



Analysis of Students' Understanding of Environmental Pollution: Perception, Attitude and Awareness of Students towards Environment in Sidoarjo

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Article Info

History Articles
Received:
13 December 2023
Accepted:
15 January 2024
Published:
30 March 2024

Keywords:
*Understanding,
Environment, and
Environmental Pollution*

Abstract

This study aims to describe the level of students' understanding of environmental pollution, describe the level of perception, attitude, and awareness of students toward environmental pollution, and describe the relationship between variables (perception, attitude, and awareness) that affect students' understanding of environmental pollution. Non-experimental quantitative research using a survey method, with environmental understanding test questions and perception, attitude and awareness questionnaires. The population amounted to 9 schools out of 191 using a random sampling technique and 500 samples of grade IX students. Based on the results of the study, it is stated that all variables are positively interrelated between all variables. The level of student understanding of environmental pollution obtained an average percentage of 76% good criteria. The level of student perceptions of environmental pollution obtained a percentage of 83.11% very good category. The level of student attitudes towards environmental pollution obtained a percentage of 85.95% very good category. The level of student awareness of environmental pollution obtained a percentage of 82.87% very good category. The relationship between variables that has the greatest influence is on the influence of awareness on attitudes with a value of 0.194 with a value of $P \geq 0.05$, so the significant value has a positive influence.

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p-ISSN 2252-6420
e-ISSN 2503-1732

INTRODUCTION

The environment is currently a common concern for people in their daily lives and is an inseparable spatial unit of living things, consisting of plants, animals, and humans (Handayani et al., 2022). The life of living things, especially humans, is very dependent on the environment they live in. There is a relationship between living things and the environment that causes problems in the environment. Environmental problems that arise can cause the sustainability of life and the welfare of humans and other living things to be disrupted. The level of environmental problems in developing countries is higher than environmental problems in developed countries (Briggs, 2003). The level of environmental problems in developing countries is dominated by industry and factory construction, in solving environmental problems with technology transfer carried out by developed countries to developing countries is less effective in helping problems and tends to benefit developed countries (Dhenge et al., 2022), so the level of environmental problems in developing countries is higher than environmental problems in developed countries.

Environmental problems that experience pollution have become a global issue that is widely discussed both from the global environment and the national scope (Pratiwi et al., 2019). Environmental problems in Indonesia have become an international concern, especially the shrinkage of forest areas, waste management that has not been done optimally, and various regions of Indonesia which act as the lungs of the world have experienced air, water, and soil pollution (Rahmani & Rahiem, 2023). Based on the data that has been recorded, 77% of the land in Indonesia is over logged due to the diversion of forest functions to be used as land for the palm oil and paper industries (Wahyuni & Suranto, 2021), and 1.7 hectares (ha) of forest in Indonesia has experienced fires per year (Adiputra & Barus, 2018).

Indonesia is the country with the largest waste producer in the world (Septiani et al., 2021), as evidenced by the waste management that has not been carried out optimally, resulting in Indonesia being called a plastic waste emergency crisis (Brotosusilo & Handayani, 2020). According to data from the Indonesian Plastic Industry Association (INAPLAS) and the Central Statistics Agency (BPS) shows that Indonesia produced 64 tons of plastic waste in 2019 (Rahmi & Selvi, 2021), in 2022 Indonesia produced 7.8 tons of waste with 4.9 tons not processed, and the remaining 83% ended up in the sea (Rahmani & Rahiem, 2023). The existence of urbanization and industrialization that occurs in urban areas in Indonesia results in environmental pollution including soil, water, and air pollution. Pollution resulting from urbanization and industrialization affects the quality of public health and causes various diseases (Shao et al., 2022). Human activity is the main factor in determining the quality of the surrounding environment. The Indonesian government has made efforts to develop the environment, such as community development programs, environmental planning programs, as well as management, protection, and education efforts (Gusmadi & Samsuri, 2020).

Environmental management efforts can be carried out to prevent environmental pollution by starting with strategic and sustainable steps, namely through education (Salehi et al., 2016). Education is the right means for the internalization and transformation of beliefs, values, knowledge, and skills in each individual (Edgerton & McKechnie, 2023). According to the opinion of the North American Association of Environmental Education (NAAEE) in 2001, environmental education is an application of a complete comprehensive process in improving human understanding of the environment and the problems experienced (Siddiq et al., 2020). Students' ability to understand the environment can be obtained by interacting directly with environmental problems that occur them (Santoso et al., 2021). Students

can be said to have the ability to understand the environment if they meet the criteria for understanding indicators of environmental pollution, namely (1) Explaining the definition of environmental pollution, (2) Describing the characteristics of environmental pollution, (3) Explaining the causes of environmental pollution, (4) Analyzing the impacts and problems of environmental pollution, (5) Creating efforts to protect the environment. Based on research conducted by Santoso (Santoso et al., 2021) reveals that environmental understanding at SMP Negeri 5 Taman is still lacking due to the number of reading sources related to the environment is still not facilitated and schools have not provided direct learning experiences for students to interact with the environment around the school.

Rahmawati (I. Rahmawati & Suwanda, 2015) revealed that the Adiwiyata program at SMP Negeri 28 Surabaya has not been implemented effectively due to socio-economic conditions and student concerns, this occurs due to a lack of understanding related to the environment and a lack of perception of caring for the surrounding environment, as well as the change of students per year which has an impact on the difficulty of forming students' environmental care behavior (Oğuz et al., 2011). Azhar (Azhar et al., 2016) revealed that the implementation of schools with environmental education and Adiwiyata programs still found many students who lacked awareness of protecting the environment. Iswari (Iswari & Utomo, 2017) revealed that understanding, attitudes, and actions at MA Negeri 1 Serpong are still relatively lacking due to the lack of implementation of environmental education that has not been implemented optimally. It is proven by the data from the Central Bureau of Statistics (2018), that the indifference behavior index to the environment in Indonesia in 2018 showed a figure of 0.51 (Siddiq et al., 2020), which means that students' concern for the environment is still lacking. This imbalance encourages researchers to find out whether

there is a relationship between students' environmental knowledge perceptions, attitudes, and environmental awareness. Najmun Nahar (Halder, 2012) stated that environmental education is included in one of the keys to solving environmental problems and preventing global sustainability, with an understanding of environmental pollution, school residents can realize a healthy environment that aims to avoid negative impacts on the environment (Hafezi et al., 2013).

The importance of environmental literacy in students has an understanding of the environment and preventing environmental pollution that occurs (Jeramat et al., 2019). A student is said to have good perception when he can interpret the information received into an understanding (López et al., 2024). A person with higher environmental awareness tends to be able to take an attitude or action in maintaining the environment so as to attract students to carry out activities that show an attitude of environmental care (Khoiri et al., 2021). Azhar (Azhar et al., 2016) argues that students with high environmental understanding scores have higher environmental care attitudes, and vice versa, if the value of students' environmental understanding is low, the value of their environmental care attitudes is lower.

Students' perceptions, attitudes, and environmental awareness can be said to have a good perception of environmental pollution if they meet the indicator criteria, namely (1) Students are able to know the perception of the causes of environmental pollution, and (2) Students are able to know the perception of the impact of environmental pollution. Students can be said to have a good attitude towards environmental pollution if they meet the indicator criteria, namely (1) Students do not have a negative attitude towards environmental action, and (2) Students have a positive attitude towards environmental action. Meanwhile, to find out whether have good awareness abilities towards environmental pollution if they have

awareness of waste management and their surroundings.

Environmental problems in the Sidoarjo region have been highlighted in the East Java region related to waste problems at the Jabon landfill which holds 350 tons per day (L. D. Rahmawati et al., 2023). Sidoarjo experienced liquid waste pollution in the Krian Subdistrict in 1996 which flooded the irrigation channel of SMPN 3 Krian (Fauzie, 2022). In 2017, there was waste pollution in the Porong River in Sidoarjo caused by PT Pakerin (Indonesian Paper Mill) deliberately dumping its waste in the river, so that people who use the river for their daily lives are disturbed (Fauzie, 2022). In addition, there is the case of the emergence of hot mudflow PT Lapindo which became a national disaster that caused environmental damage beyond the boundaries of Sidoarjo and has disrupted people's lives (Wasista & Nawiyanto, 2014). Based on environmental problems that occur in the Sidoarjo region caused by a lack of environmental awareness (Ilmi, 2017).

Concern for the environment is influenced by knowledge of environmental understanding, with a good understanding of the environment is expected to be used as a reference in maintaining the beauty and sustainability of the environment for students, and can solve the environmental problems they face at this time the attitude of the younger generation that must be developed is a sense of responsibility for the problem of environmental damage (Azhar et al., 2016). The environmental damage that occurred in the Sidoarjo area became the basis of the research and with the source of previous research only carried out abroad and in Indonesia, many were carried out at the high school and university levels, this research focused on the Junior High School (SMP) level in the Sidoarjo area, East Java, Indonesia by considering students have received material about environmental

pollution. Thus, the objectives of this study are to:

Describe students' level of understanding of environmental pollution

Describe the level of students' perceptions, attitudes, and awareness toward environmental pollution.

Describe the relationship between variables (perceptions, attitudes, and awareness) that affect students' understanding of environmental pollutions.

METHODS

Research Design

The research design used in this study is a non-experimental quantitative type of research using the survey method. The main target in this research is junior high school students in the Sidoarjo Regency area. The population used in this study amounted to 191 schools, both public and private schools in Sidoarjo Regency. Data collection techniques using random sampling techniques, by taking 5% of the total number of schools to obtain a population of 9 schools in Sidoarjo Regency by giving members of the population the same opportunity to be sampled by randomizing or drawing (Arieska & Herdiani, 2018).

Sampling Technique

The sampling technique uses a Simple Random Sampling technique or Random Sampling by sampling each member of the population is given the same opportunity to become a sample by randomization or drawing (Arieska & Herdiani, 2018). The samples taken in this study were IX students with the consideration that they had received environmental pollution material in class VII semester 2, as many as 9 schools in Sidoarjo Regency obtained 500 samples. The distribution of the number of student samples for each school is presented in Table 1.

Table 1. Distribution of Sample Number for Each School

School Population	Number of Classes	Number of Students per Class		Total Sample
		I	II	
SMP Negeri 1 Tarik	2	31	32	63
SMP Negeri 2 Tarik	2	24	30	54
SMP Negeri 1 Balongbendo	2	30	31	61
SMP Negeri 1 Wonoayu	2	30	25	55
SMP Negeri 3 Candi	2	33	31	64
SMP Al-Islam Krian	2	30	27	57
SMP Muhammadiyah 1 Sidoarjo	2	30	24	54
SMP Muhammadiyah 6 Krian	2	20	33	53
SMP Muhammadiyah 10 Sidoarjo	2	24	15	39
TOTAL				500

Assessment Instrument

The technique used in this study is to use an instrument of environmental pollution understanding test questions and questionnaires as a means of collecting information or data. The first assessment instrument uses an instrument of

environmental pollution understanding test questions which are arranged in the form of 30 multiple choice questions with 4 answer choices which are then grouped based on 5 indicators of student achievement in understanding environmental pollution which are presented in Table 2.

Table 2. Indicators of Understanding Environmental Pollution

Indicator	Question Number
Explain the definition of environmental pollution	1. 2. 6
Define the characteristics of environmental pollution	3. 7. 8. 23
Explain the causes of environmental pollution	4. 5. 9. 10. 12. 19. 20. 21
Analyze the impact and problems of environmental pollution	11. 13. 14. 16. 17. 22. 26. 27
Create an effort to protect the environment	15. 18. 24. 25. 28. 29. 30

The second assessment instrument uses a questionnaire instrument adapted and developed by Najmun Nahar (Nahar et al., 2023) which uses the English version and translated into Indonesian. The questionnaire used includes related perceptions, attitudes,

and environmental awareness of environmental pollution there are 40 statements with 5 answer options (strongly agree, agree, neutral, disagree, and strongly disagree) which are grouped based on 5 themes presented in Table 3.

Table 3. Questionnaire Themes (Perception, Attitude, and Environmental Awareness towards Environmental Pollution)

Theme	Question Number
Perceptions of causes of environmental pollution	1 – 10
Perceptions of the effects of environmental pollution	11 – 20
Negative attitudes toward environmental actions	21 – 25
Positive attitudes toward environmental actions	26 – 31
Awareness of home and surrounding waste management	31 – 41

Based on the assessment instrument above, to find out the relationship between variables (perception, attitude, and awareness) that affect students' understanding of environmental pollution can be seen in Figure 1.

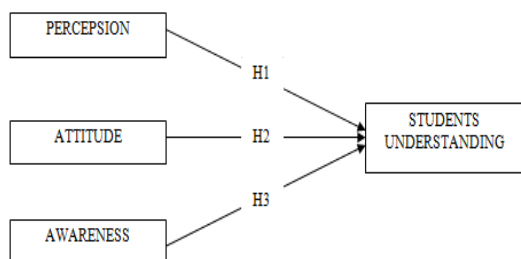


Figure 1. Hypothesis and Research Model Design

The hypotheses in this study are:

Students' perception of the environment that affects students' understanding of environmental pollution.

Students' attitudes towards the environment that affect students' understanding of environmental pollution.

Students' awareness of the environment that affects students' understanding of environmental pollution.

The indicators of each variable and the symbols for the items in the test questions and questionnaires are shown in Table 4.

Table 4. Assessment Variables and Indicators

Variable	Indicator
Student perception of the environment	Perceived causes of environmental pollution Perceived impact of environmental pollution
Students' attitude towards the environment	Negative attitude towards environmental action Positive attitude towards environmental action
Students' awareness of the environment	Awareness of home and surrounding waste management
Students' understanding of environmental pollution	Explain the definition of environmental pollution Define the characteristics of environmental pollution Explain the causes of environmental pollution Analyzing the impact of environmental pollution problems Create an effort to protect the environment

The assessment instruments for the environmental pollution comprehension test and the perception, attitude, and environmental awareness questionnaire on environmental pollution have been tested for validity and reliability. The assessment instrument for the comprehension test was carried out by 2 experts who were declared valid and reliable to be used by students as an assessment instrument. In the table of questionnaire results, the value of (N) = 10 student samples was obtained. The validity test results produced on each variable produce a value $r_{Count} \geq r_{Table}$, so it can be stated that the instrument in this study can be said to be valid. The reliability results obtained from

the variable results produced a Cronbach's alpha value > 0.6319 so it can be concluded that the questionnaire instrument in this study is reliable. The questionnaire assessment instrument was validated by 1 expert in English and declared valid and reliable to be used by students as an assessment instrument.

Data Collection and Analysis

The data collection technique was carried out through an online survey by providing a link to the assessment of environmental pollution understanding test questions and questionnaires of perceptions, attitudes, and environmental awareness of environmental pollution through the class

WhatsApp Group. There are 3 main topics in this study, namely the first to describe the level of students' understanding of environmental pollution using quantitative descriptive techniques, analyzing students' understanding of environmental pollution measured by correct and incorrect answers to environmental pollution questions. The correct answer is given a score of 1 and the wrong or unanswered answer is given a score of 0, then the total score obtained is calculated using the percentage formula for the achievement of students' understanding of environmental pollution by the assessment criteria contained in Table 5.

$$\text{Persentation (P)} = \frac{Jb}{N} \times 100\%$$

Description :

Jb = Number of questions answered correctly

N = Total maximum score

Table 5. Criteria for Students' Understanding of Environmental Pollution

Presentation	Criteria
$86 \geq P \leq 100$	Very good
$76 \geq P \leq 85$	Good
$60 \geq P \leq 75$	Fair
$55 \geq P \leq 59$	Less
$P \leq 54$	Very low

Source: (Ridwan & Ramdhan, 2021)

Topic 2 describes the level of students' perceptions, attitudes, and awareness of environmental pollution using descriptive statistical techniques using a questionnaire of perceptions, attitudes, and environmental awareness of environmental pollution. Measurements using descriptive statistics on topic 2 are carried out to determine the general description of the data in the form of the average value (mean), highest (max), and lowest (min), and standard deviation of each variable, namely perception (X1), attitude (X2), student awareness (X3), and environmental pollution (Y). The value scale used in the questionnaire is a Likert scale model, which consists of 5 options that have

been provided, ranging from 1 (strongly disagree (STS)), 2 (disagree (TS)), 3 (neutral (N)), 4 (agree (S)), and 5 strongly agree (SS)). The percentage level of students' perceptions, attitudes, and awareness of environmental pollution by the assessment criteria contained in Table 6.

Table 6. Criteria for Perception, Attitude, and Awareness Score

Presentation	Criteria
$80 \geq P \leq 100$	Very good
$60 \geq P \leq 79.99$	Good
$40 \geq P \leq 59.99$	Fair
$20 \geq P \leq 39.99$	Less
$P \leq 19.99$	Very low

Source: (Ridwan & Ramdhan, 2021)

Topic 3 describe the relationship between variables (perception, attitude, and awareness) that affect students' understanding of environmental pollution using the Structural Equation Model (SEM) Analysis Moment of Structural (AMOS) technique. The data analysis design used is adjusted to the procedure for using the Structural Equation Model (SEM) technique using empirical data obtained from the test results on understanding environmental pollution and questionnaires on perceptions, attitudes, and environmental awareness of environmental pollution. The validity of each variable is measured first through the Confirmatory Factor Analysis (CFA) model, namely in the measurement model, the standard loading factors of the measured variables on the latent variables (Amrina et al., 2022).

To determine the effect of variables (perception, attitude, and awareness) on student understanding, the assessment of normality value of each variable must be obtained to determine that the data is normally distributed with a P value ≤ 2.58 . To find out the direct and indirect effects of variables (perception, attitude, and awareness) on student understanding, it can be seen from the results of regression weights by knowing

the estimated value of the influence of each variable with a significant P value ≥ 0.05 .

RESULTS AND DISCUSSION

Students' level of understanding of environmental pollution

The analysis of junior high school students' level of understanding of environmental pollution is shown in Table 7 which is presented in the form of quantitative descriptive analysis obtained from 500 samples of junior high school ninth grade students consisting of 51.7% male students and 48.3% female students.

Table 7. Percentage Score per Indicator of Student Understanding

Indicator	Question Number	Percentage (%)	Criteria
Explain the definition of environmental pollution.	1. 2. 6	76.02	Good
Define the characteristics of environmental pollution.	3. 7. 8. 23	76.19	Good
Explain the causes of environmental pollution.	4. 5. 9. 10. 12. 19. 20. 21	78.75	Good
Analyze the impact and problems of environmental pollution.	11. 13. 14. 16. 17. 22. 26. 27	73.13	Fair
Create an effort to protect the environment	15. 18. 24. 25. 28. 29. 30	76.03	Good

Based on the table of percentage scores per indicator of student understanding, an average percentage of 76% was obtained from 500 samples who had worked on environmental understanding questions. Based on the results, the highest average score obtained is in the indicator explaining the

causes of environmental pollution with a percentage of 78.75%, while the lowest average is in the indicator analyzing the impacts and problems of environmental pollution. Graphically, the percentage of scores per indicator of environmental understanding can be seen in Figure 2.

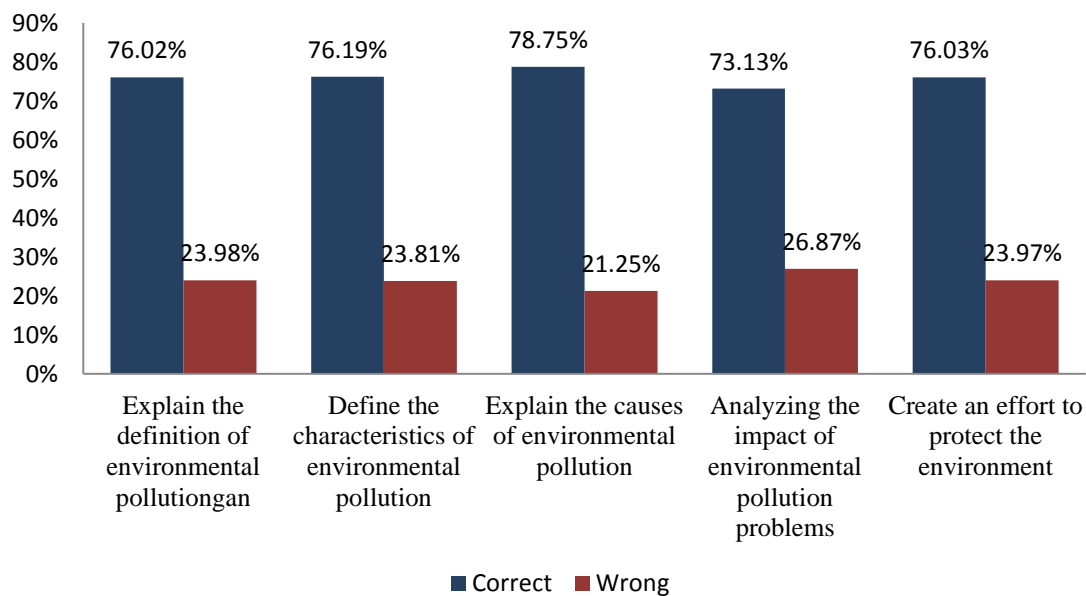


Figure 2. Graph of Percentage Score per Indicator of Student Understanding

The percentage obtained proves that the understanding of junior high school students on environmental pollution in the Sidoarjo Regency area has good criteria. Based on the results, the indicator that students can explain the causes of environmental pollution gets the highest percentage with 78.75%, this is influenced by the number of media images contained in the indicator explaining the causes of environmental pollution. The existence of image media in the problem makes students easy to accept material such as in question number 21 the relationship between population density and pollution that occurs in rural and urban environments, this is one of the characteristics of visual learning. In line with research (Bogalecka & Grobelna, 2023) which explains that visual characteristics can be remember easily through visual associations. This is also influenced by the existence of good environmental education in students so that understanding of environmental pollution is good. Based on the high level of student understanding, it is also influenced by external factors, namely education by obtaining material related to environmental pollution and environmental issues that have been studied at school, family factors, and the environment including social facilities, local culture, economy, and the education they are currently taking (Aseptianova et al., 2019).

Whereas the indicator of analyzing the impacts and problems of environmental pollution gets the lowest score with 73.13%, this can be influenced by the lack of learning experience in solving problems in the surrounding environment and students are still not used to analyzing the problems presented and students tend to prefer to think without analyzing the problem first when expressing arguments (Dewina et al., 2017). As in question number 14 which has incorrect answers from students related to the relationship of microorganisms to oxygen availability, and temperature in the environment. In line with research conducted by Yulianti (Aseptianova et al., 2019), it is

said that an understanding can help students organize student thinking and can determine a better way to solve a problem, so that if students have a good understanding, the learning process will be easier to understand.

Based on the results of research that has been conducted, junior high schools in Sidoarjo have very good quality education related to environmental understanding, especially environmental pollution, but in reality, there are still perpetrators of environmental pollution. This can be influenced by the high understanding of each individual student towards the environment which is also influenced by external factors, namely education by obtaining material related to environmental pollution and environmental issues that have been studied at school, family factors that can significantly affect students' knowledge and understanding including social, local cultural, and economic means so that they can form a good understanding correlation (Isenaj et al., 2024). So it is important for an individual to get an education at school to obtain a good quality of life, attitudes, and abilities (Singh et al., 2023).

Students' level of perception, attitude and awareness towards environmental pollution

The level of perception of junior high school students toward environmental pollution in the Sidoarjo region is shown in Table 8 which is presented in the form of descriptive statistics. Where the level of perception of the environment is obtained through a questionnaire given to students with indicators presented in table 3.

Table 8. Results of Students' Perception Level of the Environment

Indicator	Percentage (%)	Criteria
Perceived causes of environmental pollution	83.60	Very good
Perceived impact of environmental pollution	82.62	Very good

Based on the results of the level of students' perceptions of the environment, the highest percentage was obtained in the perception indicator of the causes of environmental pollution with a percentage of 83.60%. The results of the level of student perceptions of the environment obtained the lowest percentage in the indicator of the perception of the impact of environmental pollution with a percentage of 82.62%. The data on the results of students' perceptions of the environment obtained very good criteria with an average percentage of 83.11% of the 500 students who have filled out the questionnaire, as evidenced by the number of students who strongly agree with the statement that reduced vegetation has increased the population in the city of Sidoarjo and the statement that environmental pollution is a serious problem in urban life. Based on several studies revealed that a student is said to have a good perception when he can interpret the information received into an understanding that can be applied in daily activities (Indri Safitri et al., 2020). High student perception results can be influenced by a good learning environment and learning motivation (Prastiwi et al., 2019). The existence of a good learning environment can help and motivate students so as to improve the analysis of students' perceptions of environmental pollution. Based on research conducted by Hafiar (Hafiar et al., 2019) , it can be said that the higher the quality of learning, the higher the students' perceptions, so it can be said that out of 5% of junior high schools in the Sidoarjo Regency area have good learning quality.

The level of attitude of junior high school students towards environmental pollution in Sidoarjo region is shown in Table 9 which is presented in the form of descriptive statistics. Where the level of student attitudes towards the environment obtained through questionnaires given to students with indicators presented in table 3.

Table 9. Results of Students' Attitude Level towards the Environment

Indicator	Percentage (%)	Criteria
Negative attitude towards environmental action	84.49	Very good
Positive attitude towards environmental action	87.41	Very good

Based on the results of the level of student attitudes towards the environment, the highest percentage was obtained in the indicator of positive attitudes towards environmental action with a percentage of 87.41%. In the results of the level of positive attitudes towards environmental action, the lowest percentage was obtained in the indicator of perception of the causes of environmental pollution with a percentage of 84.49%. In the data on the results of students' attitudes towards the environment, the criteria are obtained very well with an average percentage of 85.95% of the 500 students who have filled out the questionnaire, as evidenced by the number of students who strongly disagree with the statement that environmental maintenance is the responsibility of the government alone and students strongly agree with the statement that environmental protection is very important for us and future generations.

Overall the attitude results obtained are very good, this is influenced by the understanding and environmental skills possessed by students so that they are expressed in the form of attitudes towards the environment. Setyowati (Kamdi et al., 2022) revealed that if environmental knowledge increases, the attitude of caring for the environment will increase, so it is expected to reduce or prevent the causes of damage and pollution to the environment. Someone with a good understanding of the environment will have a good attitude, and vice versa. Students' attitudes towards the environment can be influenced by understanding in line with

research conducted by Eufrasia (Jeramat et al., 2019) which reveals that an attitude towards environmental care is a person's reaction to his environment by not destroying the natural environment so as to create a clean and beautiful environment. An attitude of environmental care is very important so that students aim to love, care for, and protect their environment (Simarmata et al., 2018).

The level of awareness of junior high school students towards environmental pollution in the Sidoarjo area is shown in Table 10 which is presented in the form of descriptive statistics. Where the level of student awareness of the environment is obtained through a questionnaire given to students with indicators presented in table 3.

Tabel 10. Results of Students' Level of Awareness of the Environment

Indicator	Percentage (%)	Criteria
Awareness of home and surrounding waste management	82.87	Very good

Based on the results of the level of awareness obtained from 54 students, a percentage of 82.87% was obtained with an indicator of awareness of waste management at home and around it by obtaining very good

criteria, as evidenced by the number of students who strongly agreed with the statement which revealed that they always throw garbage in its place. Meanwhile, there are 17.13% of students have not met the criteria for awareness in managing home and surrounding waste. The results show that the level of awareness is very high in junior high schools in the Sidoarjo Regency area. Someone with higher environmental awareness tends to be able to take an attitude or action in maintaining the environment so as to attract students to carry out activities that show an attitude of environmental care (Mariani et al., 2014).

Environmental awareness in students will form responsible environmental attitudes and behaviors (Azrai et al., 2017). Sensitivity to the environment is considered the key to a person's behavior towards the environment so when students see environmental conditions from an empathetic perspective, students will try to care about their environment by taking action to protect the environment (McBeth & Volk, 2009).

Based on the results of the data obtained on each indicator of perception, attitude, and environmental awareness, can be seen in the graphic image presented in Figure 3.

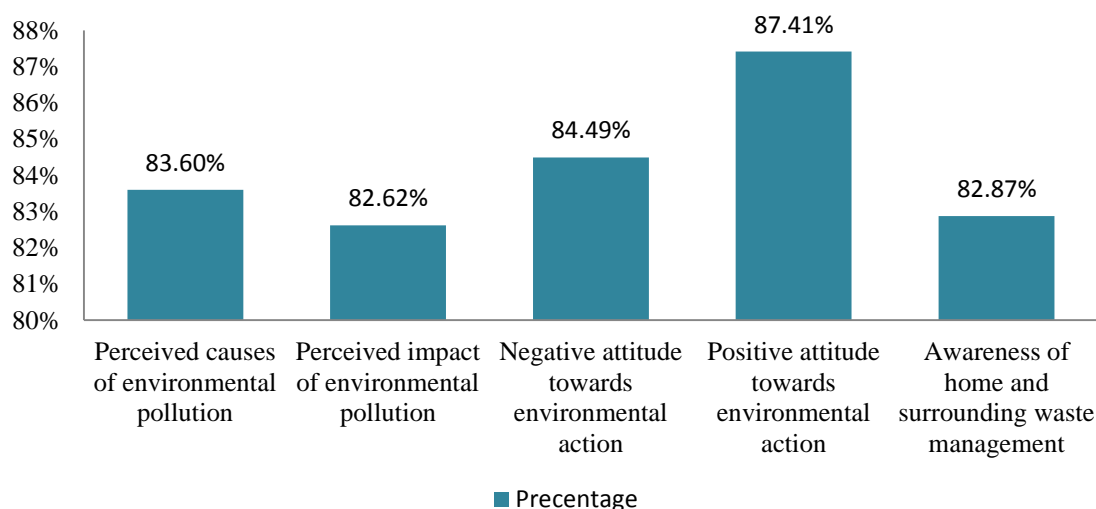


Figure 3. Indicator Graph of Perception, Attitude, and Environmental Awareness

The percentage obtained proves that all indicators of perceptions, attitudes, and awareness of junior high school students towards environmental pollution in the Sidoarjo Regency area have very good criteria. Based on the results, the indicator of students having a positive attitude toward environmental action has the highest percentage with 87.41%, this is due to the implementation of Adiwiyata schools. Iswari (Iswari & Utomo, 2017) revealed that Adiwiyata-based schools show a higher level of positive caring attitude towards the environment than schools that are not Adiwiyata-based, this can be seen from the level of knowledge, attitudes, and awareness of students in managing and preserving the environment. From the results of research conducted in junior high schools in Sidoarjo Regency, the lowest percentage value was obtained in the indicator of the perception of the impact of environmental pollution with

82.62%, this can be caused by internal and external factors in each student. Landriany (Landriany, 2014) in his research stated that Adiwiyata-based schools do not guarantee an increase in understanding and concern for the environment, as has been done in Malang City high schools due to students still not understanding the concept of environment-based schools, students still do not care about environmental conditions, and the lack of role of the school community.

Interrelationships between variables (perceptions, attitudes, and awareness) that affect students' understanding of environmental pollution

Based on the relationship between variables (perception, attitude, and awareness) that affect environmental pollution, the assessment of normality in table 11 is presented below.

Table 11. Assessment of normality

Variable	min	max	skew	c.r.	kurtosis	c.r.
Attitudes	67.273	100.000	-.260	-2.382	-.178	-.814
Perceptions	76.000	100.000	.445	4.070	-.892	-4.078
Awareness	56.000	100.000	-.047	-.427	.200	.914
Understanding	60.000	100.000	-.888	-8.125	2.911	13.314
Multivariate					-3.011	-4.869

It can be seen that the data in this study are normal as evidenced by the univariate skew value ≤ 2.58 so it can be said that the data is normally distributed univariate. In multivariate, the kurtosis value is obtained at -3.011 and c.r is obtained at -4.869, which means that the value obtained is ≤ 2.58 so it can be said that the data is normally distributed multivariate. In multicollinearity,

the value of the determinant of the sample covariance matrix = 2122240.038 is far from the value of 0, so the data does not experience multicollinearity. The results of the analysis of the relationship between variables (perception, attitude, and behavior) that affect environmental pollution are obtained in Figure 4.

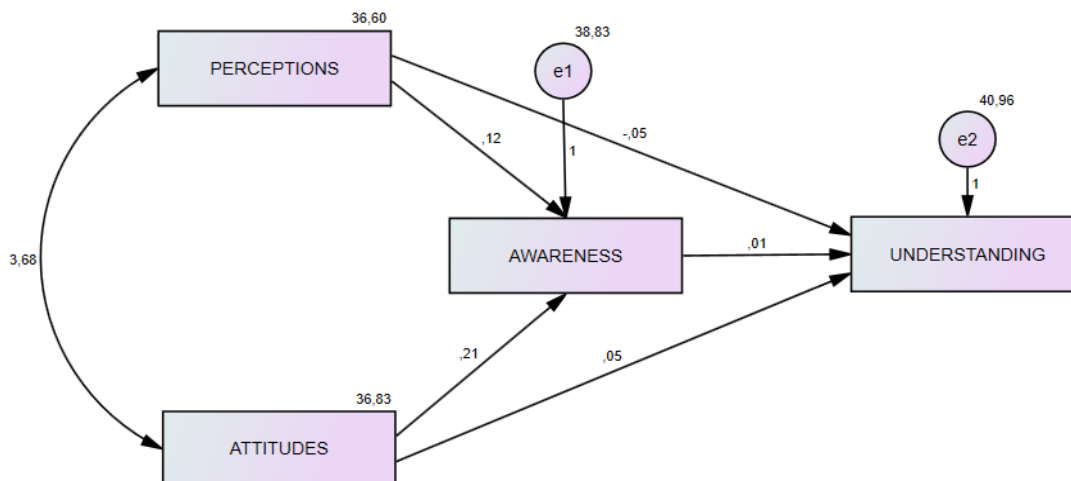


Figure 4. Path Diagram of SEM Data Analysis Results

Table 12. Regression Weights

			Estimate	S.E.	C.R.	P	Label
Awareness	<---	Perceptions	.124	.046	2.686	.007	par_2
Awareness	<---	Attitudes	.205	.046	4.447	***	par_3
Pemahaman	<---	Attitudes	.048	.048	1.004	.315	par_4
Understanding	<---	Perceptions	-.053	.048	-1.102	.270	par_5
Understanding	<---	Awareness	.014	.046	.306	.759	par_6

In the regression table, the estimated value can be generated which shows the direct effect, indirect effect, and significant and insignificant effect. Based on the table, the variables of understanding, perception,

attitude, and awareness have a significant value with a value of $P \geq 0.05$, so the significant value has a positive influence on each variable. The direct effect is in table 13 and the indirect effect is presented in table 14.

Table 13. Direct Influence of Variables

	Attitudes	Perceptions	Awareness
Awareness	.194	.117	.000
Understanding	.049	-.048	.014

Table 14. Indirect Influence of Variables

	Perceptions	Awareness	Attitudes
Awareness	.194	.117	.000
Understanding	.046	-.050	.014

In the table, the results of the direct and indirect influence of variables on variables of understanding, perception, attitude, and awareness have a positive influence between variables. The variable that has the greatest influence is the effect of awareness on attitude with a value of 0.194 with a value of $P \geq 0.05$,

so the significant value has a positive influence. Based on the results, it is known that the variables (perception, attitude, and awareness) are related or can have a positive effect on student understanding and can be proven by the results of student answers that meet the very good criteria that have been

determined on each indicator of understanding, perception, attitude, and environmental awareness. Based on SEM calculations, the highest value of interrelated indicators is in the relationship between awareness and student attitudes towards the environment, as evidenced by the number of student answers that have high awareness scores tend to have high attitude scores. In line with research (Ablak & Yeşiltaş, 2020) which reveals that environmental attitudes with environmental awareness have a positive relationship, if students have a high attitude value, the level of student awareness of the environment will be better.

Pe'er (Pe'er et al., 2007) suggests that a lower level of student understanding of the environment will be a factor that influences a person to ignore daily behavior in the environment, so students who have a high level of understanding tend to pay attention and have empathy for the environment. Amalia (Amalia Nurmasitoh & Rahayu, 2021) revealed that the factors that influence students' caring attitude toward the environment are knowledge, attitude, lifestyle, and humanity. Soemarwoto (Here & Priyanto, 2014) states that the relationship between humans and the environment is circular, everything that humans cause in the environment will have an impact back on humans, so perceptions, attitudes, and awareness of the environment are very important for humans.

CONCLUSION

Based on the results of the research conducted, it can be concluded that all variables are positively related between all variables. There is a very good relationship between the variables of students' perceptions, attitudes, and awareness of the environment with students' understanding of environmental pollution in grade ix junior high school students in the sidoarjo regency area, especially the relationship between variables that have the greatest influence on the

influence of awareness on attitudes. It is concluded that the higher the value of environmental understanding, the higher the value of perception, attitude, and environmental awareness, and vice versa if the value of students' environmental understanding is low, the value of perception, attitude, and environmental awareness. In other words, students' environmental understanding can affect students' perceptions, attitudes, and concern for the environment, this proves the importance of environmental education in schools to get the quality of life, attitudes, and abilities of students in protecting their environment. The activity of instilling public awareness that manifests in environmental care behavior requires various sources of information that play an active role in their respective portions.

Understanding that students can be agents of change that disseminate the importance of protecting the environment for junior high school students in sidoarjo can be done through friends, formal education institutions through teachers, non-formal institutions, and parents, as well as media both mass media and the internet.

Based on the findings, this study only uses a data measurement model using comprehension questions to determine the level of student understanding of environmental pollution, while to determine the level of perception, attitude, and environmental awareness of environmental pollution in students using a questionnaire adapted and developed by Najmun Nahar. To find out more about the level of understanding, perceptions, attitudes, and environmental awareness in depth can be done using other methods, such as using qualitative methods to find out more about the level of understanding of junior high school students which includes perceptions, attitudes, and awareness of environmental pollution, and can further expand the range of sample populations to be carried out for further research.

REFERENCES

- Ablak, S., & Yeşiltaş, E. (2020). Secondary school students' awareness of environmental education concepts. *Review of International Geographical Education Online*, 10(3), 445–466.
- Adiputra, A., & Barus, B. (2018). Analisis Risiko Bencana Kebakaran Hutan Dan Lahan Di Pulau Bengkalis. *Jurnal Geografi, Edukasi Dan Lingkungan (JGEL)*, 2(1), 1–8.
- Amalia Nurmasitoh, Q., & Rahayu, R. (2021). Pengaruh Pembelajaran Berbasis Lingkungan Terhadap Sikap Pelestarian Lingkungan Pada Materi Pencemaran Lingkungan. *Jurnal Riset Fisika Edukasi Dan Sains*, 8(1), 1–7.
- Amrina, Z., Anwar, V. N., Alvino, J., & Sari, S. G. (2022). Analisis Technological Pedagogical Content Knowledge Terhadap Kemampuan Menyusun Perangkat Pembelajaran Matematika Daring Calon Guru SD. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 6(1), 1069–1079.
- Arieska, P. K., & Herdiani, N. (2018). Pemilihan Teknik Sampling Berdasarkan Perhitungan Efisiensi Relatif. *Jurnal Statistika*, 6(2), 166–171.
- Aseptianova, A., Nawawi, S., & Pesisa, L. (2019). Analisis Pemahaman Konsep Siswa Pada Materi Pencemaran Lingkungan Di Sma Negeri 4 Palembang. *Bioilmi: Jurnal Pendidikan*, 5(1), 59–65.
- Azhar, A., Basyir, M. D., & Alfitri, A. (2016). Hubungan Pengetahuan Dan Etika Lingkungan Dengan Sikap Dan Perilaku Menjaga Kelestarian Lingkungan. *Jurnal Ilmu Lingkungan*, 13(1), 36.
- Azrai, E. P., Sigit, D. V., & Puji, M. (2017). the Correlation Between Environmental Awareness and Students Participation in Go Green School Activity At Adiwiyata'S School. *Biosfer: Jurnal Pendidikan Biologi*, 10(2), 7–11.
- Bogalecka, M., & Grobelna, A. (2023). Air Pollution and Its Potential Consequences for Tourism and Career Development from Students' Perspective: A Case Study of the Gdańsk Agglomeration in Poland. *International Journal of Environmental Research and Public Health*, 20(3).
- Briggs, D. (2003). Environmental pollution and the global burden of disease. *British Medical Bulletin*, 68, 1–24.
- BrotoSusilo, A., & Handayani, D. (2020). Dataset on waste management behaviors of urban citizens in large cities of Indonesia. *Data in Brief*, 32, 106053.
- Dewina, S., Suganda, O., & Widiyantje, R. (2017). Pengaruh Model Pembelajaran Problem Based Learning (Pbl) Terhadap Kemampuan Menganalisis Dan Keterampilan Berargumentasi Siswa Pada Konsep Pencemaran Lingkungan Di Kelas X. *Quagga : Jurnal Pendidikan Dan Biologi*, 9(02), 53.
- Dhenge, S. A., Ghadge, S. N., Ahire, M. C., Gorantiwar, S. D., & Shinde, M. G. (2022). Gender attitude towards environmental protection: a comparative survey during COVID-19 lockdown situation. In *Environment, Development and Sustainability* (Vol. 24, Issue 12). Springer Netherlands.
- Edgerton, E., & McKechnie, J. (2023). The relationship between student's perceptions of their school environment and academic achievement. *Frontiers in Psychology*, 13(February), 1–9.
- Fauzie, H. R. (2022). Peran pemerintah dalam implementasi kebijakan lingkungan di Kabupaten Sidoarjo. *Jurnal Politik Indonesia (Indonesian Journal of Politics)*, 8(2), 122–132.
- Gusmadi, S., & Samsuri, S. (2020). Gerakan Kewarganegaraan Ekologis sebagai upaya Pembentukan Karakter Peduli Lingkungan. *Jurnal Ilmiah Pendidikan Pancasila Dan Kewarganegaraan*, 4(2), 381.
- Hafezi, S., Shobeiri, S. M., Sarmadi, M. R., & Ebadi, A. (2013). A novel conceptual model of environmental communal education: Content analysis based on distance education approach. *Turkish Online Journal of Distance Education*, 14(1), 154–165.
- Hafiar, H., Harding, D., Kadiyono, A., Ma'mun, T., Siswadi, A., Nugraha, Y., & Wibowo, H. (2019). *Source of Information About Environmental Awareness in Growing Green Ethos For Junior High School Students in Bandung, Indonesia*.
- Halder, S. (2012). An appraisal of environmental education in higher school education system: A case study of North Bengal , India. *Journal of Environmental Sciences*, 2(4), 2223–2233.

- Handayani, A., Soenarno, S. M., & A'ini, Z. F. (2022). Hubungan Pengetahuan Lingkungan Hidup Terhadap Sikap Peduli Lingkungan Siswa SMPN 20 Depok. *EduBiologia: Biological Science and Education Journal*, 2(1), 80.
- Here, S. V., & Priyanto, P. H. (2014). Subjective Well-Being Pada Remaja Ditinjau Dari. *Psikodimensia*, 13(1), 10–21.
- Ilmi, R. (2017). Implementasi Program Zero Waste Di Kabupaten Sidoarjo. *Publika*, Vol 5, 1–8.
- Indri Safitri, W., Suryawati, E., & Yustina, Y. (2020). Environmental Literacy Analysis of Junior High School Students in Pekanbaru. *Journal of Educational Sciences*, 4(1), 116.
- Isenaj, Z. S., Moshammer, H., & Berisha, M. (2024). *Behaviors Regarding Air Pollution in Schoolchildren in*.
- Iswari, R. D., & Utomo, S. W. (2017). Evaluasi Penerapan Program Adiwiyata Untuk Membentuk Perilaku Peduli Lingkungan di Kalangan Siswa (Kasus: SMA Negeri 9 Tangerang Selatan dan MA Negeri 1 Serpong). *Jurnal Ilmu Lingkungan*, 15(1), 35.
- Jeramat, E., Mulu, H., Jehadus, E., & Utami, Y. E. (2019). Penanaman Sikap Peduli Lingkungan Dan Tanggung Jawab Melalui Pembelajaran Ipa Pada Siswa Smp. *Journal of Komodo Science Education*, 01(02), 24–33.
- Kamdi, N., Rochintaniawati, D., & Prima, E. C. (2022). Efektivitas Web Based Inquiry Learning pada Materi Pencemaran Lingkungan dalam Konteks ESD (Education Sustainable Development) untuk Meningkatkan Kemampuan Berinkuiri dan Kepedulian Lingkungan Siswa SMP Kelas VII. *PENDIPA Journal of Science Education*, 6(3), 733–738.
- Khoiri, A., Sunarno, W., Sajidan, S., & Sukarmin, S. (2021). Analysing students' environmental awareness profile using strategic environmental assessment. *F1000Research*, 10, 1–27.
- Landriany, E. (2014). Implementasi Kebijakan Adiwiyata Dalam Upaya Mewujudkan Pendidikan Lingkungan Hidup di SMA Kota Malang. *Jurnal Kebijakan Dan Pengembangan Pendidikan*, 2, 82–88.
- López, J. A., & Palacios, F. J. P. (2024). Effects of a Project-Based Learning Methodology on Environmental Awareness of Secondary School Students. *International Journal of Instruction*, 17(1), 1–22.
- Mariani, S., Wardono, & Kusumawardani, E. D. (2014). The Effectiveness of Learning by PBL Assisted Mathematics Pop Up Book Against The Spatial Ability in Grade VIII on Geometry Subject Matter. In *International Journal of Education and Reserach* (Vol. 2, Issue 8, pp. 531–548).
- McBeth, W., & Volk, T. (2009). The national environmental literacy project: A baseline study of middle grade students in the United States. *Journal of Environmental Education*, 41(1), 55–67.
- Nahar, N., Hossain, Z., & Mahiuddin, S. (2023). Assessment of the environmental perceptions, attitudes, and awareness of city dwellers regarding sustainable urban environmental management: a case study of Dhaka, Bangladesh. *Environment, Development and Sustainability*, 25(8), 7503–7531.
- Oğuz, D., Çakıcı, I., Kavas Ankara Üniversitesi Ziraat Fakültesi, S., Mimarlığı Bölümü, P., & Ankara Üniversitesi Çevre Sorunları Araştırma ve Uygulama Merkezi, A. (2011). Environmental awareness of students in higher education. *Turkish Journal of Forestry*, 12(1), 34–39.
- Pe'er, S., Goldman, D., & Yavetz, B. (2007). Environmental literacy in teacher training: Attitudes, knowledge, and environmental behavior off beginning students. *Journal of Environmental Education*, 39(1), 45–59.
- Prastiwi, L., Sigit, D. V., & Ristanto, R. H. (2019). Ecological Literacy, Environmental Awareness, Academic Ability and Environmental Problem-Solving Skill at Adiwiyata School. *Indonesian Journal of Science and Education*, 3(2), 82.
- Pratiwi, R. D., Rusdi, & Komala, R. (2019). JPBI (Jurnal Pendidikan Biologi Indonesia) The effects of personality and intention to act toward responsible environmental behavior. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 5(1), 169–176.
- Rahmani, N. F., & Rahiem, M. D. H. (2023). Implementasi Pendidikan Lingkungan Hidup di Raudhatul Athfal. *Jurnal Ilmiah Potensia*, 8(1), 12–25.
- Rahmawati, I., & Suwanda, I. M. (2015). LINGKUNGAN SISWA MELALUI SEKOLAH ADIWIYATA DI SMP NEGERI 28 SURABAYA I Made Suwanda Indonesia merupakan Negara

- yang kaya akan sumber daya alam . Dengan sumber daya alam yang melimpah masyarakat dapat memenuhi kebutuhannya dengan mudah . Kemudahan menikmati. *Kajian Moral Dan Kewarganegaraan*, 1(3), 71–88.
- Rahmawati, L. D., Studi, P., Negara, A., Iman, G. M., Studi, P., & Negara, A. (2023). *Proses Collaborative Governance Dalam Program Pengurangan Sampah Di TPA Jabon , Kabupaten Sidoarjo Program Studi Administrasi Negara , Fakultas Ilmu Social dan Ilmu Politik , Ghulam Maulana Iman permasalahan lingkungan yang kompleks , karena volume sampa*. 8(2).
- Rahmi, N., & Selvi, S. (2021). Pemungutan Cukai Plastik Sebagai Upaya Pengurangan Sampah Plastik. *Jurnal Pajak Vokasi (JUPASI)*, 2(2), 66–69.
- Ridwan, M., & Ramdhan, F. (2021). Profil Keterampilan Literasi Sains Peserta Didik Kelas Viii Smp Pada Konsep Pencemaran Lingkungan. *Bioed: Jurnal Pendidikan Biologi*, 8(1), 34.
- Salehi, S., Nejad, Z. P., Mahmoudi, H., & Burkart, S. (2016). Knowledge of global climate change: view of Iranian university students. *International Research in Geographical and Environmental Education*, 25(3), 226–243.
- Santoso, R., Roshayanti, F., & Siswanto, J. (2021). Analisis Literasi Lingkungan Siswa Smp. *JPPS (Jurnal Penelitian Pendidikan Sains)*, 10(2), 1976–1982.
- Septiani, U., Najmi, & Oktavia, R. (2021). Eco Enzyme : Pengolahan Sampah Rumah Tangga Menjadi Produk Serbaguna di Yayasan Khazanah Kebajikan. *Jurnal Universitas Muhamadiyah Jakarta*, 02(1), 1–7.
- Shao, Q., Tao, R., & Luca, M. M. (2022). The Effect of Urbanization on Health Care Expenditure: Evidence From China. *Frontiers in Public Health*, 10(February), 1–11.
- Siddiq, M. N., Supriatno, B., & Saefudin, S. (2020). Pengaruh penerapan problem based learning terhadap literasi lingkungan siswa SMP pada materi pencemaran lingkungan. *Assimilation: Indonesian Journal of Biology Education*, 3(1), 18–24.
- Simarmata, B., Daulae, A. H., & Raihana, R. (2018). Hubungan Tingkat Pengetahuan Lingkungan Hidup dengan Sikap Peduli Lingkungan Siswa. *Jurnal Pelita Pendidikan*, 6(4), 204–210.
- Singh, F., Saini, M., Kumar, A., Ramakrishna, S., & Debnath, M. (2023). Perspective of educational environment on students' perception of teaching and learning. *Learning Environments Research*, 26(2), 337–359.
- Wahyuni, H., & Suranto, S. (2021). Dampak Deforestasi Hutan Skala Besar terhadap Pemanasan Global di Indonesia. *JIIP: Jurnal Ilmiah Ilmu Pemerintahan*, 6(1), 148–162.
- Wasista, D., & Nawiyanto. (2014). Perubahan Lingkungan di Kabupaten Sidoarjo Tahun 1970-2006. *Artikel Ilmiah Mahasiswa*, 2006, 1–11.