear relationship between the ability to solve problems and students' self -efficacy. Linear test with the help of SPSS, the following results are obtained.

The results of the analysis showed that the anova table of self -efficacy variables in high schools had an F value of 1,585 with a significance of 0.168, the value of self -efficacy in schools was having an F price of 0.594 with a significance of 0.801, while self -efficacy in low

schools had an F value of 1,434 with significance 0.278, so that the conclusion is obtained that the value is significant ≥ 0.05 then from the hypothesis given, received. This means that the data is interconnected in linearly between the ability to solve problems and students' self -efficacy in high school, medium and low.

Table 4. Self-Efficacy Data Linearity Test Results

Self –efficacy data	F	Sig.	Interpretation
High School	1.585	0.168	Linier
Middle School	0.594	0.801	Linier
Low School	1.434	0.278	Linier

Based on these results, the hypothesis test of the relationship of problem solving capability with self -efficacy will be carried out with statistics using the correlation test.

Data Correlation Test

To test and prove statistically the relationship between problem solving capabilities and students' self -efficacy in high school, medium and low used Product Moment Correlation Analysis with the help of the SPSS for Windows version 25.0 program. Product Moment correlation analysis is used to determine the correlation between one independent variable and one dependent variable.

Below this is the result of a correlation test that uses product moment correlation analysis. The criteria for the significance level used as a basis for knowing the correlation, namely: a) P <0.01 means there is a very significant correlation; b) 0.01 ≤ P <0.05 means there is a significant correlation; c) P> 0.05 means insignificant. Table 5 below is a description of the correlation coefficient between the ability to solve problems and self -efficacy.

Table 5. Data Correlation Test Results

School	Pearson Correlation	Sig. (2-tailed)	Interpretation
High School	0.721	0.000	Strong
Middle School	0.741	0.000	Strong
Low School	0.433	0.040	Medium

Table 5 shows that between the ability to solve problems with students' self -efficacy in high school there is a correlation coefficient (R) of 0.721 with a significance of 0,000. This means that there is a positive correlation between the ability to solve problems and self -efficacy and the level of strong relationship, and the correlation is significant because P <0.05 (0,000 <0.05). The ability to solve problems with students' self -efficacy in schools while there is a correlation coefficient (R) of 0.741 with a significance of 0,000. This means that there is a positive correlation between the ability to solve problems and self -efficacy and the level of strong relationship, and the correlation is significant because P <0.05 (0,000 <0.05). While the ability to solve problems with students' self -efficacy in low schools there is a correlation coefficient (R) of 0.433 with a significance of 0.040. This means that there is a positive correlation between the ability to solve problems and self -efficacy and the level of intercourse, and the correlation is significant because P < 0.05 (0.00 < 0.05).

Confidence in one's own ability is generally influenced by the experience or knowledge possessed by students, as a result students feel they are able to solve the problems given because they have interrupted or studying these problems. Whereas students who are afraid of being wrong, are generally influenced by many things such as giving up, less optimistic, and afraid of getting a negative response when doing class. So making, the students chose to give up at the beginning safely rather than taking the risk of making mistakes that will be seen by many people. Students who have a high level of self -efficacy affect the prettering achieved vice versa.

Previous research findings show that self -efficacy is the first step to find out how far the individual's ability is to something (Puspitaningtyas, 2017). Self -efficacy, influences knowledge competencies that have implications for increasing the mastery of knowledge competencies (Ariana et al., 2018).

According to Anshari (2017), the ability to solve problems has a close relationship with the confidence of students in solving problems, because the beliefs or self -efficacy possessed by students in dividing the problem will influence the learning outcomes of students. Furthermore, according to Surya (2015) self -efficacy is a person's belief about his chances of successfully carrying out certain tasks. Self -confidence in mathematics can be formed because of a positive attitude towards mathematics, where with this attitude students can solve mathematical problems in accordance with their ability.

Self-efficacy according to Sunaryo (2017) helps someone in making choices, their efforts to progress, perseverance and persistence they show in dealing with difficulties and degrees of calm or anxiety experienced when maintaining tasks that include daily life. The ability to solve problems according to Rahayu (2014) is a tool used not only as a tool to help students develop the ability to think but also help them to develop basic abilities in solving problems, especially in everyday life. In solving problems there are several stages that must be taken, including understanding the problem, planning how to solve, carry out plans, and re -examine the results.

The relationship between self -efficacy and problem solving ability is that self -efficacy determines how much

effort will be made and how long the individual will survive in the face of obstacles. Students with low self -efficacy will tend to avoid the tasks that they consider difficult, on the contrary students who have high self -efficacy will continue to try to complete the task no matter how difficult the assignment is given.

Noer (2012) states that self -efficacy will affect a person's choice in the arrangement of their behavior, the number of their efforts to complete the task, and the length of time they survive in the face of obstacles. Victoriana (2012) also argues that someone with high self -efficacy will put a high effort to what he is doing and raise efforts during failure or setbacks. He stated self-efficacy as one of the factors that affect the amount of an effort to a job shows that self -efficacy is an important thing that must also be considered especially in learning mathematics. The confidence of students with their abilities will make students have encouragement in themselves to try to solve problems in the questions given. Which shows a positive and unidirectional relationship between students' self and mathematical problem solving abilities.

Other relevant studies are also supported by Hendriana's research (2019) conducted with a research sample of 30 students, from the results of his research obtained the Pearson correlation coefficient between self -efficacy and the solving mathematical problems of students of 0.776 This shows that there is a strong relationship between efficacy self and the ability to solve students' mathematical problems. The value of the determination of the correlation coefficient is 60.2%, this can be interpreted that self -efficacy affects the ability to solve the mathematical problem of students by 60.2% while the remaining 39.8% is influenced by other factors outside the confidence or self -efficacy of students. From the two results of the research described above shows that the ability to solve the mathematical problem of students is influenced by the self -efficacy of students.

Conclusion

Based on the results of the correlation test, it is known that there is a relationship between the ability to solve problems and students' self -efficacy with the significance value of P <0.05 (0,000 <0.05), meaning that the correlation is positive. Field trial results show that the instrument of assessment of problem solving capabilities with self -efficacy has advantages because it can be well understood by students in high schools, medium schools and low schools. In general, self -efficacy can be a determining factor in determining how individuals face and solve challenges. High self -efficacy motivates individuals to overcome obstacles and survive in dealing with difficult tasks, while low self -efficacy can cause a tendency to avoid tasks that are considered difficult. This conclusion reflects the importance of developing self -efficacy in the context of developing problem solving skills.

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