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The Effect of Science Attitudes toward Science Process Skills of Junior High School Students in Jambi

Rahmat Perdana*, Asrial, Maison

Graduate School of Science Education, Universitas Jambi, Indonesia

Abstract: The purpose of the research will be to see if there is an influence between students' attitudes and science process skills. Quantitative study with a sample size of 139 students. The research instrument used a questionnaire and an observation sheet. Based on the research results, there are 65.0% of students have very good attitudes in learning science and 64.3% of students' science process skills are categorized as very good. Based on the results obtained, it is known that there is an influence of students' attitudes on students' science process skills. As much as 75.7% of students' process skills in science learning are influenced by students' attitudes and 24.3% of students' science process skills are influenced by other factors. These science process skills can be trained and improved through hands-on experience such as conducting experiments or practicums. Students' science process skills will be good along with a good attitude in learning.

Keywords: science attitude, science process skills, junior high school students.

Abstrak: *Tujuan penelitian akan melihat apakah ada pengaruh antara sikap dan keterampilan proses sains siswa. Penelitian ini merupakan penelitian kuantitatif dengan jumlah sampel 139 siswa. Instrumen penelitian menggunakan angket dan lembar observasi. Berdasarkan hasil penelitian, terdapat 65,0% siswa memiliki sikap sangat baik dalam pembelajaran IPA dan 64,3% keterampilan proses sains siswa dikategorikan sangat baik. Berdasarkan hasil yang diperoleh diketahui bahwa terdapat pengaruh sikap siswa terhadap keterampilan proses sains siswa. Sebanyak 75,7% keterampilan proses siswa dalam pembelajaran IPA dipengaruhi oleh sikap siswa dan 24,3% keterampilan proses sains siswa dipengaruhi oleh faktor lain. Keterampilan proses sains ini dapat dilatih dan ditingkatkan melalui pengalaman langsung seperti melakukan eksperimen atau praktikum. Keterampilan proses sains siswa akan baik seiring dengan sikap yang baik dalam belajar.*

Kata kunci: *sikap sains, keterampilan proses sains, siswa SMP.*

▪ INTRODUCTION

Science is a science that examines natural phenomena and everything in the universe (Hendri & M, 2019; Marr, 2009; Purbosari, 2016). Natural phenomena in science can be reviewed based on the place of occurrence, objects, themes, and problems, so that science learning is a collection of theories that have been tested for truth, explaining related patterns and regularities as well as natural phenomena that have been carefully observed (Gusti et al. al., 2020; Suryaningsih, 2017; Widiana, 2016). In general, science learning is divided into three branches, namely chemistry, biology, and physics. Physics is a science that can train students' scientific process skills in objective, logical, critical, and disciplined thinking in overcoming problems in everyday life (Fitriani et al., 2021; Purwanto et al., 2016). Science learning, especially physics, is very important to learn and apply in life because it can train and improve students' scientific process skills.

Science process skills are defined as a skill that students have in understanding, developing, and discovering knowledge using a scientific method (Charlesworth & Lind,

Rahmat Perdana
*Email: rahmat260997@gmail.com

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2012; Lestari & Diana, 2018; Mutlu, 2020). Science process skills consist of two types, namely basic science process skills and integrated science process skills. Basic science process skills include observing, classifying, communicating, measuring, inferring, and predicting (Rezba et al., 2007; Darmaji, Kurniawan and Irdianti, 2019; Senisum, 2021). Meanwhile, integrated science process skills include identifying variables, tabulating data, presenting data in graphical form, describing relationships between variables, collecting and processing data, analyzing research, formulating hypotheses, operationally defining variables, designing research, and carrying out experiments (Lepiyanto, 2007). 2017; Rosidi, 2016). These science process skills can be trained and improved through direct experience, one of which is through experiments or practicum activities (Royani, Mirawati and Jannah, 2018; Ikhsan, 2020; Ningsi, Purwaningsih and Darmaji, 2021). The views of students in learning science through practical activities can be seen from the attitude aspect.

Attitude is a person's reaction to a certain object, both positive and negative reactions (Ayu & Kurniawati, 2017; Hong et al., 2021). Students' attitudes related to the learning process are inseparable. If students have a negative attitude towards science learning, these students will avoid and avoid, even hate science learning (Nursa'adah, 2015; Yilmaz et al, 2021). Meanwhile, if students have a positive attitude, students will enjoy learning science, eager to learn, their abilities and skills in learning will increase and the achievements obtained may increase (Kurniawan et al., 2019). Therefore, students' attitudes will affect how the learning process and results that will be achieved by students in learning, including students' process skills in conducting practicals. If the students are positive, the students' science process skills will be high, whereas if the students' science process skills are low, the students' science process skills will also be low.

Previous research relevant to this research was conducted by Gasila et al., (2019) on science process skills. The similarity of this research with the research of Gasila et al., (2019) is that they both measure students' science process skills in science learning and use the same level of students, namely junior high school students. The difference is that in this study the material studied in science learning is more specific, namely hydrostatic pressure material, while in the research of Gasila et al., (2019) the material studied is science in general. Another difference is that in this study, the science process skills studied were obtained through practical activities, while in the research by Gasila et al., (2019), science process skills were studied through science questions tests. Furthermore, a relevant research was conducted by Kurniawan et al., (2018) regarding student attitudes in learning. The similarity of this research with the research of Kurniawan et al., (2018) is that they both examine student attitudes in science learning with the research subjects being junior high school students. The difference is that in this study, researchers examined students' attitudes towards science process skills which were not carried out by Kurniawan et al., (2018), the study only examined students' attitudes in learning science and the obstacles they faced.

Based on previous studies, the researcher will conduct research to fill the gaps that exist in previous research by providing innovations that are different from previous research. In this study, the researchers combined two variables to be studied, namely student attitudes and science process skills. Based on these two variables, the researchers conducted this study to examine the problem formulation, namely "How is the influence

of students' attitudes on students' science process skills in learning science?", with the research objectives consisting of:

1. Describe students' attitudes in learning science
2. Describe the science process skills of students in science learning
3. The influence of students' attitudes towards students' science process skills in science learning

▪ METHOD

Research Design

The researcher uses a quantitative approach in this research. Quantitative research is research that focuses primarily on quantitatively analyzing certain objects from a sample of a population for further conclusions to be drawn (Akar & elik, 2019; Hammer & Habib, 2016; Pastore, 2017). Quantitative research is conducted to compare one or more groups with a comparison group to see the difference or influence of a quantitative data (Alkhateeb & Milhem, 2020; Darmaji et al., 2020; Wang & Chang, 2018). Quantitative data is data in the form of numbers or numerics where the data can be calculated for analysis (Perdana et al., 2020; Sumual, 2017; Walsh, 2015). In this study, researchers obtained quantitative data by first preparing data collection instruments.

Instrument

The data collection instrument is a tool used to collect information or data needed in research (Pranatawijaya et al., 2019). This study used instruments in the form of student attitude questionnaires and observation sheets of students' science process skills in science learning. Attitude questionnaires and observation sheets are provided in the form of a Likert scale. The Likert scale is the answer choice in the questionnaire that functions as a scale used to measure the opinions and attitudes of a person or group of people about the object being studied (Joshi et al., 2015; Pranatawijaya et al., 2019; Saputra & Nugroho, 2017). The number of student attitude questionnaire statements is 25 items while the number of observation sheet statements used are 15 items with a Likert scale used is a Likert scale 4 answer choices from very poor to very good intervals. The following table presents the categories of student attitude questionnaire scores in science learning.

Table 1. Categories of student attitude questionnaires in science learning

Indicator	Interval	Category
Social implications of science	5.00 – 8.75	Not very good
	8.76 – 12.50	Not good
	12.51 – 16.25	Good
	16.26 – 20.00	Very good
Fun in learning science and Interest in a career in science	10.00 – 17.50	Not very good
	17.51 – 25.00	Not good
	25.01 – 32.50	Good
	32.51 – 40.00	Very good

Table 1 is a category of student questionnaires in science learning with 25 statements from the very bad, not good, good, and very good categories. Furthermore, for

the category of observation sheets in measuring students' science process skills in the hydrostatic pressure practicum, it is presented in table 2.

Table 2. Categories of students' science process skills

Indicator	Interval	Category
Observe	8.00 – 14.00	Not very good
	14.01 – 20.00	Not good
	20.01 – 26.00	Good
	26.01 – 32.00	Very good
Classify	4.00 – 7.00	Not very good
	7.01 – 10.00	Not good
	10.01 – 13.00	Good
	13.01 – 16.00	Very good
Measure	6.00 – 11.00	Not very good
	11.01 – 16.00	Not good
	16.01 – 21.00	Good
	21.01 – 26.00	Very good

Table 2. students' science process skills in the hydrostatic pressure practicum with 15 statements from the very bad, not good, good, and very good categories.

Participant

After the data collection instrument has been prepared, the instrument can be used to collect research data from samples in a population. The population involved in this study were students of SMP Negeri in Muara Jambi. The entirety of all the studied subjects is referred to as the population (Effendi-Hasibuan et al., 2020; Hashim et al., 2021; Rusydiyah et al., 2020). Some of the subjects from a population that are considered to be able to represent the population are called samples (Darmaji et al, 2019; Mazen & Tong, 2020; Sugiyono, 2007). The sample in this study was the 8th grade junior high school students as many as 139 students. Samples were taken from the population using purposive sampling technique. Sampling with purposive techniques is used in selecting research samples that are in accordance with the research objectives to maximize the results of the information obtained (Mosabala, 2018; Najoli, 2019; Rohmah & Sutiarso, 2018). The criteria for selecting the sample itself are 8th grade junior high school students who have studied science lessons, especially physics on hydrostatic pressure material.

Analysis Data

After the data from the research sample has been collected, the data can be analyzed. The data analysis was carried out by descriptive statistics and inferential statistics. Descriptive statistics are used to obtain the mean, median, mode, and so on from each distribution table, while for inferential statistics using assumption tests and hypothesis testing (Ismajli & Imami-Morina, 2018; Tambunan et al., 2021; Yalçın, 2017). The assumption test used is the normality, and linearity test then the data can be tested for hypotheses (Chen et al., 2018; Ong et al., 2021; Ozdemir et al., 2018). While the hypothesis test used is a linear regression test. Linear regression is used to see the effect of one variable on another variable, if a significance value is obtained below 0.05 then

the tested variable has an influence on other variables (Buchori & Cintang, 2018; Ertikanto et al., 2018; Pan, 2017).

▪ RESULT AND DISSCUSSION

The first time the researcher conducted data analysis was to perform descriptive statistics using the help of IBM SPPS 23. The descriptive test results from the questionnaire data on student attitudes in science learning can be seen in table 3 below.

Table 3. Descriptive test of the results of student attitudes in learning science

Interval	Category	f	%	mean	min	max
25.00 – 43.5	Not very good	0	0 %			
43.76 – 62.50	Not good	8	5.7 %	16.88	10.00	20.00
62.51 – 81.25	Good	41	29.3 %			
18.26 – 100.0	Very good	91	65.0 %			

Table 3 is a descriptive test of the results of the student attitude questionnaire in science learning with the dominant students having a very good attitude towards science with a percentage of 65% or as many as 91 students out of 139 students having a very good attitude. as for the average score obtained is 16.88, the minimum score is 10.00 and the maximum score is 20.00. The percentage of students' attitudes per attitude indicator is presented in table 4 below.

Table 4. Percentage (%) of students' attitudes towards science learning for each indicator

Indicator	Category			
	Very not Good (%)	Not Good (%)	Good (%)	Very Good (%)
Social implications of science	0	3.7	28.8	67.5
Fun in learning science	0	5.7	31.3	63.0
Interest in a career in science	0	6.0	34.7	59.3

Based on table 4, it can be seen that the percentage of students' attitudes on the indicators of social implications of science in general is categorized as very good with a percentage of 67.5%, on the indicator of Enjoyment in learning science of 63.0%, and on the indicator of interest in a career in science/science of 59 ,3%. Thus, it can be concluded that the overall indicators of student attitudes in science learning are very good. Furthermore, the descriptive test results from the observation sheet data on students' science process skills in science learning can be seen in table 5 below.

Table 5. Descriptive Test Results of Student Science Process Skills Observation Sheet

Interval	Category	f	%	mean	min	Max
18.00 – 31.50	Not very good	0	0 %			
31.51 – 45.00	Not good	7	5.0 %	60.45	36.00	72.00
45.01 – 58.50	Good	43	30.7			
58.51 – 72.00	Very good	93	64.3 %			

Table 5 is a descriptive test of the results of students' science process skills in science learning with dominant students having excellent skills in science with a percentage of 64.3% or as many as 93 students out of 139 students having very good skills. As for the average score obtained is 60.45, the minimum score is 36.00 and the maximum score is 72.00. As for the percentage of students' science process skills, each indicator is presented in table 6 below.

Table 6. Descriptive Test Results of Student Science Process Skills Observation Sheet

Indicator	Category			
	Very Not Good (%)	Not Good (%)	Good (%)	Very Good (%)
Observe	0	0	7.5	92.5
Classify	0	2.1	9.7	88.2
Measure	3.7	6.7	8.3	81.3

Based on table 6, it can be seen that the percentage of students' science process skills on the observing indicator is in the very good category with a percentage of 92.5%, the classification indicator is 88.2%, and the measuring indicator is 59.3%. Thus, it can be concluded that the overall indicators of students' science process skills in science learning are very good. Based on the data that has been presented in table 3-6 related to the descriptive test, it is known that the results of the student attitude questionnaire in science learning as many as 139 dominant students have a very good attitude with a percentage of 65%, while the results of the descriptive test The students' science process skills, which were seen based on the results of the analysis of the observation sheet, it was known that students had very good science process skills with a percentage of 64.3%. As for each indicator of student attitudes, 67.5% of students have very good attitudes on indicators of social implications of science, 63.5% on indicators of learning pleasure in the very good category, and 59.3% on indicators of interest in science. It appears that the highest student attitudes are found in the indicators of the social implications of science. Furthermore, on the indicators of students' science process skills, the percentage for observing indicators is 92.5% in the very good category, the classification indicators with a percentage of 88.2% in the very good category, and the measuring indicator is 81.3% in the very good category. good. Thus, it is known that students' attitudes and students' science process skills are generally categorized as very good.

After conducting a descriptive test, it can be continued with the first assumption test, namely the normality test and homogeneity test. Based on the tests that have been carried out, the results showed that the data were normal (0.56) and linierity (0.04) which was indicated by a significant value of more than 0.05 for normality and linierity below significany 0.05. After the normality and linierity test has been carried out, then proceed to the last assumption test. After the assumption test was completed, and it was found that the distribution of the data had met the requirements to test the hypothesis, the researcher continued by conducting a regression test with the results presented in table 7 below.

Table 7. Linear regression analysis of students' attitudes toward students' science process skills on science learning

Model	Unstandardized Coefficient		Standardized Coefficient	T	Sig
	B	Std.Error	Beta		
(Constant)	33.759	5.584	.790	6.046	.000
Attitude	.634	.067		9.468	.001

Based on table 7, it is known that the significance value obtained is 0.001. In accordance with the basis of decision making on the regression test, it can be concluded that there is an influence of students' attitudes on students' science process skills in science learning. This is because the significance value obtained is smaller than 0.05. Furthermore, to find out how big the percentage of the influence of students' attitudes on the science process skills can be seen by looking at table 8 below.

Table 8. Regression and determination coefficient

Model	R	R Square	Adjust R Square	Std. Error of the Estimate
1	,870[a]	,757	,617	5,733

Based on table 8 by looking at the R Square column, the results are 0.757. This interpretation that the influence of students' attitudes towards students' science process skills is 75.7% while 24.3% of students' science process skills is influenced by other variables not examined. Based on the results of hypothesis testing using regression testing to determine the effect of students' attitudes on students' science process skills, a significance value of 0.001 was obtained. The basis for decision making in the regression test is if the significance value is greater than 0.001 then there is no influence between the two variables, and if the significance value obtained is less than 0.05 then there is an influence between the two variables. Because in this study, the significance value obtained is smaller than 0.05, then "there is an influence of students' attitudes towards science process skills in science learning". The percentage of attitudes affecting students' science process skills is 75.7%, while 24.3% is influenced by other variables not examined.

This research was conducted to complete the gaps that exist in previous studies. One of these studies was conducted by Gasila et al., (2019) which discussed students' science process skills. The results of this study indicate that the science process skills of State Junior High School students in Pontianak City are based on each indicator, the indicator that has the highest value is the observing indicator with an average value of 89.9 with a very good category. The similarity of this research with the research of Gasila et al., (2019) is that they both measure students' science process skills in science learning with the samples used are junior high school students. The difference is that in this study the sample was selected using a purposive sampling technique while in this study using a random sampling technique, the material studied in this study was a more specific natural science material, namely hydrostatic pressure, while in the research of Gasila et al., (2019) the material used was hydrostatic pressure. studied is IPA in general. Another difference is that in this study, the science process skills studied were obtained through practicum

activities, while in the research by Gasila et al., 2019 science process skills were studied through a test of science questions.

In this study, science process skills and critical thinking skills based on observations during practical activities showed that female students dominated science process skills and students' critical thinking skills. The role or impact of science process skills in the teaching and learning process in the classroom and daily life is very significant. Science process skills can grow and practice critical and logical thinking skills in solving problems in people's lives. Experience or science process skills that involve students directly are much better in the absorption of students' long-term memory. Students tend to be less likely to have misconceptions with science process skills because direct experience will make students more aware of concepts, trained to think critically and have an impact on good learning outcomes. Students who have low science process skills and critical thinking skills will be different from the learning outcomes of students who have good science process skills and critical thinking skills.

Based on previous studies that are relevant to this research, the researcher intends to examine the effect of students' attitudes on students' science process skills that have not been carried out by previous researchers as a form of renewability of research conducted by researchers. In this study, the researcher wanted to see three indicators of student attitudes, namely the social implications of science, enjoyment in learning science, and interest in a career in science. And also look at the three indicators of students' science process skills, namely the indicators of basic science process skills in the form of observing, classifying, and measuring.

This research can contribute to improving the quality of education, especially in learning activities, one of which is through practicum activities. According to (Imran, 2016) one alternative that can make students more active in learning activities is real learning such as practicum which can develop students' science process skills. This is supported by the statement of Rahayu & Anggraeni, (2017) that students' scientific research skills can be improved by direct experiences in learning. Because through direct experience, students can better appreciate the process or activity that is being carried out. During the direct learning experience, it will be known how the students' attitudes in these activities and learning will be. A positive attitude can have a good impact on students and a bad attitude can have a bad impact on students.

Therefore, the researcher recommends that future researchers can use the results of this study as a reference material for further research and fill in the existing gaps. Future researchers are expected to be able to examine students' attitudes with other indicators that have not been studied by this research and also examine other indicators on students' science process skills such as integrated process skills that have not been carried out in this study. Not only in science learning, especially physics, further researchers can examine other lessons that may also have an influence on students' attitudes towards students' science process skills in the learning

▪ CONCLUSION

The conclusion of this research is that 65.0% of students have a very good attitude towards science learning and 64.3% of students' science process skills are categorized as very good. Based on the results that have been obtained, it is known that there is an influence of students' attitudes towards students' science process skills with a significance

value of 0.001. As much as 75.7% of students' process skills in science learning are influenced by students' attitudes and 24.3% of students' science process skills are influenced by other factors not examined. These science process skills can be trained and improved through hands-on experience such as conducting experiments or practicums. Students' science process skills will be good along with a good attitude in learning.

▪ REFERENCES

Akar, H., & Çelik, O. T. (2019). Organizational justice and cynicism: A mixed method study at schools. *International Journal of Evaluation and Research in Education, 8*(1), 189–200.

Alkhateeb, M. A., & Milhem, O. A. Q. B. (2020). Student's concepts of and approaches to learning and the relationships between them. *Cakrawala Pendidikan, 39*(3), 620–632.

Ayu, S. M., & Kurniawati, T. (2017). *Hubungan Tingkat Pengetahuan Remaja Putri Tentang Aborsi dengan Sikap Remaja Terhadap Aborsi di Man 2 Kediri Jawa Timur* [The Relationship between the Knowledge Level of Young Women About Abortion and Adolescent Attitudes towards Abortion in Man 2 Kediri, East Java]. *Unnes Journal of Public Health, 6*(2), 97–100.

Buchori, A., & Cintang, N. (2018). The Influence of Powtoon-Assisted Group to Group Exchange and Powtoon-Assisted Talking Chips Learning Models in Primary Schools. *International Journal of Evaluation and Research in Education (IJERE), 7*(3), 221.

Charlesworth, R., & Lind, K. K. (2012). Math and science for young children. Wadsworth Cengage Learning: Boston.

Chen, Y. F., Luo, Y. Z., Fang, X., & Shieh, C. J. (2018). Effects of the application of computer multimedia teaching to automobile vocational education on students' learning satisfaction and learning outcome. *Eurasia Journal of Mathematics, Science and Technology Education, 14*(7), 3293–3300.

Darmaji, D., Kurniawan, D. A., & Irdianti, I. (2019). Physics education students' science process skills. *International Journal of Evaluation and Research in Education (IJERE), 8*(2), 293.

Darmaji, Kurniawan, D. A., Astalini, Perdana, R., Kuswanto, & Ikhlas, M. (2020). Do a science process skills affect on critical thinking in science? Differences in urban and rural. *International Journal of Evaluation and Research in Education, 9*(4), 874–880.

Darmaji, D., Astalini, A., Kurniawan, D. A., & Perdana, R. (2019). A study relationship attitude toward physics, motivation, and character discipline students senior high school, in Indonesia. *International Journal of Learning and Teaching*, *11*(3), 99-109.

Effendi-Hasibuan, M. H., Fuldiaratman, Dewi, F., Sulistiyo, U., & Hindarti, S. (2020). Jigsaw learning strategy in a diverse science-classroom setting: Feasibility, challenges, and adjustment. *Cakrawala Pendidikan, 39*(3), 733–745

Ertikanto, C., Rosidin, U., Distrik, I. W., Yuberti, Y., & Rahayu, T. (2018). Comparison of mathematical representation skill and science learning result in classes with problem-based and discovery learning model. *Jurnal Pendidikan IPA Indonesia, 7*(1), 106–113.

Fitriani, R., Maryani, S., Chen, D., Aldila, F. T., Br.Ginting, A. A., Sehab, N. H., & Wulandari, M. (2021). *Mendeskripsikan Keterampilan Proses Sains Siswa melalui Kegiatan Praktikum Viskositas di SMAN 1 Muaro Jambi* [Describing Students' Science Process Skills through Viscosity Practicum Activities at SMAN 1 Muaro Jambi]. *PENDIPA Journal of Science Education, 5*(2), 173–179.

Gasila, Y., Fadillah, S., & Wahyudi. (2019). Analisis Keterampilan Proses Sains Siswa dalam Menyelesaikan Soal IPA di SMP Negeri Kota Pontianak [Analysis of Students' Science Process Skills in Solving Science Problems at Pontianak City Junior High School]. *Primary: Jurnal Pendidikan Guru Sekolah Dasar, 6*(1), 14–22.

Gusti, A. R., Afriansari, Y., Sari, D. V., & Walid, A. (2020). Penilaian Afektif Pembelajaran Daring IPA Terpadu dengan Menggunakan Media Whatsapp [Affective Assessment of Integrated Science Online Learning by Using Whatsapp Media]. *Diffraction, 2*(2), 65–73.

Hammer, H. L., & Habib, L. (2016). A quantitative analysis of uncertainty in the grading of written exams in mathematics and physics. *Eurasia Journal of Mathematics, Science and Technology Education, 12*(4), 975–989.

Hashim, M., Shariff, M. D. M., Mahat, H., Norkhaidi, S. B., Nayan, N., & Saleh, Y. (2021). Water-saving among school students in malaysia. *Cakrawala Pendidikan, 40*(1), 32–42

Hendri, S., & M, H. (2019). *Identifikasi Literasi Sains Mahasiswa (Studi Kasus Mahasiswa STISIP Amal Ilmiah Yapis Wamena)* [Identification of Student Scientific Literacy (Case Study of STISIP Amal Scientific Student Yapis Wamena)]. *Journal of Natural Science and Integration, 2*(1), 95–104.

Hong, J. C., Hsiao, H. S., Chen, P. H., Lu, C. C., Tai, K. H., & Tsai, C. R. (2021). Critical attitude and ability associated with students' self-confidence and attitude toward "predict-observe-explain" online science inquiry learning. *Computers & Education, 166*, 104172.

Ikhsan, M. (2020). *Peningkatan Kemampuan Keterampilan Proses Sains melalui Praktikum Sederhana di SDN 004 Filial Kutai Kartanegara* [Improving Science Process Skills Ability through Simple Practicum at SDN 004 Filial Kutai Kartanegara]. *JMM (Jurnal Masyarakat Mandiri), 4*(2), 225–233.

Imran, M. E. (2016). *Penerapan Scientific pada Pengembangan Perangkat Pembelajaran IPA untuk Melatihkan Keterampilan Berpikir siswa* [Scientific Applications in the Development of Science Learning Tools to Practice Students' Thinking Skills]. *Jurnal Kajian Pendidikan Dasar, 1*, 23–24.

Ismajli, H., & Imami-Morina, I. (2018). Differentiated instruction: Understanding and applying interactive strategies to meet the needs of all the students. *International Journal of Instruction, 11*(3), 207–218.

Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert scale: Explored and explained. *British journal of applied science & technology, 7*(4), 396.

Kurniawan, Dwi Aagus, Astalini, & Kurniawan, N. (2019). *Identifikasi Sikap Siswa Terhadap Mata Pelajaran IPA di SMP Se Kabupaten Muaro Jambi* [Identification of Students' Attitudes towards Science Subjects in Junior High Schools in Muaro Jambi Regency]. *Jurnal Pijar Mipa, 14*(2), 111–127.

Kurniawan, Dwi Agus, Astalini, & Anggraini, L. (2018). *Evaluasi Sikap Siswa SMP Terhadap IPA di Kabupaten Muaro Jambi* [Evaluation of Middle School Students' Attitudes towards Science in Muaro Jambi Regency]. *Jurnal Ilmiah Didaktika, 19*(1), 124–139.

Lepiyanto, A. (2017). *Analisis Keterampilan Proses Sains pada Pembelajaran Berbasis Praktikum* [Analysis of Science Process Skills in Practicum-Based Learning]. *BIOEDUKASI (Jurnal Pendidikan Biologi), 5*(2), 156.

Lestari, M. Y., & Diana, N. (2018). *Keterampilan Proses Sains (KPS) pada Pelaksanaan Praktikum Fisika Dasar I* [Science Process Skills (KPS) in the Implementation of Basic Physics Practicum I]. *Indonesian Journal of Science and Mathematics Education, 1*(1), 49–54.

Marr, M. J. (2009). The natural selection: behavior analysis as a natural science. *European Journal of Behavior Analysis, 10*(2), 103–118.

Mazen, J. A., & Tong, X. (2021). Bias correction for replacement samples in longitudinal research. *Multivariate Behavioral Research, 56*(5), 805-827.

Mosabala, M. (2018). Teachers' transformed subject matter knowledge structures of the Doppler Effect. *Eurasia Journal of Mathematics, Science and Technology Education, 14*(6), 2407–2417.

Najoli, E. K. (2019). The effectiveness of wited programme on enrollment of women in technical and vocational education and training (TVET). *Eurasia Journal of Mathematics, Science and Technology Education, 15*(3).

Ningsi, A. P., Purwaningsih, S., & Darmaji. (2021). *Pengembangan penuntun Praktikum Ekektronik Berbasis Keterampilan Proses Sains Materi Suhu dan Kalor untuk SMP/MTs* [Development of an Electronic Practicum Guide Based on Science Process Skills in Materials of Temperature and Heat for SMP/MTs]. *Edumaspul: Jurnal Pendidikan, 5*(1), 242–252.

Nursa'adah, F. P. (2015). *Pengaruh Metode Pembelajaran dan Sikap Siswa pada Pelajaran IPA Terhadap Hasil Belajar IPA* [The Influence of Learning Methods and Student Attitudes in Science Lessons on Science Learning Outcomes]. *Formatif: Jurnal Ilmiah Pendidikan MIPA, 4*(2), 112–123.

Ong, E. T., Govindasamy, D., Singh, C. K. S., Ibrahim, M. N., Wahab, N. A., Borhan, M. T., & Tho, S. W. (2021). The 5E inquiry learning model: Its effect on the learning of electricity among malaysian students. *Cakrawala Pendidikan, 40*(1), 170–182.

Ozdemir, B., Cakir, O., & Hussain, I. (2018). Prevalence of Nomophobia among university students: A comparative study of Pakistani and Turkish undergraduate students. *Eurasia Journal of Mathematics, Science and Technology Education, 14*(4), 1519–1532.

Pan, W. T. (2017). A newer equal part linear regression model: A case study of the influence of educational input on gross national income. Eurasia Journal of Mathematics, *Science and Technology Education, 13*(8), 5765–5773.

Pastore, S. (2017). Research Designs and Methods in Self-assessment Studies: A Content Analysis. *International Journal of Evaluation and Research in Education (IJERE), 6*(4), 257.

Perdana, I., Saragi, R. E. S., & Aribowo, E. K. (2020). Students ' Perception of Utilizing Kahoot In Indonesian Language Learning. *Kwangsan: Jurnal Teknologi Pendidikan, 8*(2), 290–306.

Pranatawijaya, V. H., Widiatry, W., Priskila, R., & Putra, P. B. A. A. (2019). *Penerapan Skala Likert dan Skala Dikotomi Pada Kuesioner Online* [Application of Likert Scale and Dichotomy Scale in Online Questionnaire]. *Jurnal Sains Dan Informatika, 5*(2), 128–137.

Purbosari, P. M. (2016). *Pembelajaran Berbasis Proyek Membuat Ensiklopedia Ilmu Pengetahuan Alam (Ipa) untuk Meningkatkan Academic Skill pada Mahasiswa* [Project-Based Learning Creates an Encyclopedia of Natural Sciences (Science) to Improve Academic Skills in Students]. *Scholaria : Jurnal Pendidikan Dan Kebudayaan, 6*(3), 231–238.

Purwanto, A., Hendri, M., & Susanti, N. (2016). *Studi Perbandingan Hasil Belajar Siswa Menggunakan Media PhET Simulations dengan Alat Peraga pada Pokok Bahsan Listrik Magnet di Kelas IX SMPN Kabupaten Tebo* [Comparative Study of Student Learning Outcomes Using PhET Simulations Media with Teaching Aids on Magnetic Electricity Subject in Class IX SMPN Tebo Regency]. *Jurnal EdulFisika, 1*(1), 22–27.

Rahayu, A. H., & Anggraeni, P. (2017). *Analisis Profil Keterampilan Proses Sains Siswa Sekolah Dasar Di Kabupaten Sumedang* [Profile Analysis of Science Process Skills of Elementary School Students in Sumedang Regency]. *Pesona Dasar (Jurnal Pendidikan Dasar Dan Humaniora), 5*(2), 22–33.

Rohmah, M., & Sutiarso, S. (2018). Analysis problem solving in mathematical using theory Newman. *Eurasia Journal of Mathematics, Science and Technology Education, 14*(2), 671–681.

Rosidi, I. (2016). *Pengembangan Lembar Kegiatan Siswa Berorientasi Pembelajaran Penemuan Terbimbing (Guided Discovery Learning) Untuk Melatihkan Keterampilan Proses Sains* [Development of Guided Discovery Learning Oriented Student Activity Sheets to Practice Science Process Skills]. *Jurnal Pena Sains, 3*(1), 55–63.

Royani, I., Mirawati, B., & Jannah, H. (2018). *Pengaruh Model Pembelajaran Langsung Berbasis Praktikum Terhadap Keterampilan Proses Sains dan Kemampuan Berpikir Kritis Siswa* [The Effect of Practicum-Based Direct Learning Model on Science Process Skills and Students' Critical Thinking Ability]. *Prisma Sains : Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika Dan IPA IKIP Mataram, 6*(2), 46–55.

Rusydiyah, E. F., Purwati, E., & Prabowo, A. (2020). How to use digital literacy as a learning resource for teacher candidates in Indonesia. *Cakrawala Pendidikan, 39*(2), 305–318

Saputra, P. A., & Nugroho, A. (2017). *Perancangan Dan Implementasi Survei Kepuasan Pengunjung Berbasis Web Di Perpustakaan Daerah Kota Salatiga* [Design and Implementation of a Web-Based Visitor Satisfaction Survey at the Salatiga City Regional Library]. *JUTI: Jurnal Ilmiah Teknologi Informasi, 15*(1).

Senisum, M. (2021). Keterampilan Proses Sains Siswa SMA dalam Pembelajaran Biologi. Jurnal Pendidikan Dan Kebudayaan Missio, 13(1), 76–89. https://doi.org/10.36928/jpkm.v13i1.661

Sugiyono. (2007). *Metode Penelitian pedidikan pendekatan kuantitatif, kualitatif, dan R&D*. ALFABETA.

Sumual, M. Z. I. (2017). Evaluation of Primary School Teachers' Competence in Implementing 2013 Curriculum: a Study in Tomohon City. *Journal of Education and Learning, 11*(3), 343–350.

Suryaningsih, Y. (2017). *Pembelajaran Berbasis Praktikum Sebagai Sarana Siswa untuk Berlatih Menerapkan Keterampilan Proses Sains dalam Materi Biologi* [Practicum-Based Learning as a Means for Students to Practice Applying Science Process Skills in Biological Materials]. *Jurnal Bio Education, 2*(2), 49–57.

Tambunan, H., Sinaga, B., & Widada, W. (2021). Analysis of teacher performance to build student interest and motivation towards mathematics achievement. *International Journal of Evaluation and Research in Education, 10*(1), 42–47.

Walsh, I. (2015). Using quantitative data in mixed-design grounded theory studies: An enhanced path to formal grounded theory in information systems. *European Journal of Information Systems, 24*(5), 1–27.

Wang, S., Kirillova, K., & Lehto, X. (2017). Travelers' food experience sharing on social network sites. *Journal of Travel & Tourism Marketing, 34*(5), 680-693.

Wang, H., & Chang, T. C. (2018). A new mental experience quantification and emotion prediction model for E-learning users. *Eurasia Journal of Mathematics, Science and Technology Education, 14*(6), 2623–2638.

Widiana, I. W. (2016). *Pengembangan Asesmen Proyek Dalam Pembelajaran Ipa di Sekolah Dasar* [Development of Project Assessment in Science Learning in Elementary School]. *JPI (Jurnal Pendidikan Indonesia), 5*(2), 147–157.

Yalçın, S. (2017). Teacher Behaviours Explaining Turkish and Dutch Students' Mathematic Achievements. *International Journal of Evaluation and Research in Education (IJERE), 6*(2), 174–182.

Yilmaz, E., & Korur, F. (2021). The effects of an online teaching material integrated methods on students' science achievement, attitude and retention. *International Journal of Technology in Education, 4*(1), 22-45.