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A study of junior high school students' attitudes and learning motivation on science process

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Abstract

This study aims to determine the effect of students' attitudes and motivation on science process skills. The type of research used is quantitative research with a research sample of 153 junior high school students. Sampling was selected using the purposive sampling technique with the criteria that junior high school students should have followed the science learning process and have attended science practicum in the school laboratory. The research instruments used were questionnaires and observation sheets with descriptive statistical data analysis techniques and inferential statistics. The results showed that students' attitudes and learning motivation had an effect on science process skills as indicated by the correlation value between variables of 0.504 and the data significance value was smaller than 0.05, namely 0.000, so that the regression equation model could be obtained, namely $Y = 2.612 + 0.492X_1 + 644X_2$. This research was conducted to complement previous research. The novelty of this research is to see the effect of students' attitudes and learning motivation on science process skills in science learning.

Keywords: Attitudes; Learning Motivation; Science Process Skills

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1. Introduction

1.1. Conceptual and theoretical framework

Education is a series of processes in which several people who have the skills and expertise play a role in educating others to understand the basic mechanisms in education (Davies, 2017; Veiga-Neto & Lopes, 2017). Education also helps students develop their potential (Sabaruddin, 2020; Simamora et al., 2020). Education can be used as a benchmark in improving human resources to create a superior generation (Krismiyati, 2017; Mantiri, 2019; Putri et al., 2021; Rasyid, 2015). Therefore, good quality education is needed to create a superior generation through a fun learning process. One of the subjects studied in education is science learning.

Science learning is also one of the subjects that is closely related to a scientific approach. Science is a subject that studies the cause or effect of events that occur in nature (Safitri et al., 2019; Zscheischler et al., 2018). It consists of a set of concepts, facts and laws found with scientific concepts (Ali, 2018; Desstya et al., 2018). Science learning emphasises on hands-on experience to help improve competence so that students explore and understand nature (Jufrida et al., 2019; Tanti et al., 2020). When the science learning process takes place, students' attitudes are needed.

Attitude is a condition of emotional mental readiness to take a certain action when a situation is encountered (Ernawati et al, 2022; Kamid et al., 2021; Nugraha, 2018). Attitude shows that a person in a condition is ready to do something, which is not their real behaviour (Ernawati et al, 2022; Gabriella & Sugiarto, 2020; Subqi, 2019). Everyone has a different attitude to a stimulus. This is caused by several factors that exist in each individual, such as differences in talents, interests, experience, knowledge, intensity, feelings and environmental situations (Septina et al., 2021). Attitude is one of the factors that describes the success of learning thus it is very important in learning (Alwi, 2021). In science learning, attitudes are seen to be important because attitudes can improve students' educational achievement and affect the learning process (Anggraini & Perdana, 2019; Kurniawan et al., 2019) in addition to the attitude of the potential of students that must be developed in the science learning process, namely process skills.

Process skills that can be developed in order to understand natural science are science process skills (Yunianti et al., 2019). Science process skills is the ability of students to apply scientific models in understanding, developing and discovering knowledge (Darmaji et al., 2018; Sari, 2016). Through direct experience, students can develop science process skills such as practicum activities (Hayati et al., 2019; siti nur Lestari et al., 2017; Kustijono et al., 2018; Satriani & Hardiyanti, 2020; Yeni Suryaningsih, 2017). Practicum is a means to actively and optimally involve students in the learning process (Firmansyah et al., 2020; Fitriani et al., 2021; Nuswowati et al., 2020). In the learning process, students' science process skills are formed if students have motivation.

Motivation is one of the internal factors that affects the learning process of students. Learning motivation has an important role in providing stimulation, enthusiasm and pleasure in the learning process (Prasetya & Safitri, 2020; Rumbewas et al., 2018). Without motivation, it is impossible for students to have the will to learn. Changes in motivation in the learning process will also change the form, shape and learning outcomes (Kamid et al, 2022; Ahmad et al., 2021; Mislaini, 2022). Motivation can be increased by creating a pleasant learning atmosphere so that students get pleasure from lessons or feel their needs are being met (Suwarti, 2019). Thus, learning motivation is the mental strength that students must have to encourage the learning process (Kamid et al, 2022; Rini et al., 2020). If the motivation to learn in students is weak, then the absence of the motivation to learn will weaken learning activities. Therefore, the motivation to learn in students needs to be strengthened

continuously. So when students have a strong learning motivation, an encouraging learning atmosphere is created.

1.2. Related research

This research was conducted to complement the research that was carried out by previous researchers. The research relevant to this research is the research conducted by Darmaji et al. (2021), who stated that there was an influence of scientific attitudes (high and low) on science learning on students' science process skills. Then, the research conducted by Chen et al. (2021) shows that there are differences in the science process skills of the experimental class students and the control class where the science process skills of the experimental class students are higher than the control class students. Then the research conducted by Siahaan et al. (2021) showed that the science process skills of the experimental class students were not different from the control class students, and that the students' science process skills were positively correlated with the mastery of science concepts. Based on the existing research conducted by previous researchers, there has been no research on the influence of students' attitudes and learning motivation on students' science process skills. Therefore, the researcher conducted a study to examine the effect of students' attitudes and learning motivation on students' science process skills in order to complete the shortcomings of previous research.

1.3. Purpose of the study

Given the importance of students' attitudes and learning motivation in the science learning process and the importance of each student to have science process skills in science learning, the researchers conducted this study with the aim of knowing the effect of students' attitudes and learning motivation on science process skills.

2. Method and Material

2.1 Research Model

This research is a quantitative research with a survey research design. The survey research is a research that uses a questionnaire as a means of collecting basic data with data analysis of measurement results (Astalini et al., 2021; Maksum, 2002). Quantitative research is used to conduct research on a particular population or sample by producing data in the form of generalised numbers in the form of a description of the phenomenon under study (Astalini et al., 2021; Creswell, 2014). Quantitative research was also conducted to investigate the casual hypothesis by comparing one or more groups with a comparison group to see the differences (Alkhateeb & Milhem, 2020; Darmaji et al., 2020; Syahrial et al., 2019; Wang & Chang, 2018). This study aims to determine the effect of students' attitudes and learning motivation on science process skills and to determine the relationship between attitudes and learning motivation to science process skills in the science learning process.

2.2 Participants

The population in this study were junior high school students. The population is an unordered collection of distinct units in the sample paired with the corresponding value of the variable of interest (Chen et al., 2022). The sample of this research consisted of 153 junior high school students. The sample in this study was obtained by using the purposive sampling technique. The purposive sampling applied was used to obtain research subjects based on special considerations, namely research needs (Marzal et al., 2021). The criteria for sampling are junior high school students who have participated in the science learning process and have participated in science practicum in the school laboratory.

2.3 Data Collection

The data in this study were obtained from quantitative data using questionnaires and observation sheets. The research instrument is a tool used to collect the desired data or to measure the object of the variable to be studied. The instruments used in this study were student attitude questionnaires, student learning motivation questionnaires and science process skills' observation sheets. Questionnaires were used to obtain research quantitative data (Astalini et al., 2021; Rintakorpi & Reunamo, 2017; Tölle et al., 2019; West, 2015). The questionnaire used in this study is a student attitude questionnaire with 10 statements and a student learning motivation questionnaire with 25 statements. The science process skills' observation sheet was used to observe student activities when doing practicum (Israel et al., 2016). The science process skills' observation sheet consists of 24 statements. The student attitude questionnaire grid can be seen in Table 1 and the student attitude criteria can be seen in Table 2.

Table 1. Grid of Student Attitude Instruments

Indicator of attitude in science
Students feel happy when they hear the term science
Students are interested in TV shows that contain information about animal life, animals or about space
Students believe that by understanding science it will be easy to get a job
Students like to talk with friends or with others about Science
Students often use their spare time to read science books
Sometimes science lessons are fun for students
Students love to learn science, because it uses practicum
Students like to read books that have to do with science
Students have a desire to study science seriously, but find it difficult to understand
Students understand well the content of science subject matter delivered by the teacher

The range of the criteria can be seen in Table 2.

Table 2. Student Attitude Criteria

Range	Criteria
32.6 – 40.0	Excellent
25.1 – 32.5	Good
17.6 – 25.0	Less
10.0 – 17.5	Invalid

The student learning motivation questionnaire grid can be seen in Table 3 and the student motivation criteria can be seen in Table 4.

Table 3. Grid of Students' Learning Motivation Instruments

Indicator of learning motivation students
Persevere in the face of the task
Tenacious in the face of adversity
Show Interest
Happy to work independently

Get bored quickly on routine tasks
Can defend his opinion
It's not easy to let go of what you believe in
Happy to find and solve problems

Then, the range of criteria of student learning motivation can be seen in Table 4.

Table 4. Criteria for Student Learning Motivation

Range	Criteria
81.25–100.0	Excellent
62.51–81.25	Good
43.76–62.50	Less
25.00–43.75	Invalid

The grid for the science process skills' observation sheet can be seen in Table 5 and the criteria for the science process skills' observation sheet can be seen in Table 6.

Table 5. Science Process Skills Instrumental Grid

Indicator of science process skills
Observation
Classification
Communication
Measure
Designing experiments
Analysing experiments
Doing experiments
Collecting and processing data
Prediction
Creating data tables
Conclusion

Then, the range of criteria can be seen in Table 6.

Table 6. Criteria for Science Process Skills

Range	Criteria
78.1 – 96.0	Excellent
60.1 – 78.0	Good
42.1 – 60.0	Less
24.0 – 42.0	Invalid

2.4 Data Analysis

The data analysis technique in this study used descriptive statistical analysis and inferential statistics. Descriptive statistics were used to analyse the data obtained from the calculation of the mean, median, mode, standard deviation, maximum value, minimum value and range (Marquezin et al., 2016; Río & Fernández, 2016). Inferential statistics is a technique for processing data with the aim

of testing a proposed hypothesis in order to get a conclusion. Inferential statistics consist of prerequisite tests and hypothesis testing (Dewi et al., 2019). Inferential statistics are used to test hypotheses consisting of prerequisite tests, namely normality test, homogeneous test and linearity test, then followed by hypothesis testing, namely multiple linear regression test and *t*-test. The flow chart in shown in Figure 1.

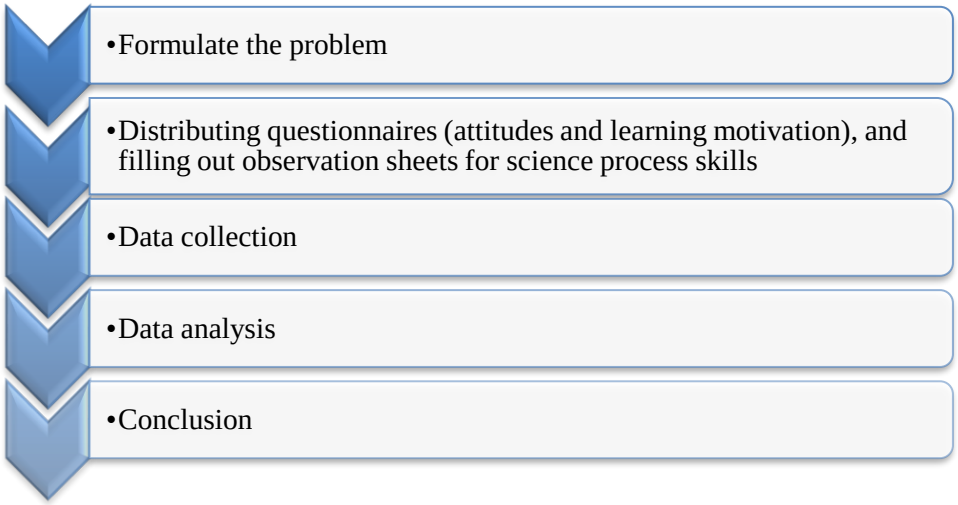

Figure 1. Research procedure

3. Result

This research was conducted to determine the effect of attitudes and learning motivation on students' science process skills. The results of the data are obtained from the distribution of students' attitude questionnaires, students' learning motivation questionnaires and science process skills' observation sheets. The results of the research or analysis of research data are used as guidelines for further research on the influence and relationship of attitudes and learning motivation on science process skills. The update in this research is to look at the effect of attitudes and learning motivation on science process skills.

The results of the descriptive analysis of students' attitudes in the science learning process can be seen in Table 7.

Table 7. Descriptive analysis of students' attitude

Classsification		Total	%	Mean	Min	Max
Range	Criteria					
32.6 – 40.0	Excellent	21	19.6	27.96	21	36
25.1 – 32.5	Good	132	80.5			
17.6 – 25.0	Less	0	0			
10.0 – 17.5	Invalid	0	0			

Based on Table 7, it was found that 80.5% (132 of 153 students) had a good attitude in science learning and 19.6% (21 of 153 students) had a very good attitude. This is also supported by the average student attitude score of 27.96 with good criteria and a maximum score of 36 with very good

criteria. The results of the descriptive statistics show that the average student's attitude is in good and very good criteria in learning science.

Then, the results of the descriptive analysis of students' learning motivation questionnaire in the science learning process can be seen in Table 8.

Table 8. Descriptive analysis of students' learning motivation

Classsification		Total	%	Mean	Min	Max
Range	Criteria					
81.25 – 100.0	Excellent	18	11.8	81.92	60	100
62.51 – 81.25	Good	111	72.8			
43.76 – 62.50	Less	24	15.8			
25.00 – 43.75	Invalid	0	0			

Table 8 shows that 18 students (11.8% of students) have very good motivation, 111 students (72.8% students) have good motivation and 24 students (15.8% students) have poor learning motivation. The results of the average value of learning motivation was obtained at 81.92 with very good criteria, with a maximum value of 100 which was in very good criteria. So based on the descriptive results obtained, it is stated that on average students have good and very good learning motivation, although there are still some students who have poor learning motivation in science learning.

Then, the results of the descriptive analysis of the scientific process skills observation sheet can be seen in Table 9.

Table 9. Descriptive analysis of science process skills

Classsification		Total	%	Mean	Min	Max
Range	Criteria					
78.1 – 96.0	Excellent	9	4	66.84	54	84
60.1 – 78.0	Good	111	72.4			
42.1 – 60.0	Less	36	23.5			
24.0 – 42.0	Invalid	0	0			

Table 9 shows that 9 out of 153 students (4% students) have very good science process skills, 111 out of 153 students (72.4% students) have good science process skills and 26 out of 153 students (23.5% students) have poor science process skills. This is supported by the average score of students' science process skills of 66.84 with good criteria. So it can be seen that on average students have good science process skills, but there are still students who have poor science process skills.

Descriptive statistical analysis has been carried out to determine the description of students' attitudes and motivation to learn science process skills. Furthermore, inferential statistical analysis was conducted to see the effect of students' attitudes and motivation on science process skills. The

prerequisite test consists of a normality test and a linearity test. The results of the normality test can be seen in Table 6.

Table 10. Normality test results

	Kolmogorov-Smirnov Z	Sig. (2-tailed)
Student Attitude	.236	.071
Learning Motivation	.246	.064
Science Process Skills	.226	.066

Based on Table 10, the obtained results of the sig. value on student attitudes, learning motivation and science process skills are greater than 0.005, namely 0.071, 0.064 and 0.066, respectively. So according to the basis of decision-making in the normality test, it can be concluded that the data on student attitudes, student motivation and science process skills are data with normal distribution. Then, the linearity test was carried out with the results of the linearity test being shown in Table 11.

Table 11. Linearity test results

	Sig.
Science Process Skills* Student Attitude	,022
Science Process Skills * Learning Motivation	,011

Based on Table 11, the linearity test results obtained have significance values of 0.022 and 0.011. The significance values obtained are smaller than 0.05; thus, it can be concluded that the data used in this study has a linear relationship. The data has been declared to be normally and linearly distributed so that it can be continued at the hypothesis testing stage, namely the multiple linear regression test. The results of multiple linear regression can be seen in Table 12.

Table 12. Summary model of students' attitude variables and learning motivation on science process skills

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
1	254	504	.239	6.85389

Based on Table 12, the *R*-value is a symbol of the correlation coefficient value. The correlation value between students' attitude variables and learning motivation towards science process skills is 0.504. This value shows that the relationship between the three research variables is in the medium category. In addition, when viewed from the value of R^2, it is known that the variables of student attitudes and learning motivation on science process skills have an effect of 0.504 or equivalent to 50.4%.

Table 13. Analysis of variance

Model		Sum of square	f	Mean Square	F	Sig.
1	Regression	8109.336	2	4054.668	7336.583	000
	Residual	82.900	150	.553		
	Total	8192.235	152			

Table 13 obtains the results to determine the level of significance or linearity of the regression. The criteria in determining the significance level of the regression can be determined based on the *F*-test or significance value test (sig. with the condition that the *F*-test is the data significance value must be less than 0.05). Table 13 shows that the data significance value is 0.000, which means the data used is significant and the model linear regression met the criteria for linearity.

Table 14. Coefficients

Model	Unstandardized Coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.612	11.874		.220	.031
Attitude	.492	.215	.190	.894	.040
Motivation	.644	.249	.760	3.567	.000

4. Discussion

Table 14 shows that the regression equation model obtained constant coefficients and variable coefficients in the unstandardised coefficients column B. Thus, the regression equation model is $Y = 2.612 + 0.492X_1 + 644X_2$.

The results of descriptive statistics state that students' attitudes are in good criteria in science learning as indicated by the mean result of 27.96. Then the students' learning motivation is also in good criteria with the mean result obtained is 81.92. Then the students' science process skills have good criteria with a mean value of 66.84. Based on the results of descriptive statistics obtained, it shows that students' attitudes and learning motivation are in good criteria so that they are in harmony with the results of the science process skills possessed by students in good criteria. The attitude of students obtained in this study in learning science is a positive attitude of students which is evidenced by students having process skills. Good attitude in conducting experiments. It is very important for students to have a scientific attitude in learning science, especially at the junior high school level because students are required to understand science concepts and students are also equipped with the ability to conduct science experiments to trigger students' understanding and insight in understanding science learning. The attitude of students can determine that someone is successful in understanding the material in the learning process. The positive attitude of students is supported by student learning motivation, where learning motivation is the driving force from within the individual to carry out learning activities to increase knowledge and skills as well as experience. Positive student attitudes and good learning motivation have an impact on students' science process skills. Science process skills are very important for everyone to learn and master. If every student has good science

process skills, then students can master the concept of science learning so that the learning process they receive becomes more meaningful.

Then seen from the results of inferential statistics on the assumption test, it states that the data on student attitudes and student motivation towards science process skills are normally distributed and have a linear relationship. This is indicated by the significance value obtained is greater than 0.05. Then on the results of hypothesis testing using multiple linear regression, the results show that the correlation value between the variables of student attitudes and learning motivation towards science process skills is 0.504 and the value of R square is known that the variables of student attitudes and learning motivation on science process skills have an influence of 0.504 or equivalent to 50.4%. Based on the *F* test or the significance value test, it shows that the significance value of the data is 0.000 which means the data used is significant and the linear regression model meets the linearity criteria with the regression equation model: $Y = 2.612 + 0.492X_1 + 644X_2$. So it can be stated that the influence of student attitudes and learning motivation on science process skills is a positive effect. When students have positive scientific attitudes and good learning motivation in science learning, students have good science process skills. Science process skills are skills that apply the scientific method as a whole. The process skills consist of observing, measuring, calculating, classifying, making and using tables and graphs, asking questions, developing hypotheses, planning experiments, identifying variables, controlling variables, formulating operational definitions, interpreting data, making models, drawing conclusions, predicting and communicating (Tantia et al., 2016).

Science process skills are influenced by students' attitudes and learning motivation. In addition, Putra et al. (2015) stated that there was no significant effect between science process skills on understanding science concepts, but there was a significant and positive influence between scientific attitudes on understanding science concepts, and there was a significant and positive influence between science process skills and scientific attitudes on understanding IPA concept. In a study conducted by Isticharoh (2019), it was stated that there was a significant influence between Science process skills and scientific attitudes together on the academic achievement of class VIII junior high school students in South Jakarta. Then, the research conducted by Rahmani et al. (2015) showed that applying the guided inquiry learning model could improve students' science process skills and students' learning motivation on the material properties of light. Research conducted by previous researchers show that there has been no research on the effect of student attitudes and motivation on science process skills. So this study was conducted to complement previous research with the results obtained stating that students' attitudes and learning motivation affect science process skills where when students have a positive attitude and good learning motivation, students have good science process skills in science learning.

Science process skills are skills that must be trained and possessed by students. Students' science process skills are influenced by their attitudes and learning motivation, so the role of the teacher is very important in forming positive attitudes and good learning motivation in order for students to have science process skills. In the learning process, the ability of teachers as mediators and facilitators in managing learning is an important part. Teachers can guide and shape students' scientific attitudes and motivation to learn in order to shape students' science process skills. In the learning process, teaching and learning interactions can motivate students to study well and seriously and students can have a positive attitude. The teacher is responsible as a teacher and class manager. As a teacher and class manager, the teacher is responsible so that students can learn well in a reasonable atmosphere, without pressure, in conditions that stimulate students to learn so that students can concentrate on learning and can improve students' science process skills. If students already have a positive attitude

and good learning motivation, then they have science process skills that can improve their achievement or learning outcomes in science subjects.

The novelty of this research can be seen from how many variables are used by the researcher; this research focuses only on two variables. Elfeky et al. (2020) shows that science process skills can be varied with e-learning. So for this study, it is recommended to vary the use of variables and data used.

5. Conclusion

Attitude is a condition of a person's mental readiness to take a certain action. Everyone has a different attitude. Learning motivation is one of the internal factors that affects the learning process of students which has an important role in providing stimulation, enthusiasm and pleasure in the learning process. Science process skills are students' ability to apply scientific models in understanding, developing and discovering knowledge. In science learning, students' attitudes, learning motivation and science process skills have an important role, especially at the junior high school level because students are required to understand science concepts and students are also equipped with the ability to conduct science experiments to trigger students' understanding and insight in understanding learning. science. Based on the results of descriptive statistical analysis, it was stated that the students' attitudes were in good criteria with an average value of 27.96. Then, students' learning motivation is also in good criteria with an average value of 81.92. Then, students' science process skills have good criteria with an average value of 66.84. After that, an inferential statistical analysis was carried out using a hypothesis test, namely multiple linear regression with the results obtained that the correlation value between the variables of student attitudes and learning motivation towards science process skills was 0.504 and the data significance value was less than 0.05, namely 0.000. So it can be stated that students' attitudes and learning motivation have an effect on science process skills.

6. Recommendation

This research will be more complete if interview data are added to strengthen the findings. Based on this, it will be better if further research is added with qualitative data.

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