Students' self-regulation and motivation in learning science

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Article Info	ABSTRACT

The student's self-regulation and motivation are essential for students to study. Especially with 21st-century learning students are required to be more active in learning than teachers. This Mixed Methods research aimed to determine the influence between the students' self-regulation with the motivation of students learning. The sample size was 534 students from Madrasah Tsanawiyah in Jambi city, Indonesia determined by total sampling technique. Data were then analyzed with the SPSS 21 application to find descriptive statistics as well as inferential statistics using simple regression and for comparison using the independent sample T-Test. The results of this research are dominant in both self-regulation and student motivation in learning, which is strengthened by the relationship and influence between self-regulation and the motivation of students in learning. It is seen from the value of sig = 0.019 and has a contribution of 70.3%. According to the results, it is recommended that students need to be given the opportunity to conduct learning directly and teachers must perform innovative learning.

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1. INTRODUCTION

Education is one of the most important things in human life. Because through human education can develop their horizons, so they will be able to deal with every problem and change through an open attitude with a creative approach without losing their identity [1-4]. The Government has made various efforts and policies in order to improve the quality of education, including: Perfecting the curriculum, freeing upschool fees for elementary school and junior high students, doing activities that can improve their thinking skills, Complete facilities and infrastructures such as: science laboratories, computer laboratories, libraries and many more facilities and infrastructures that support student learning, updating learning models and methods, and holding certification Teachers, upgrades and seminars [5, 6].

Science lessons According to the 2013 curriculum, emphasizing that students are encouraged to learn through active involvement with the skills, concepts, and principles in each science lesson [7]. Learning will be increasingly difficult to adjust to the level. In elementary school, science lessons are only limited to the introduction of nature and the environment, while the junior high school science lessons are more focused. The scope of science in junior high school focuses on observing natural phenomena and its application in daily life, in addition to issues concerning natural phenomena related to productive competence and expansion of abstract concepts. Learning about abstract concepts gives students difficulty in understanding science lessons. Students must therefore have an attitude toward the subject of science.

Attitudes are an individual's tendency to act, think, understand, and feel in the face of an object, idea, situation, or value [8, 9]. In addition, Kurniawan [10] said that attitudes towards science show that students will be interested or have feelings for science. This statement explains whether the student likes or does not like science. In order to know the attitude of students to the natural sciences, the attitude measured according to Fraser's [11], TOSRA (Test of Science-attitude related). The attitudes that students possess have an influence on self-regulation and student motivation in the teaching.

Several studies in science education proved that motivation and self-regulatory ability are two important factors that determine students ' success in the learning process. Motivation plays an important role in providing energy, directing, and maintaining positive student behavior to always be actively involved in the learning process, and to influence the development of student learning [12-14]. Students with high motivation for learning tend to have a positive attitude in learning, such as focusing on following the learning process, which is actively involved in class activities, often filing Teachers' questions, and always have time to learn [15]. Furthermore, motivation is the main need that students need to have their own regulatory skills. Self-regulatory capability consists of two main components; the ability to use, effective and efficient learning strategies, and the ability to motivate ourselves to always actively participate in the learning process [16]. Students are said to have the ability to Self-regulation if they can use a variety of learning strategies, and be able to decide when, why, and how to use this strategy in the right context.

Various research literature in the field of science education shows that the learning environment is a major factor that plays an important role in encouraging students to have high motivation and good self-regulatory skills [17]. So far, there has been a lot of research proving that constructivism-based learning environment focuses on students oriented (student-centered learning) to increase student motivation in learning science [18, 19]. A study conducted by Maison [20], shows that the task of orientation and investigation is a psychosocial factor in the learning environment that has the most positive and significant effect on the learning of motivation and self-regulation. However, there are limited studies in Indonesia to explore the psychosocial factors of a learning environment that have a significant impact on student motivation, as well as analyzing the dimension of motivation that is positively correlated with the formation of self-regulation in learning integrated sciences. Therefore, to address the research gaps, the main goal of this study is to explore the main factors of the learning environment that have a significant impact on the motivation and self-regulation strategy, and to evaluate the main components of motivational learning that has a significant impact on the use of Self-regulatory strategies of students by establishing structural models of relationships between learning environment, motivation, and student self-regulation strategies in learning science Integrated knowledge.

Self-regulation in good learning will help a person in fulfilling the various demands he faced. Vohns [21], mentioning the existence of self-regulation in learning will make the individual set the goal, evaluate it and make the necessary adaptation so as to support the achievement. Other research results also show that self-regulation in learning has a great role in achieving one's academic achievement [22-24]. Cheng described that someone who can do self-learning has a clear idea of how and why self-regulatory strategies in learning should be used [24]. They are active learners in the case of Metacognitive, motivation and control of actions. Further explained by Cheng [24] in the self-learning process, one needs to organize their learning objectives, create learning plans, choose their learning strategy, monitor their learning process, evaluate learning outcomes them and suppress distractions.

2. RESEARCH METHOD

This research employed mixed method approach. Mixed methods can refer to the use of quantitative and qualitative data in answering research questions and is part of a larger research program and designed as a complement to provide Information related to different methodological approaches [25]. The type used is sequential explanatory. Sequential Explanatory is a research that data collection initially is quantitative which is then followed by qualitative data, which means that the quantitative data is strengthened by the qualitative data to be acquired [26].

Where, quantitative data are obtained through the provision of motivation questionnaire and self-regulation, then followed by qualitative activities that are conducting interviews with students. The study used 534 students in classes VII and VIII with details of 324 female students and 210 male students of MTS Madrasah who were equivalent to junior high school in Jambi city using total sampling techniques. The total sampling technique is an example of a collection technique that uses the entirety of a population [27]. Interview only conducted to 20 students who are willing to conduct the interview. Instruments in this study are questionnaire, and interviews. Cohen, *et al.* [28] stated that questionnaire is a list of questions given to others who are willing to answer (the respondents) according to the user's request.

In the process of collecting the first data, because it uses a sequential type of explanation, the data obtained first is quantitative data through motivation questionnaire and self-regulation. The self-regulatory questionnaire was adapted and had a valid declaration of 21 statements with a Cronbach alpha value of 0.73, as well as a learning motivation for students obtained a valid statement of 22 statements with a Cronbach Alpha value of 0.76 that uses the Likert scale of 4, namely for a positive statement strongly disagree have a score of 1, do not agree to have a score 2, agree to have a score 3 and strongly agree 4. Then, do a semi-structured interview to confirm the quantitative results that have been done. Then to process SPSS 21 data is used to look for descriptive statistics to see quantitative data, while for qualitative data using miles & Huberman, i.e. data reduction, data display, and conclusion [28]. Descriptive statistics are presented in the frequency of summary, such as mean, mode, median, minimum, maximum and standard deviation [28]. In this study the descriptive statistics used are mean, Min, Max, and Category. For the categories in this study can be seen in Table 1.

Table 1 Categorization of self-regulation and motivation

| Category | Interval | | Motivation |
| | Self-regulation | | |
	Metacognitive	Elaboration	
Very Not Good	21.0–36.7	21.0–36.7	22.0–38.5
Not Good	36.8–52.5	36.8–52.5	38.6–55.0
Good	52.6–68.2	52.6–68.2	55.1–71.5
Very Good	68.3–84.0	68.3–84.0	71.6–88.0

During data collection as can be seen in Figure 1, the first activity that must be done is to select students based on the categories provided by the researcher, then give questionnaire of self-regulation and motivation to students. The questionnaire is then processed using SPSS 21 application data to see descriptive statistics, in the form of, the mean, min, max, percentage, and category of students and find out if there is an impact and comparison between the two variables.
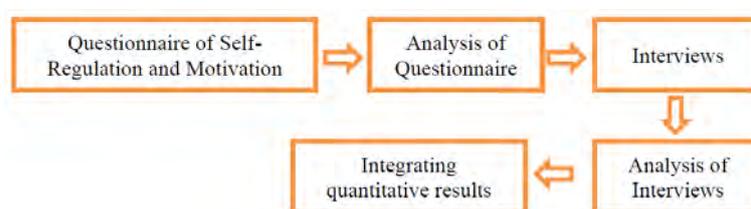

Figure 1. Data collection

All data were obtained from the motivation and self-regulation questionnaires on student values and collected and calculated and assisted with the SPSS 21 application. Descriptive statistics are given to calculate the frequency, percentage, mean, Min, and Max of a sample [26]. In this study, quantitative data were analyzed using parametric statistics of simple regression to determine whether there was an impact between student self-regulation, and student motivation; then see the difference between class VII and VIII in self-regulation and its motivation this study used SPSS 21 at significance level 0.025. Interviews are used conducted to reinforce quantitative data outcomes, which is analyzed using Miles and Huberman [29], including reducing data, displaying data, and concluding.

3.   RESULTS AND DISCUSSION
3.1.   Results
3.1.1. Metacognitive students in self-regulation
The results of the questions given and the results obtained using the SPSS 21 can be seen in the Table 2. From Table 2, which came from 534 respondents from the Madrasah Tsanawiyah in Kota Jambi after they were obtained and the results obtained using the SPSS 21 application program, on the indicator of teacher support in the student learning environment has the dominant results Is good, with a percentage of 67.6% for 361 students from a total of 534 students, and very unwell amounting to 5.4% for 29 students of the total 534 students. From 534 students, the mean result is 57.4, maximum value 79, and a minimum value of 26.

Table 2. The result of metacognitive in student self-regulation in learning science

Range	Classification Respond	M	F	Total	Mean	Min	Max	%
21.0–36.7	Not very good	19	10	29				5.4
36.8–52.5	Not good	27	20	47				8.8
52.6–68.2	Good	123	238	361	57.4	26	79	67.6
68.3–84.0	Very good	41	56	97				18.2
Total		210	324	534				100

3.1.2. Elaboration in self-regulation

The results of the questions given and the results obtained using the SPSS 21 application can be seen in the Table 3. From Table 3, which came from 534 respondents from the Madrasah Tsanawiyah in Kota Jambi after they were obtained and the results obtained using the SPSS 21 application program, on the elaboration indicator in the student self-regulation has the dominant result is good, with a percentage of 66.3% for 354 students from a total of 534 students, and very unwell amounting to 7.3% for 39 students from a total of 534 students. From 534 students, the mean result is 59.2, maximum value 80, and a minimum value of 26.

Table 3. Result of elaboration in student self-regulation in learning science

Range	Classification Respond	M	F	Total	Mean	Min	Max	%
21.0–36.7	Not very good	20	19	39				7.3
36.8–52.5	Not good	27	21	47				8.8
52.6–68.2	Good	133	221	354	59.5	26	80	66.3
68.3–84.0	Very good	29	65	94				17.6
Total		210	324	534				100

3.1.3. Motivation

The results of the questions given and the results obtained using the SPSS 21 application can be seen in the Table 4. From Table 4, which came from 534 respondents from the Madrasah Tsanawiyah in Kota Jambi after they were obtained and the results obtained using the SPSS 21 application program, on learning motivation students have the dominant result is good, with a percentage of 59.7% for 319 students from a total of 534 students, and very unwell amounting to 5.6% for 30 students of the total 534 students. From 534 students, the mean result is 67.4, maximum value 87, and a minimum value of 27.

Table 4. The result of student motivation to learn science

Range	Classification Respond	M	F	Total	Mean	Min	Max	%
22.0–38.5	Not very good	18	12	30				5.6
38.6–55.0	Not good	36	25	61				11.4
55.1–71.5	Good	110	209	319	67.4	27	87	59.7
71.6–88.0	Very good	46	78	124				23.3
Total		210	324	534				100

3.1.4. Class VII and class VII differences in learning environment

To see the differences in the learning environment of students in classes VII and VIII can be seen in the Table 5. From Table 5 it can be seen that the value obtained (t arithmetic) with the value of t table. T-table values can be found in the t table with a significance value of 0.025 (2-tailed test) with a degree of freedom (df) 534. In this study, the results for t table are 1.967903. As for the t value, it can be seen in Table 5. (Column t) that is 20.153. So, it can be concluded that there are significant differences in learning environment students' in class VII and VIII.

Table 5. Independent sample t-test for self-regulation

	T	df	Mean	Std.Deviation	95% confidence interval Lower	Upper
Self-regulation	20.153	534	3.0906	.14321	18.236	.6120
	20.153	239.067	2.4033	.19015	17.935	.8615

3.1.5. Class VII and class VII differences in student motivation

To see the student motivation differences in classes VII and VIII can be seen in the Table 6. From Table 6 it can be seen that the value obtained (t arithmetic) with the value of t table. T-table values can be found in the t table with a significance value of 0.025 (2-tailed test) with a degree of freedom (df) 534. In this study, the results for t table are 1.967903. As for the t value, it can be seen in Table 6. (Column t) that is 20.553. The hypothesis testing criteria is that there is a rejection value of H_0 (Cramer, 2003). So, it can be concluded that there are significant differences in motivation students' in class VII and VIII.

Table 6. Independent sample t-test for motivation

	T	df	Mean	Std.Deviation	95% confidence interval	
					Lower	Upper
Motivation	20.553	534	3.2306	.14321	18.236	.6120
	20.553	241.067	2.3033	.18315	17.935	.8615

3.1.6. The regression

For the results of the influence of a learning environment with students' motivation can be seen in Table 7. From Table 7, it can be seen the results of a simple regression test found that the regression equation is Y = 13.561 + 0.229X. For the number of contributions from self-regulation on motivation can be seen in Table 8. The result of a simple regression analysis (Table 8) suggests that the value of the coefficient of determination is (R^2) 0.703. This means that the contribution of self-regulation to the motivation of learning is 70.3%, while the remaining 29.7% is influenced by other variables.

Table 7. Results of regression

Variable	Unstandardized Coefficients		Standardized Coefficients	t	sig.
	B	Std. Error	Beta		
1 (Constant)	13.561	3.151		4.584	.000
Self-regulation	.229	.224	.223	1.328	.019

Table 8. Contribution of learning environment on motivation

Model	R	R square	Adjust R Square	Std. Error of the Estimate
1	.823	.703	.712	2.703

3.2. Discussion

The results of the analysis of questionnaires in Table 2, a metacognitive indicator in the Self-Regulation in the junior lesson has a good metacognitive capability of 67.6% (361 of 534) students in science subjects. The ability is demonstrated by being able to design an answer and think of answers as desired. It can also be seen from the results of interviews that have been done.

"When you know there will be a test next week, what do you do?"
"I will prepare myself before the test"
"What kind of preparation do you mean?"
"Like learning every night about lessons to be tested, and praying"

Metacognitive is part of an individual's ability when thinking about designing or planning the action you want to take. Metacognitive is done by early childhood when given information by using questions after being given questions or assignments then the aspect that plays a lot Determining the regulation of himself is metacognitive then gives rise to the conclusion that the self-regulation in the strategy of acceptance of information and good learning is correlated with metacognitive ability [30, 31]. In Dinsmore Research comparing the underlying aspects of self-regulation, it is found that metacognitive plays an important role as a person's self-regulatory forming [32].

The results of the analysis of the questionnaire on Table 3, the elaboration indicator in the Self-regulation in the junior lesson has a good elaboration capability of 66.3% (354 of 534) students in the science subjects. The ability is demonstrated by explaining something in detail from other people, because it has good elaboration skills. It can also be seen from the results of interviews that have been done.

"When you meet a friend, you are unable to explain a problem, what do you do?"
"I'll examine the issue in more detail than my friend did, so I'd get the answer I wanted"
"When your friend explained something of a problem that he encountered, what would you do?"
"I will add, clarify or elaborate deeper back so that the problem can be missed"

Elaboration is the ability to explain, develop, enrich or elaborate more detailed answers or ideas given. By having this ability student can answer the problems that have been given [33-35]. Students who have this ability will also have a good value because it will help his friend in enriching ideas that other people have.

The results of the survey analysis in Table 4, is the motivation of students in learning who have a good category of 59.7% (319 of 534) students in the junior lesson. This is demonstrated by the student's interest in learning and is characterized by more active students in class. It can also be seen from the results of interviews that have been done.

"How do you think the circumstances of friends are in class?"
"My friend on average has more interest in learning"
"What is the evidence, that your friends are more interested in the learning?"
"My friends are more active in the classroom, such as asking questions, answering questions, and always engaging in classes"

Learning motivation can arise due to intrinsic and extrinsic factors, one of the extrinsic factors is a conducive learning environment. Conducive means truly supporting the sustainability of the learning process. The atmosphere during the learning process can affect the efficiency of learning time with a less conducive atmosphere that will make students not focused on the learning process so that the learning time is not effective [36, 37]. In line with this, Hidi explains that conducive environment is a driving factor that provides an appeal for the learning process, otherwise the less pleasant environment will cause saturation and boredom [38-40]. Teachers and parents who always provide a good example for a child, a social companion who provides positive life lessons, a quiet learning area, and a complete lesson tool can improve students' motivation to learn.

Students' ability to regulate themselves in the learning process is an important activity in the student learning process. According to Sungur, *et al.* [41], Social cognitive learning theory has explained the ideal concept of learners, i.e., self-regulation-based learners. Self-regulation-based learning term is a translation of self-regulated learning foreign words. Self-regulation-based learning is a topic that is often researched and studied in recent years. Various variables affecting the regulation self-based learning variables include the Problem Based Learning model [42, 43]. Period of study, learning environment, cognitive self-regulation, learning Motivation, Acceleration class, the level of IT integration (information Technology) which includes the ability Use of IT and attitude towards IT, learning motivation and interaction of teachers and students [44, 45].

Based on the self-regulatory process of Zimmerman [46], there are three stages of self-regulation, namely the forward orientation stage, the performance stage, and the self-reflection stage. The forward orientation stage consists of two main processes: The task analysis and the confidence of self-motivation. Task analysis consists of goal setting and strategy planning. Self-motivation beliefs consist of self-efficacies, hope towards results, interests/intrinsic value and orientation learning objectives. The performance stage consists of two processes namely self-control and self-observation. Self-control consists of imagination, self-briefing, centring attention, and learning strategy. Self-observation consists of two main processes: self-recording or self-recording of personal events, and self-experimentation to get the cause of the event. The self-reflection stage consists of two main processes: self-judgement and self-reaction. The form of self-assessment is self-evaluation, which compares the results of self-observation of the pre-existing performance standards, the performance of others, or the absolute performance standards [47]. Another form of self-assessment is the causal attribution that points to beliefs about the cause of success or error [48, 49]. The form of self-reaction on self-regulation-based learning cycles consists of self-satisfaction and adaptive or defensive response. Increased self-satisfaction in the stage of self-reflection increases motivation, while decreasing self-satisfaction will undermine learning efforts. Reaction adaptation will result in self-adjustment directed at the increased effectiveness of a learning method.

Motivation is a series of businesses to provide certain conditions, so someone wants to do something. Motivation is an encouragement in one's self to try to make a better behavior change in fulfilling the need only [50]. In the learning activities, motivation is the driving force in the students that raises the learning activities, which guarantees the continuity of the learning activities and that gives direction to the learning activities, so that the objectives desired by the subject of study It is accomplished [51, 52]. That is,

students who have strong motivation will have a lot of energy to do learning activities. Motivation will be aroused if the atmosphere of a good class, sufficient classroom, the existence of freedom to move, light and good air circulation will spur the motivation to learn students well according to ability [53]. This means that schools and classrooms need to be managed properly, and create a learning climate that supports learning. Astalini, *et al*; and Maison, *et al.* state that the lack of motivation will lead to less-than-motivated students in learning [54, 55].

The exploration of the relationship between students ' motivation using the Self-regulatory strategy shows that extrinsic goal orientation is the most significant motivation dimension for the use of self-regulatory strategies for students in integrated learning of science knowledge, both in cognitive strategies (organizations), and in metacognitive strategies (critical Thinking and Metacognitive) [56, 57]. On the other hand, extrinsic goal orientation is part of the goal orientation that explains why a student is actively engaged in learning and performing tasks related to extrinsic reasons, such as obtaining an award from a teacher, Peers, and parents, get good grades, or avoid punishment [58]. Therefore, there is the influence of self-regulation with the motivation of students in the study of science.

4. CONCLUSION

The research found that the outcome of the student self-regulation has a good category because, with the students having a good attitude will make himself comfortable in learning that will affect the motivation that belongs to the student. If students who have good self-regulation, it will encourage the extrinsic motivation of students. It is also supported by the relationship between student self regulation and student motivation and there is an influence between the two variables with a contribution of 70.3%. According to the results, it is recommended that students need to be given the opportunity to conduct learning directly and teachers must perform innovative learning.

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