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THE EFFECT OF SELF-REGULATED LEARNING AND SELF-EFFICACY ON STUDENT'S SOLVING PROBLEM ABILITY

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Abstract

Mathematics Problem Solving will give the expected results depending on a person's ability to control and direct his thinking activities (self-regulated learning) as well as his ability to have self confidence in solving problems. This study aimed to determine the effect of self-regulated learning and self-efficacy on problem-solving in social arithmetic material in class 7th graders of Public Junior High School 19 Ambon. The approach used was quantitative, with a sample of 27 students determined by random sampling (randomly). The research instrument used questionnaires and tests. It consisted of the self-regulated learning questionnaire, which 40 items, and the self-efficacy questionnaire 30 items. Data analysis used simple linear regression analysis, multiple linear regression analysis in which there were multiple correlation coefficients, and simultaneous and partial significant hypothesis testing at a significant level = 0.05 with the assistance of SPSS version 26.0. The research results show that : (1) there is no effect of self-regulated learning on problem solving in social arithmetic material 7th graders of Public Junior High School 19 Ambon, (2) there is no effect of self-regulated learning on problem solving in social arithmetic material in 7th graders of Public Junior High School 19 Ambon, (3) there is no effect of self-regulated learning and self-efficacy on problem solving in social arithmetic material in 7th graders of Public Junior High School 19 Ambon The contribution given to these two variables to problem solving is 4.%.

Keywords: problem solving, self-efficacy, self-regulated learning, social arithmetic

1. Introduction

Mathematics is an important science that must be studied at the educational level because mathematics is useful in human life. According to Ratumanan & Matitaputty (2017), mathematics is a subject with a strategic position in formal school education in Indonesia. In studying mathematics at school, students are challenged to solve mathematical problems, usually presented as questions. Apart from being at school, in everyday life, students also encounter various problems. Mathematical problems that students often find are usually related to calculations. For example, when shopping at a supermarket, students need to calculate the amount of money to be paid at the cashier. In addition to calculations, other examples relate to comparisons. For example, when students want to make cakes, students need to calculate and compare the measurements of ingredients to be used as cake dough. There are still many math problems that students find in everyday life. To deal with these problems, students must have good problem-solving ability

According to Polya (Hendriana et al., 2017), problem-solving is a way out of a difficult problem. Widiyastuti (2015) said that when students learn problem-solving, students will be allowed to relate mathematical ideas and can improve conceptual understanding. Sternberg & Ben-Zeev (Hasratuddin, 2018) also state that problem-solving is a cognitive activity to solve problems from not knowing how to solve the problem.

Aisyah et al. (2021) said that in the learning process, the teacher needed to be more active to develop effective learning and tend to convey learning material based only on existing books so that student problem-solving could be higher. In this case, the teacher must pay more attention to students to improve problem-solving. According to Morin & Herman (2022), problem-solving is a structured, logical, and careful effort to deal with a problem, and it requires other insights to complement each other in handling. Indria & Andriani (2018) say problem-solving is a very important part of the mathematics curriculum because students gain experience using the insights and skills they already have to practice problem-solving in the learning process and its completion.

According to Ratumanan & Matitaputty (2017), the National Council of Mathematics emphasizes that problem-solving is the main focus of the mathematics curriculum. The following is an important assertion of NCTM, namely that the main attention must be given to (1) the activeness of students in constructing and applying mathematical ideas, (2) problem-solving is a tool and learning goal, and (3) the use of various forms of learning such as small groups, individual investigation, peer teaching, whole class discussion, and project work.

Self-regulated learning is needed to fulfill optimal goals in problem-solving, which is an important focus of the mathematics curriculum because it focuses on student activity. Pintrich (Azmi, 2016) states that self-regulated learning is a constructive activity that actively involves students in determining their learning goals and then monitoring, regulating, and controlling their cognition, determination, and character. Sa'dah (2021) also said that in the learning process, good self-regulated learning could be seen from students who are used to and know their cognitive strategies (repetition, elaboration, and organization). It means that self-regulated learning directly has a positive impact on students in their learning process. Self-regulated learning will make students control their motivation. If students can control their motivation properly, all school assignments can be completed (Mukaromah et al., 2018). Meanwhile, according to Etiafani & Listiara (2015), if students have low self-regulated learning, it will cause academic anxiety, such as anxiety when completing assignments, presenting assignments in front of the class, and worrying about facing tests.

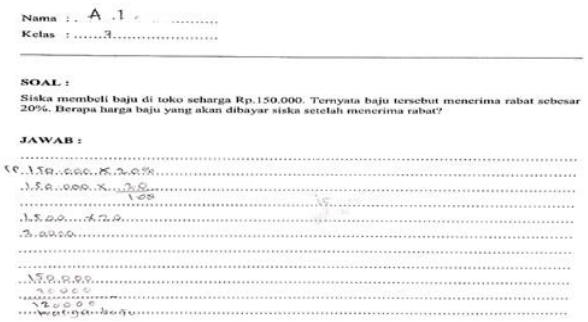
In addition to the influence of self-regulated learning on individual cognitive activities related to problem solving, the belief in one's abilities can also influence decision making. Individuals who believe in their abilities will try to solve problems. The individual's ability to direct his thoughts depends on his belief in his abilities.

According to Zimmerman (Adicondro & Purnamasari, 2011), one of the individual factors that can affect self-regulated learning is self-efficacy (self-efficacy). Luciano (2021) states that self-efficacy is an attitude of confidence from individuals in their abilities so that individuals do not panic in making decisions, can freely do what they want and accept risks for their actions, behave well with others, and have the desire to excel and understand its strengths and weaknesses. Zahro & Surjanti (2021) argues that students with high self-efficacy (self-efficacy) can increase their confidence to go through all series of learning processes well, do every task given, and achieve optimal learning output according to a specified target. According to Santrock (Tarumasely, 2021), self-efficacy can influence students' efforts and

persistence in completing assignments and their performance. Individuals motivated by their abilities tend to do well, are very enthusiastic, and are responsible for the tasks given by the teacher (Desnatalia, 2022).

Correlation between the variables of self-efficacy, self-regulation and mathematical problem solving can be seen from the results of research conducted by Fatmasari, et al (2021). They found that if students have high self-efficacy, they can confidently take steps to solve mathematics problems. Besides having self-efficacy in solving problems, the problem-solving process also depends on the way a person directs his thinking (self-regulation) to solve problems.

One method of increasing self-regulation is through the process of problems solving because it requires higher-order thinking stages. High self-regulation can improve good problem-solving skills (Amalia, et al, 2022). Based on the description above, it can be seen that self-efficacy variables and self-regulation variables can contribute to the problem solving process. In pre researc, it is known that one of the materials that is considered very difficult for students is social arithmetic material. The following is the result of student A's work on the questions given.


Nama : A .1
Kelas : .....3.....

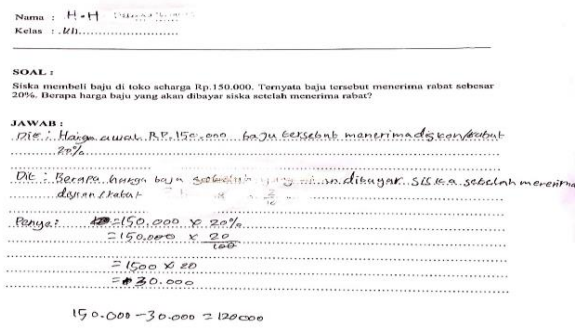
SOAL :
Siska membeli baju di toko seharga Rp.150.000. Ternyata baju tersebut menerima rabat sebesar 20%. Berapa harga baju yang akan dibayar siska setelah menerima rabat?

JAWAB :

Figure 1. The test result of Student A

Based on this work, there were several mistakes made by students in solving the problems. The first mistake is students did not write down what was known and asked but immediately made the solution, this is shown by the work of student A who only made a solution to the problem and did not write down what was known and asked. Furthermore, there was a second error in determining the formula for the question to be used and not concluding the results of the answers that were done, this is indicated by the results of student B's work in the completion of which he did not write down the formula first, namely discount price = initial price x discount. Student B starts the solution by writing 150,000 x 20%. In addition, student B did not conclude the results of the answers that had been obtained. The third mistake is that students perform wrong integer operations and determine the wrong percent value. This is shown by the results of student C's work only writing 150,000 without writing the symbol for the multiplication operation that should be 150,000 x and also student C changing the fraction wrong to 20 x 1.

To find out more about the process of solving problems in relation to the use of self-regulation and self-efficacy, the same questions were given to two students. The results of their work can be seen in the following figure.

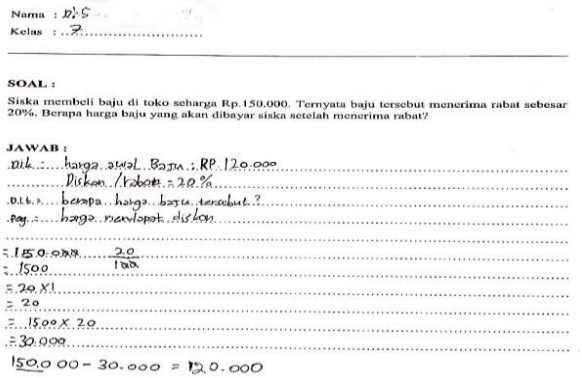

Nama : H-H
Kelas : .VII.....

SOAL :
Siska membeli baju di toko seharga Rp.150.000. Ternyata baju tersebut menerima rabat sebesar 20%. Berapa harga baju yang akan dibayar siska setelah menerima rabat?

JAWAB :
Dik : Harga awal Rp.150.000 baju bersebut menerima diskon/rabat 20%
Dit : Berapa harga baju setelah ... dibayar siska setelah menerima diskon/rabat
Penye : =150.000 x 20%
=150.000 x 20/100
=1500 x 20
=#30.000
150.000 - 30.000 = 120.000

Figure 2. The test result of Student B

From the analysis of student works in Figure 2, it can be seen that the student wrote down the information contained in the problem, but made an error in the calculation process and did not change the story problem into a mathematical model.


Nama : D.S
Kelas : .7.....

SOAL :
Siska membeli baju di toko seharga Rp.150.000. Ternyata baju tersebut menerima rabat sebesar 20%. Berapa harga baju yang akan dibayar siska setelah menerima rabat?

JAWAB :
Dik : harga awal Baju : RP 120.000
Diskon / Rabat = 20%
Dit : berapa harga baju tersebut ?
Peny : harga mendapat diskon
= 150.000 x 20/100
= 1500 x 20
= 20 x1
= 20
= 1500 x 20
= 30.000
150.00 - 30.000 = 120.000

Figure 3. The test result of Student C

The students' work in Figure 3 show that there was an error in carrying out the calculation process even though writing down the information contained in the problem.

The results obtained above are supported by previous research by Yunia & Zanthy (2020), including (1) type 1 error, namely, students work on questions students do not write down what is known and asked, (2) type 2 error, namely students do not change the words in problems into the form of mathematical models, (3) type 3 error, namely students' error in carrying out operations on integers and decimal numbers. Based on

students' answers, students did not have problem-solving ability. It causes students to score below the Minimum Completeness Criteria (KKM), is 71.

Another thing that underlies this research is that there has never been any previous research that examines self-regulated learning and self-efficacy in this school. Therefore, the researcher chose Public Junior High School 19 Ambon as the research location. Referring to the previous elaboration, the researcher was interested in writing a study entitled "The Influence of Self-Regulated Learning and Self Efficacy on Problem Solving Ability in Social Arithmetic Material in 7th grader of Public Junior High School 19 Ambon". The formulation of the problems in this study are: (1) Is there an effect of self-regulated learning on problem-solving abilities in social arithmetic material in 7th graders of Public Junior High School 19 Ambon? (2) Is there an effect of self-efficacy on problem-solving abilities in social arithmetic material in 7th graders of Public Junior High School 19 Ambon? (3) Does self-regulated learning and self-efficacy affect problem-solving abilities in social arithmetic material in 7th grade of Public Junior High School 19 Ambon?.

2. Method

This study uses a quantitative approach because the research data is in the form of numbers and is analyzed using statistical methods with research procedures beginning with observation to determine student characteristics and learning conditions, reviewing theories, formulating problems, compiling instruments, conducting instrument trials, determining samples, collect data, analyze data, and draw conclusions (Silalahi, 2015; Sugyono, 2019).

The sample in this study was 27 students from 7th grade 2 of Public Junior High School 19 Ambon. The sampling technique used in this study was Simple Random Sampling. According to Sumargo (2020), Simple Random Sampling is a very simple and fair sampling technique, meaning that each unit has an equal chance of being selected.

The instruments used in this study were self-regulated learning and self-efficacy questionnaires and problem-solving test questions. This self-regulated learning questionnaire consisted of 40 statement items consisting of positive statements and negative statements. The self-regulated learning questionnaire in this study was modified from the self-regulated learning indicators presented by Hidayati & Listyani (2010) and Zimmerman et al. (Adicondro & Purnamasari, 2011). The self-efficacy questionnaire in this study consisted of 30 statement items and was adapted from research by Nurfauziah et al., (2018). The problem solving test consisted of 4 questions.

3. Result and Discussion

3.1 Result

The result of data analyses Effect of Self-Regulated Learning (X_1) on Problem Solving (Y)

Based on the results of the t-test analysis, a value of 1.026 was obtained and at a significance level of 5%, a value of 2.060 was obtained, so if confirmed with the hypothesis testing criteria, it was obtained ≤ ≤ or -2.060 ≤ 1.026 ≤ 2.060. Thus Ho is accepted, that is, there is no positive and significant effect of self-regulated learning on problem solving for 7th grade for 7th graders of Public Junior High School 19 Ambon

The percentage contribution of the variance of the independent variable (self-regulated learning) to the dependent variable (problem solving) can be seen in the following table.

Table 1. Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square *Change*	F Change	df1	df2	Sig. F Change
1	.201[a]	.040	.002	15.842	.040	1.054	1	25	.315

a. Predictors: (Constant), Self Regulated Learning

At this stage, the researcher tested what percentage of the dependent variable variance was explained by the independent variables. Table 1 show that the contribution of self- regulated learning to problem solving is 0.040. It means that variable X1 contributes 4% to variable Y while variables outside research, such as attitudes and interests, influence the remaining 96%.

The result of data analyses Effect of Self-Efficacy (X_2) on Problem Solving (Y)

The results of the study show that there is no significant positive effect between self-efficacy *v*ariables on problem solving. It is shown by the t_{hit} value of 1.489 and t_{tab} at a significance level 5% of 2.068. It means that $t_{count} < t_{table}$ (1,489 < 2,068), so H_0 is accepted and it can be concluded that there is no effect of self-efficacy on problem solving for 7th graders of Public Junior High School 19 Ambon.

The percentage contribution of the variance of the independent variable (self-efficacy) to the dependent variable (problem solving) can be seen in the following table.

Table 1. Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square *Change*	F Change	df1	df2	Sig. F Change
1	.150[a]	.022	-.017	15.990	.022	.573	1	25	.456

a. Predictors: (Constant),Self Efficacy

At this stage, the researcher tested the variance percentage of the dependent variable explained by the independent variables. Based on table 2 shows that the contribution of self-efficacy to problem solving is 0.022. It means that variable X2 contributes 2.2% to variable Y while variables outside the research, such as attitudes and interests, influence the remaining 97.8%.

The result of data analyses Effect of Self-Regulated Learning (X_1) and Self-Efficacy (x_2) on Problem Solving (Y)

The results showed no significant positive effect between self-regulated learning and self-efficay variables on problem solving. This is shown from the F_{hit} of 0.521 with a significance value of 0.600 and the F_{table} of 3.39 at a significance level of 0.05. This shows that $F_{count} < F_{table}$ (0,521 < 3,39), then H_0 is accepted, and it can be stated that variable Y is not influenced by X_1 and X_2 simultaneously (together). Therefore, it can be concluded that there is no effect of self-regulated learning and self-efficacy on problem solving of 7th grader of Public Junior High School 19 Ambon.

The percentage contribution of the variance of the independent variable (self-regulated learning and self-efficacy) to the dependent variable (problem solving) can be seen in the following table.

Table 1. Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square *Change*	F Change	df1	df2	Sig. F Change
1	.204[a]	.042	-.038	16.159	.042	.521	2	24	.600

a. Predictors: (Constant), Self Regulated Learning, Self Efficacy

At this stage, the researcher tested the variance percentage of the dependent variable explained by the independent variables. Table 3 shows that the contribution of self-regulated learning and self-efficacy to problem solving is 0.042. It means that variables X1 and X2 contribute 4.2% to variable Y, while variables outside the study, such as attitudes and interests, influence the remaining 95.8%.

3.2 Discussion

The Effect of Self-Regulated Learning (X_1) on Problem Solving (Y)

According to Ajiksukmo (Tarumasely, 2021), there is no significant effect between self-regulated learning variables on problem solving. It can happen because there are individual differences between one learner and another. For example, there are individual differences in setting different strategies. With the same conditions, self-regulated learning is also influenced by students' perspectives on what is observed. Students will manage themselves well when they see learning as something important and useful.

According to Ermi (2017), the metacognitive process is a process that students need to utilize. The teacher does not introduce effective tools in learning, so students are not trained to have good learning strategies and do not monitor the effectiveness of their learning strategies. Dayana & Marbun (2018) also say that a person must have motivation because motivation

has a strategic role in learning, and if there is no motivation, then no learning activities occur. Consequently, self-regulated learning in students will be low.

According to the interviews conducted by researchers in an unstructured manner with students, the researcher found several problems with students. Some students disliked mathematics because mathematics was not fun, difficult to understand, had lots of formulas, was boring, and had many assignments. According to Sembiring et al., (2019), the attitude of students who do not like mathematics can occur because there is a general response in the minds of students about the difficulty of mathematics which is based on other people's comments, learning experiences in class as a result of a learning process that is less attractive to students, inappropriate teacher's attitude, failure to monitor mathematics and not knowing the use of mathematics. It resulted in students lacking self-regulated learning, affecting the results of the problem-solving test.

Based on the results of filling out the questionnaire, it was found that self-regulated learning was low because students filled out the questionnaire as they pleased. It can be seen in the student JN's low scores on the questionnaire, but JN achieved high scores on the problem-solving test. Based on the problems above, it can be concluded that the results of filling out the questionnaire and problem-solving tests are not matched because students did not deliver their experiences in the questionnaire. Therefore, "there is no effect of self-regulated learning on problem solving in social arithmetic material in the 7th grader of Public Junior High School 19 Ambon.

The Effect of Self Efficacy (X_2) on Problem Solving (Y)

There is no significant effect between self-efficacy variables on problem-solving. It is reinforced by the results of Novferma's research (2016) which shows that even though students already have high self-efficacy, most students still find it difficult to solve mathematical problems. She also explained that the factors that made it difficult for students to solve problems were students who were not careful, often felt afraid, gave up easily, and were in a hurry to solve problems. These factors are related to self-efficacy in students, so it is very influential for students in solving problems. The results of Utami & Wutsqa's research (Imaroh et al., 2021) also show that the average self-efficacy of students in their research is in the medium category. However, problem-solving is in a low category. It happens because students need to have learning experiences that support problem-solving.

One factor influencing self-efficacy is the Physiological and Affective States factor. According to Meredith (Amelia et al., 2022), if students have a physical condition that is weak, tired, tense, or anxious, it will affect the learning process of students so that they will have low scores. Samsuddin et al. (2022) state that students who avoid many tasks, especially challenging ones, have low self-efficacy. It has an impact on the problem-solving process of low-students.

Based on the interviews conducted by researchers in an unstructured manner with students, the researcher found several problems experienced by students. Students thought that mathematics was very difficult to learn, students could not complete assignments without the help of friends, and there were even students who felt afraid if the teacher asked for material that was not understood. Soesilawati (2013) said that if students have such views, this certainly reflects their belief in themselves in mathematics. It resulted in students needing more self-efficacy, affecting the problem-solving test results.

According to the results of the interviews, the researchers found that filling out the questionnaire was not following the reality experienced by students. In filling out the self-efficacy questionnaire, students responded that they supported self-efficacy, but the response was the opposite of what they experienced. Therefore, the self-efficacy questionnaire does not support the results of problem-solving tests on students. Kusumastuti et al., (2020) also argue that the respondents' interest, mood, and honesty when answering statements in the questionnaire also impact the quality of data acquisition, ensuring accuracy for drawing conclusions from a problem.

Based on the problems above, the researcher concluded that the results of the questionnaire and the problem-solving test needed to be in sync or invalid because of the students' responses in filling out the questionnaire. The students did not support self-efficacy, but it was very high in the problem-solving test results. Ideally, the higher the response, the higher the problem-solving test results, or the lower the response, the lower the problem-solving test results. Therefore, it can be concluded that "there is no effect of self-efficacy on problem-solving for 7th grader of Public Junior High School 19 Ambon".

The Effect of Self-Regulated Learning (X_1) and Self Efficacy (X_2) on Problem Solving (Y)

Based on the findings obtained by the researcher during the research and from unstructured interviews, it was found that students made several mistakes in filling out the self-regulated learning and self-efficacy questionnaires. The questionnaire revealed different results from what was experienced by students, so the results obtained are different from the results of the problem-solving test. Ammirullah (2022) also argues that researchers should not assume that respondents are always ready with the correct answers and always provide the information we need because respondents must have limitations and may not even be able to answer because they are not given information, may forget or cannot interpret the problems being asked.

According to Murniyati (2018), students who are lazy to take part in learning because they feel it is monotonous, boring, and less interesting will affect their learning outcomes to be low and not have good problem-solving. Hastuti (Isrok'atun & Rosmala, 2021) also said that the tendency of mathematics learning to be centered on teachers and students who are passive in receiving lessons makes students lazy to solve problems and need to be more independent in working on questions. Consequently, students need higher self-regulated learning and self-efficacy. It affects problem-solving abilities to be low as well. Based on the problems above, it can be concluded that "there is no effect of self-regulated learning and self-efficacy on problem-solving for 7th grader of Public Junior High School 19 Ambon".

Research Limitation

This research has been attempted and carried out following research procedures but has the following limitation:

a. Before the research questionnaire was distributed, there were no prior interviews with students regarding the items stated in the questionnaire instrument that had been validated.

b. In the preparation of the questionnaire, which was carried out to answer the problems in this study, there were indicators to answer the variables that were different from what was expected. They were still too broad to answer the existing variable.

c. In filling out the questionnaire, the researchers did not motivate students to answer according to the circumstances experienced. Many students were found to be dishonest in filling out research questionnaires.

Not all students answer problem-solving questions using the four steps according to Polya in full, so it affects the problem-solving results.

4. Conclusion

There is no effect of self-regulated learning on problem solving in social arithmetic material in 7th grader of Public Junior High School 19 Ambon. This is shown from the results of the study, namely the t-test obtained t_{count} X_1 to Y of 1.026 with a significance of 0.315 and t_{tab} = 2,060 on a significance of 0.05 (two-tailed test) with df = n – 2 so that $-t_{table} \leq t_{count} \leq t_{table}$ (-2,060 ≤ 1,026 ≤ 2,060), then Ho is accepted. The contribution made by self-regulated learning to student problem solving is 0.040. This means that variable X_1 contributes 4% to variable Y while the remaining 96% is influenced by variables outside of research such as attitudes and interests.

There is no effect of self-efficacy on problem solving in social arithmetic material in 7th grader of Public Junior High School 19 Ambon. This is shown on the results of the study, namely the T-test, obtained t_{count} X_2 to Y of 0.757 with a significance of 0.456 and t_{tab} = 2.060 on a significance of 0.05 (two-tailed test) with df = n – 2 so that obtained $-t_{tabel} \leq t_{hitung} \leq t_{tabel}$ (-2,060 ≤ 0,757 ≤ 2,060), then Ho is accepted. The contribution of self-efficacy to student problem solving is 0.022. This means that variable X_2 contributes 2.2% to variable Y while the remaining 97.8% is influenced by variables outside of research such as attitudes and interests.

There is no effect of self-regulated learning and self-efficacy on problem solving in social arithmetic material in 7th grader of Public Junior High School 19 Ambon. This is shown on the results of the study at a significance of 0.05 (two-tailed test) and dk = n-2. It was obtained F_{table} = 3.40. Then, in the significance test simultaneously, it was obtained F_{count} of 0,521 with significance value of 0,60 then it was obtained $-t_{table} \leq t_{count} \leq t_{table}$, (-2,060 ≤ 0,521 ≤ 2,060). Therefore, Ho is accepted. At a significance of 0,05 (two-tailed test) and dk = n-2, it was obtained t_{tab} =2,060. In the partial significance test, it was obtained t_{count} X_1 to Y is 0,694 with a significance of 0,494 so that $-t_{table} \leq t_{count} \leq t_{table}$, (-2,060 ≤ 0,694 ≤ 2,060). Then, Ho is accepted. In the partial significance test. It was obtained t_{count} X_2 to Y is 0,174 with a significance of 0,864 $-t_{table} \leq t_{count} \leq t_{table}$, (-2,060 ≤ 0,174 ≤ 2,060). Then, Ho is accepted so

that contribution of *self regulated learning* and *self efficacy* on student problem solving is 0.042. This means that variables X_1 and X_2 contribute 4,2% to variable Y while the remaining 95.8% is influenced by variables outside of research such as attitudes and interests.

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