

Research Article

Analysis of ethnoscience integrated environmental literacy for junior high school

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ABSTRACT

An analysis of environmental literacy that integrates ethnoscience in sustainable science learning between scientific knowledge and problems in life, as well as the value of local wisdom. This study was aimed to determine the profile of ethnoscience integrated environmental literacy. This research uses a survey method with a sampling technique of cluster random sampling and conducting a Question Test and a Middle School Environmental Literacy Survey (MSELS) to students. The parameters of this study consist of knowledge of ecology, cognitive skills, attitudes and behavior. Descriptive data analysis used average score. Research findings indicate that the ethnoscience integrated environmental literacy of junior high school students obtained an average score of 61 (with a range of 100). The achievement of environmental literacy parameters for ecological knowledge, cognitive skills, attitudes and behavior are 48, 29, 73 and 71, respectively, while the results of the ethnoscience integrated environmental literacy analysis illustrate that the average Junior High School has implemented ethnoscience integration in environmental literacy well. So empowering knowledge and attitudes contribute to environmental literacy students.



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INTRODUCTION

One of the global issues that is currently the main focus is on environmental issues, especially the issue of climate change (Puspasari et al., 2019). An understanding of the importance of environmental management needs to be instilled in order to maintain environmental sustainability in a sustainable manner through changes in human perspective and behavior towards nature. Badan Pusat Statistik, (2017), conducted a survey of the Environmentally Uncaring Behavior Index (EUBI) or *Indeks Kualitas Lingkungan Hidup (IKLH)* in Indonesia which was seen through 4 dimensions, namely saving water, Energy Management, and Private Transportation. and Waste Management where each dimension scored 0.44, 0, 16, 0.71 and 0.72. From the energy management data, the smallest *IKLH* index shows that energy management in Indonesia is classified as good. while waste management has the largest *IKLH* index which shows that the level of ignorance of

waste management in Indonesia is high. Riau Province has the highest *IKLH* on the dimensions of personal transportation and waste management of 0.81 and 0.72, respectively, this shows that environmental indifference behavior in Riau is dominated by these two dimensions.

The Indonesian government has made various efforts to increase environmental awareness, one of which is through handling environmental problems such as waste problems, forest and land fires, pollution and climate change in several ways, one of which is through education, namely establishing *adiwiyata* (green program) schools, because schools play a role in the formation of schools. the values of life including the values of caring and environmental culture with the aim of realizing school citizens who are insightful and responsible in efforts to maintain and manage the environment to support sustainable development through good school governance (Alim et al., 2020; Puspasari et al., 2019). Realizing the importance of protecting the environment, this must be done through education which aims to build a society that is forward-looking and has an awareness of the importance of the environment in supporting its life (Syofyan & Sumantri, 2019). Currently, the government is promoting a movement to strengthen character education which is integrated through the 2013 revised 2017 curriculum which contains 18 characters values that will be developed, including the value of caring for the environment. So that each level of the education unit has the responsibility to cultivate this character for students which is realized through integrated environmental learning in every subject carried out by *adiwiyata* and non-*adiwiyata* schools so that the environmental literacy of students in Indonesia is increasing.

A person is said to be environmentally literate if he knows what will be done for the environment (Nasution, 2021). Students who have environmental literacy will behave in an environmental responsible knowledge, skills, and awareness of environmental problems, so that environmental literacy plays a role in shaping one's character to care about the environment (Rokhmah & Fauziah, 2021). Environmental literacy in students is currently still in the stage of growing awareness and concern while responsibility has not become a real behavior / participation and has not been based on strong knowledge. Environmental literacy is a person's level of awareness of the environment which includes 7 components (Mihanpour et al., 2018; Nasution, 2021). However, for the junior high school level, the appropriate components in assessing students' environmental literacy are 4 components, namely ecological knowledge, cognitive skills, attitudes and behavior. From the results of the study, it was obtained that the mastery of knowledge and attitudes were 35% and 54%, respectively, which means that the mastery of knowledge is still low while attitudes are in the medium category (Susilastri & Rustaman, 2015).

Environmental literacy in students is still categorized in the low stage, Santoso et al., (2021) concludes that the index of student behavior towards the environment nationally is still not entirely good. The average index nationally is 0.57. This number indicates that students have not behaved in environmental care in their daily life. The formation and cultivation of the nature of environmental concern can be done with a branch of science that is closely related to human life and the environment, namely science. Monotonous and theoretical science learning without going directly into the field will be very boring for students, this can be circumvented by bringing students directly into the environment to see what phenomena are happening in the environment around their lives. Science learning will look irrelevant in the eyes of students and will be very disliked by students if the learning is not related to their daily lives (Hekmah et al., 2019).

Meanwhile, the results of the study Rokhmah and Fauziah, (2021) show that students' abilities in several aspects of environmental literacy are still relatively low, only 29.3% of students meet the environmental literacy assessment standards and the remaining 70.7% are still below the standard. Because basically the ability of junior high school students to identify, analyze problems, and make planning actions to the practice of solving environmental problems is still low, so efforts need to be made to improve students' environmental literacy.

All students, as future consumers, need to know about environmental issues and how to help create a healthier and more humane world. Students who have environmental literacy will be able to be responsible for the environment through knowledge, skills, and awareness of environmental problems (Pulungan, 2017). However, so far, the cumulative level of environmental literacy of students in Indonesia still needs to be improved. Students' knowledge and cognitive skills towards the environment are in the high category, while students' attitudes and behavior are in the medium category. Environmental Education is an effort to change behavior and attitudes to increase one's knowledge, skills and awareness about environmental values and issues which in turn can move the community to play an active role in environmental conservation and safety.

There is a policy from the government that changes the 2013 curriculum to the Education Unit Level Curriculum (EULC) or *Kurikulum Tingkat Satuan Pendidikan (KTSP)*. According to (Adam, 2014; Subianto &

Ramadan, 2021), in line with the objectives of the KTSP to improve local excellence education, provide opportunities as an educational unit to prepare and develop competency standards and basic competencies in accordance with characteristics of students. Currently, science learning has been linked to activities of daily life, but no one has linked it with local wisdom (Susilastrri & Rustaman, 2015). Generally, teachers use the potential of the environment as an apperception, not yet discussing the material on more in-depth local wisdom. Future science learning is sought so that there is continuity between scientific knowledge itself and the cultivation of scientific attitudes, as well as the values of local wisdom that exist and develop in the community. Students can better appreciate nature, the culture that develops in society and utilize science according to the technology they master so that it will increase the ability to use scientific knowledge in solving various everyday problems. Therefore, the socio-cultural environment of students needs serious attention in developing science education in schools because in it is buried genuine science that can be useful for their lives.

The current 2013 curriculum development in science education pays attention to local cultural wisdom (ethnoscience), national identity, character and local cultural customs (Hadi et al., 2019). Ethnoscience is an activity of transforming between original science and scientific science. Genuine scientific knowledge consists of all knowledge pertaining to the facts of society. This knowledge comes from beliefs that are passed down from generation to generation. The scope of original scientific knowledge covers the fields of science, agriculture, ecology, medicine and about the benefits of flora and fauna (Muna et al., 2016). By using learning with an ethnoscience approach, students can appreciate nature more and take advantage of science in everyday life. The ethnoscience approach as an ethnoscience approach is a process of reconstructing the original science that developed in the community to be transformed into scientific science (Khoiri & Sunarno, 2018).

Ethnoscience can be integrated into science learning in schools with various learning themes. Sardjiyo in (Pertwi et al., 2018; Widiyawati et al., 2021) explains that the ethnoscience approach is a strategy for creating a learning environment and designing learning experiences that integrate culture as part of the learning process. Science learning should lead students to be literate about science and technology. Thus, knowledge is the result of the construction of the knowledge of the students themselves. In addition, the learning process does not always occur in the classroom, but learning can take place outside the classroom (Aji, 2017; Aji et al., 2017).

Currently, science learning has been associated with activities of daily life, but no one has linked it with local wisdom (ethnoscience). Generally, teachers use the potential of the environment as an apperception, not yet discussing the material on more in-depth local wisdom. Future science learning is sought so that there is continuity between scientific knowledge itself and the cultivation of scientific attitudes, as well as the values of local wisdom that exist and develop in the community. Students can better appreciate nature, the culture that develops in society and utilize science according to the technology they master so that it will increase the ability to use scientific knowledge in solving various everyday problems. Therefore, the socio-cultural environment of students needs to get serious attention in developing science education in schools because it contains genuine science that can be useful for their lives (Susongko et al., 2020).

Based on the facts above, it is necessary to make efforts as early as possible in realizing the character values of caring for the environment so that the environmental problems experienced can be resolved. This can be started from the world of education through environmental education learning with the aim of making students aware of the environment from an early age (Ananda & Wandini, 2022). Environmental education is currently implemented in an integrated manner in every subject, one of which is the study of Natural Sciences or *Ilmu pengetahuan alam (IPA)*. Science learning must be contextual which must involve students directly to observe their surroundings and train students to think about the results of their observations, because the 21st century skills that students must have been analyzing and practicing them in concrete life. In general, science learning in schools is still centralized in book material. It is still rare for science learning to truly reveal the cultural reality around students. The content of the material being taught has not been widely integrated with culture. Reflecting on this condition, it is necessary to develop learning methods, one of which is the approach used. The application of science learning with an ethnoscience approach requires the ability of teachers to combine original knowledge with scientific knowledge (Dinissjah et al., 2019).

To see the effectiveness of learning related to the environment, it is necessary to measure the literacy level of students based on ethnoscience so that it becomes an evaluation material in improving learning. This environmental literacy study can also be used as initial data to develop a model for strengthening

environmental care character values (Apriana et al., 2020; Indrawan & Mahendra, 2021). As for the specific purpose of this research is to see if the use of environmental literacy is effective in improving student learning, the next generation needs to be provided with supplies and insight into the environment so as to form an environmentally literate generation. Junior high school children are the basis for developing future generations who care about the environment. On the other hand, learning science that effectively makes a significant contribution to environmental literacy in children is still very low less.

METHOD

This research is a survey research using a quantitative approach with a descriptive method of data sources and the main information is obtained from respondents as research samples using questionnaires or questionnaires as data collection instruments (Susanti & Purmintasari, 2015). The study was conducted on junior high school students in May 2020. The sampling technique was cluster random sampling, which is a type of sampling technique where a researcher divides the population into several separate groups called clusters, from these clusters several samples are taken. selected randomly or randomly (Wang & Hamilton, 2003). The research analysis of the cluster random sampling technique was taken from the sample data of these clusters. (Haubold et al., 2020). with a sample of 372 students. Parameters in this study are knowledge of ecology, attitudes, cognitive skills, and behavior.

The research instrument used MSELs test questions and a questionnaire adapted from (Hollweg et al., 2011), which consists of 60 questions consisting of ecological knowledge, attitudes, cognitive and behavioral skills that have been validated using Anates and SPSS. The research data was then analyzed descriptively by using the average achievement score of each parameter to describe the environmental literacy profile of junior high school students. Guidelines for assessing environmental literacy parameters are presented in Table 1, Environmental Literacy Range Conversion Criteria presented in Table 2, and Components of Summary of Interview Results related to Ethnoscience presented in Table 3.

Table 1. Guidelines for assessing environmental literacy

Environmental literacy parameters	Competence	Question number	Number of Item	Score ranges	Factor multiply
Knowledge	Ecological knowledge	1-20	20	0-60	3
	Sensitivity verbal commitment feelings	21-32	12	37-185	5
Attitude	Issue identification analysis	33-44	12	0-60	30
		45-57	13		
Cognitive skills	Action plan	58-59	2	12-60	6
Behavior		60	2 (8)		

Table 2. Environmental literacy range conversion criteria

Criteria	Knowledge (0-100)	Attitude (0-100)	Cognitive skills (0-100)	Behavior (0-100)	Literacy environment (0-100)
Low	0-33	0-33	0-33	0-33	0-33
Currently	34-67	34-67	34-67	34-67	34-67
High	68-100	68-100	68-100	68-100	68-100

Table 3. Components of summary of interview results related to ethnoscience

Component question	JHS 1 Pekanbaru	JHS 5 Pekanbaru	JHS 32 Pekanbaru	JHS 9 Pekanbaru	JHS 10 Pekanbaru
Applied curriculum	2013	2013	2013	2013	2013
Ethnoscience terms	Not yet recognize	Not yet recognize	Not yet recognize	Not yet recognize	Not yet recognize
Implementing ethnoscience without realizing it	Apply	Apply	Apply	Not yet apply	Apply
Material in application of ethnoscience	Ecosystem	Ecosystem	Ecology	Ecology	Ecosystem
Wisdom example locale applied to theory	Environmental Adiwiyata	Adiwiyata independent	Adiwiyata school	Environmental Adiwiyata	Environmental Adiwiyata

Component question	JHS 1 Pekanbaru	JHS 5 Pekanbaru	JHS 32 Pekanbaru	JHS 9 Pekanbaru	JHS 10 Pekanbaru
Student reaction with implementation	Enthusiasm	Enthusiasm	Enthusiasm	Enthusiasm	Enthusiasm
Obstacle application of ethnosience	Covid condition	Covid condition	Covid condition	Covid condition	Covid condition
Model, method applied during ethnosience integration (unnoticed)	Talk/introduction adiwiyata through video virtual	Talk/introduction adiwiyata through video virtual	Talk/introduction adiwiyata through video virtual	Talk/introduction adiwiyata through video virtual	Talk/introduction adiwiyata through video virtual
Learning resources used	Videos, books handle, internet	Videos, books handle, internet	Videos, books handle, internet	Videos, books handle, internet	Videos, books handle, internet

RESULTS AND DISCUSSION

The results of the environmental literacy analysis of junior high school students were obtained from the MSELS test and the questionnaire questions are presented in [Figure 1](#).

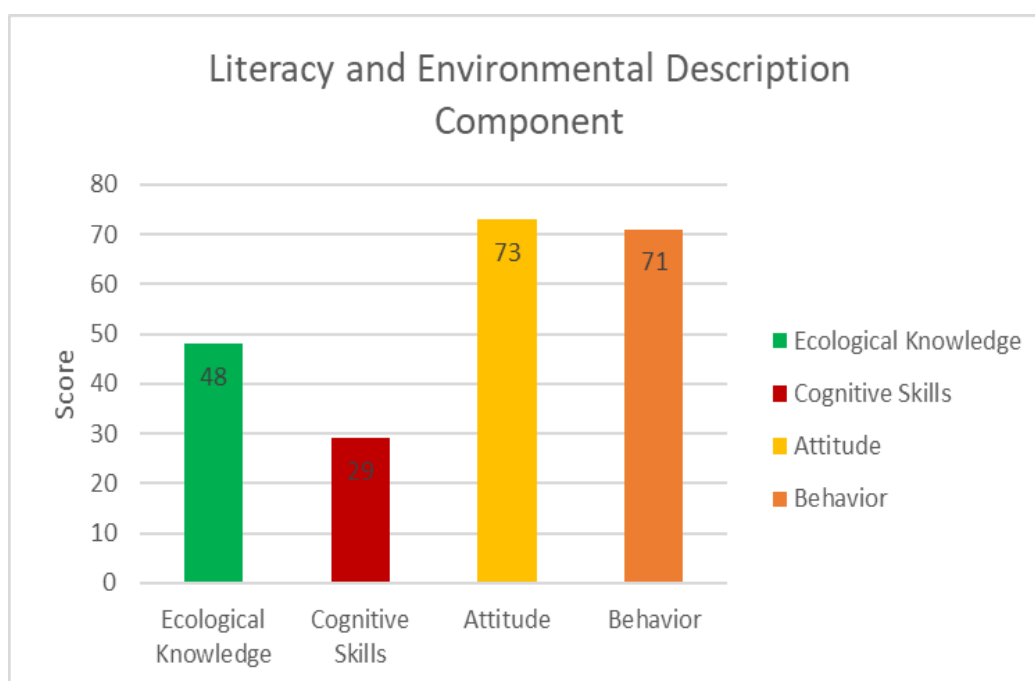


Figure 1. Literacy and environmental description of each component

Based on [Figure 1](#), the environmental literacy of junior high school students is categorized as moderate with a score of 61. The results of the analysis for each component, namely knowledge, cognitive skills, attitudes and behavior, are 48, 29, 73 and 71 respectively. The bar chart above also shows that ecological knowledge and cognitive skills are still not at their maximum stage, after the authors conducted the analysis this happened because of various factors including the use of environmental literacy which took a long time to prepare. However, this view can be overcome by the way we do learning in the environment for only a few minutes and then the discussion will be carried out in class, then students will tend to do their own activities outside of learning activities. This is because students will be more enthusiastic about learning in the environment. The way to overcome this weakness is that the teacher must be good at managing students so that they remain orderly when learning in the environment takes place ([Nurwidodo et al., 2021](#)).

Cognitive skills

In several studies conducted by experts, it turns out that knowing the value of local wisdom can improve student learning outcomes, including research conducted ([Pamungkas et al., 2017](#)) designing science learning based on local wisdom. which shows an increase in 11 positive students' characters, with the most significant positive characters being disciplined, honest, thorough, careful, diligent, responsible, and caring for the environment. Creativity or imagination is one of the dimensions of science education. In addition, a study

entitled Development of Local Wisdom-Based Learning CDs for the Theme of Vibration and Waves for Class VIII Junior High School Students which showed that there was an increase in learning outcomes from the research (Muna et al., 2016). The integration of local wisdom values in science learning will provide an understanding of the love of their own culture, in integrating local wisdom values in learning in schools, of course, teachers must adjust to the level of child development, adapted to the material/subjects delivered, learning methods used. used. Through the integration of the values of local wisdom, it is hoped that the value of students' nationalism towards local culture can develop, in this integration, of course, it must be adjusted to the material to be delivered, the development of students, and also the methods used.

The knowledge of junior high school students related to the environment is in the medium category with a value of 48. For knowledge, there are 20 questions that are tested with the results of the achievement of each item on knowledge, parameters can be seen in Figure 2.

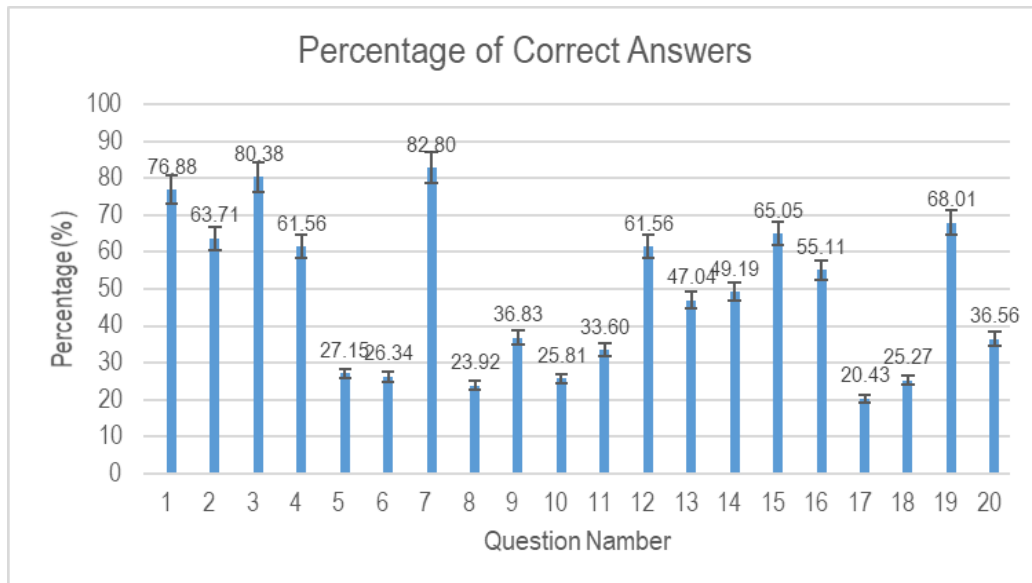


Figure 2. Percentage of correct answers for each item

The distribution of knowledge answers from the 20 questions is grouped into 3 indicators, namely the concept of ecology, energy production and transfer as well as the relationship between environmental and social problems with percentages that can be seen in Figure 3.

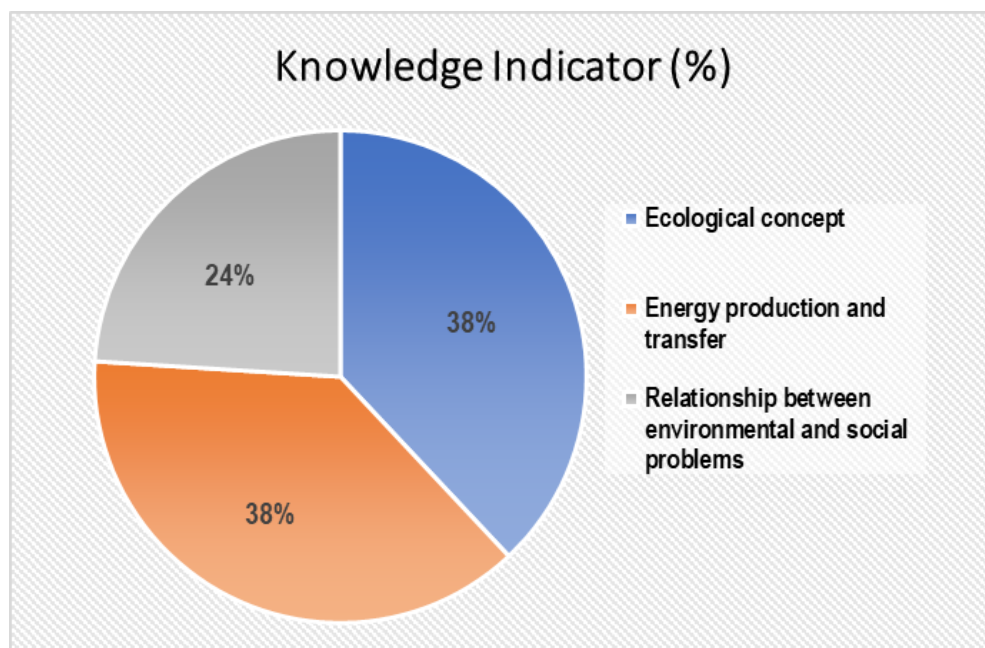


Figure 3. Percentage of each knowledge indicator

Based on the picture above, it means that 38% of students understand the concept of ecology, 38% of students understand the production and transfer of energy and 24% of students understand the relationship between environmental and social problems. Based on the percentage above, the indicator of the relationship between environmental and social problems has low results compared to the other 2 indicators, namely 24%, which means students are still lacking in relate concepts to facts related to everyday life. This is related to the cognitive skills of students who are in the low category, which is 29, following the results of the percentage of students' cognitive skills in [Figure 4](#).

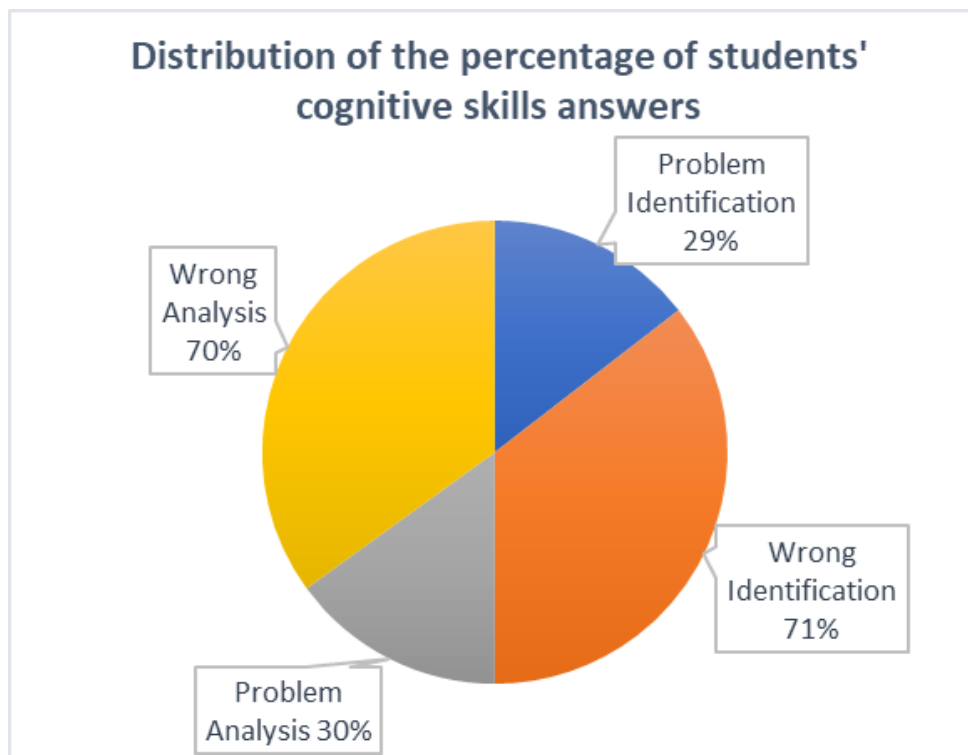


Figure 4. Distribution of the percentage of students' cognitive skills answers

Cognitive skills are related to students' ability to identify environmental problems and analyze environmental problems based on the picture above. Only 107 students were able to correctly identify the problem or about 29% while in terms of analyzing 111 people or 30%. Cognitive skills are closely related to knowledge where cognitive skills are related to students' skills in analyzing, synthesizing, and evaluating information about a problem using primary and secondary sources and personal values. While behavior includes complex perceptions related to values and commitments made verbally and actually ([Cruz & Manata, 2020](#); [Erdoğan et al., 2009](#)). Environmental knowledge is a collection of ecological knowledge possessed by individuals about the environment. Environmental knowledge is very important to understand concepts, principles and theories related to ecology about how a system works and how the system interacts with the social environment ([Akintunde, 2017](#)).

Good environmental knowledge will also affect good human behavior. Environmental knowledge relates to general knowledge about facts, concepts and relationships about the natural environment and the surrounding ecosystem. This condition involves what people know about the environment, including the products produced, environmental impacts, and collective responsibility for sustainable development and better environmental literacy. However, currently students' environmental literacy is still in the stage of growing awareness and concern while responsibility has not become a real behavior/participation and has not been based on strong knowledge because students are limited in knowledge but are still low in synthesizing problems ([Susilastri & Rustaman, 2015](#)).

Environmental literacy of junior high school students related to attitudes and behavior is in the high category with scores of 73 and 71, respectively. Attitudes towards the environment are divided into 5 indicators which are described in [Figure 5](#).

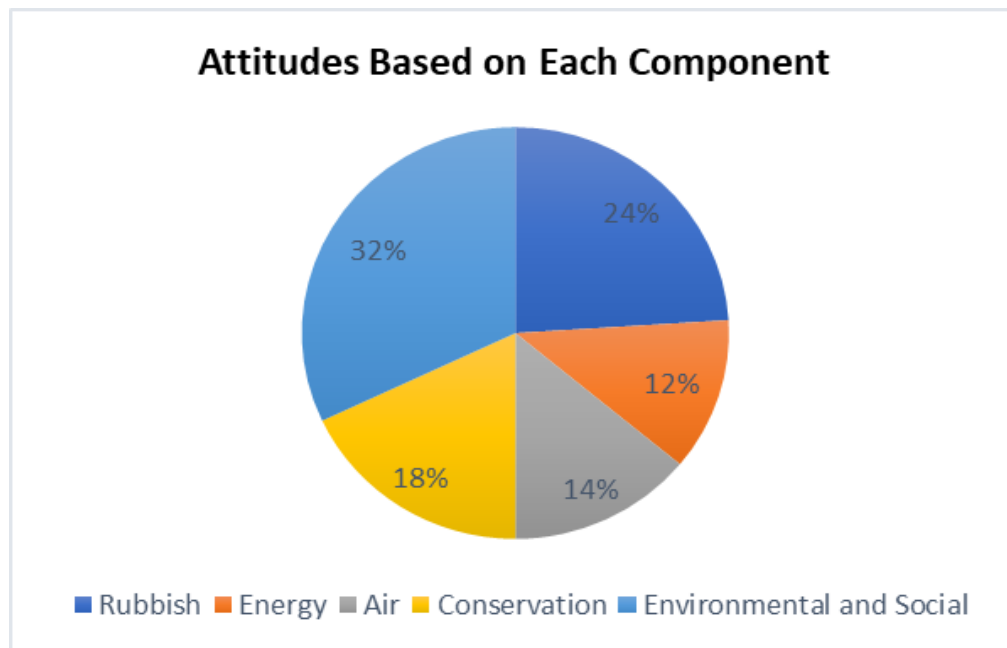


Figure 5. Percentage of attitudes based on each component

The diagram Figure 5, it can be seen that the highest attitude is related to environmental and social issues and the lowest attitude is related to energy issues. In the school environment, environmental issues related to waste have been widely disseminated through the installation of posters, the presence of trash bins in every classroom, and the implementation of waste recycling programs. However, the problem of energy is still lacking where there are still many students who do not turn off the fan after finishing studying, leaving the laptop/cellphone charger plugged in even though it is not used and there are still few posters / banners calling for energy savings. The attitude of caring for the environment that these students have also grows with habituation. This is related to Liang et al., (2018) and Negev et al., (2008) the attitude involves knowledge about something. This means that knowledge about something is a beginning that affects attitudes that can lead to an act that is repeated.

The development of environmental literacy can support a more comprehensive understanding and a more balanced and sustainable approach in dealing with complex, broadly applicable issues such as linking social problems (unemployment, poverty) to environmental problems (access to water, food or energy sources) (Hollweg et al., 2011). This is also related to the way teachers teach that teachers still have difficulty in teaching environmental education in the classroom. Therefore, teachers are required to develop appropriate models or strategies to improve students' environmental literacy, as research conducted by Puspasari et al., (2019), suggested that GI experimental learning tools developed can improve students' environmental literacy skills which include aspects of knowledge, attitude and habituation to environmentally friendly agricultural sub-materials Environmental Education (PLH). As for the planning of ethnosience-based science learning activities through environmental analysis at JHS 1 Pekanbaru, JHS 5 Pekanbaru, JHS 32 Pekanbaru, JHS 9 Pekanbaru and JHS 10 Pekanbaru, it is known that all science teachers are the samples. Integrating ethnosience into Ecosystem and ecology material, this is different from the results of interviews at JHS 9 Pekanbaru, which have not applied ethnosience at all to ecosystem and ecology materials. The implementation of ethnosience- based science learning can be done by integrating the learning materials with the environment. Based on the results of interviews and analysis, it can be said that the average junior high school has implemented ethnosience integration in environmental literacy, both consciously and unconsciously.

CONCLUSION

Based on the research that has been done, it can be concluded that Environmental Literacy in junior high school students is included in the medium category. Based on the four parameters of environmental literacy achievement for the parameters of knowledge, attitudes and behavior are in the medium category while

cognitive skills are in the low category. Of the four parameters of environmental literacy, the parameters of knowledge and attitudes have a contribution to environmental literacy. Based on the results of interviews and analysis, it can be said that the average junior high school has implemented the integration of ethnoscience on environmental literacy both consciously and unconsciously. The author's suggestion by increasing environmental literacy in learning is able to improve educational aspects, while the literacy level in Indonesia is still lacking. Efforts to increase scientific literacy in Indonesia can be done with ethnoscience-based learning. Where the ethnoscience approach is a strategy for creating a learning environment and designing learning experiences that integrate culture as part of the learning process

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REFERENCES

- Adam, A. F. B. (2014). Analisis implementasi kebijakan kurikulum berbasis lingkungan hidup pada program adiwiyata mandiri di SDN Dinoyo 2 Malang. *Jurnal Kebijakan Dan Pengembangan Pendidikan*, 2(2), 166–173. <https://ejournal.umm.ac.id/index.php/jkpp/article/view/1915/2020>
- Aji, S. D. (2017). Etnosains dalam membentuk kemampuan berpikir kritis dan kerja ilmiah siswa. *Jurnal Ilmiah*, 1(1), 7–11. <http://e-journal.unipma.ac.id/index.php/snpf/article/view/1604/1262>
- Aji, S. D., Hudha, M. N., & Rismawati, A. Y. (2017). Pengembangan modul pembelajaran fisika berbasis problem based learning untuk meningkatkan kemampuan pemecahan masalah fisika. *Science Education Journal*, 1(1), 36–51. <https://doi.org/10.21070/sej.v1i1.830>
- Akintunde, E. A. (2017). Theories and concepts for Human behavior in environmental preservation. *Journal of Environmental Science and Public Health*, 01(02), 120–133. <https://doi.org/10.26502/jesph.96120012>
- Alim, Sarwi, & Bambang Subali. (2020). Implementation of ethnoscience-based guided inquiry learning on the scientific literacy and the character of Elementary School Students. *Journal of Primary Education*, 9(2), 139–147. <https://doi.org/10.15294/jpe.v9i2.29189>
- Ananda, E. R., & Wandini, R. R. (2022). Analisis kemampuan literasi matematika siswa ditinjau dari self efficacy siswa. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 6(5), 5113–5126. <https://doi.org/10.31004/obsesi.v6i5.2659>
- Apriana, E., Munandar, A., Rustaman, N. Y., & Surtikanti, H. K. (2020). Pengembangan program perkuliahan biologi konservasi dengan pendekatan kontekstual berbasis kearifan lokal Aceh. *Visipena Journal*, 11(1), 1–15. <https://doi.org/10.46244/visipena.v11i1.1086>
- Badan Pusat Statistik. (2017). *Statistik Indonesia 2017*. <https://www.bps.go.id/publication/2017/07/26/b598fa587f5112432533a656/statistik-indonesia-2017.html>
- Cruz, S. M., & Manata, B. (2020). Measurement of environmental concern: A review and analysis. *Frontiers in Psychology*, 11(March), 1–14. <https://doi.org/10.3389/fpsyg.2020.00363>
- Dinissjah, M. J., Nirwana, N., & Risdianto, E. (2019). Penggunaan model pembelajaran direct instruction berbasis etnosains dalam pembelajaran fisika untuk meningkatkan kemampuan berpikir kritis siswa. *Jurnal Kumparan Fisika*, 2(2), 99–104. <https://doi.org/10.33369/jkf.2.2.99-104>
- Erdoğan, M., Kostova, Z., & Marcinkowski, T. (2009). Components of environmental literacy in elementary science education curriculum in Bulgaria and Turkey. *Eurasia Journal of Mathematics, Science and Technology Education*, 5(1), 15–26. <https://doi.org/10.12973/ejmste/75253>
- Hadi, W. P., Sari, F. P., Sugiarto, A., Mawaddah, W., & Arifin, S. (2019). Terasi Madura: Kajian etnosains dalam pembelajaran IPA untuk menumbuhkan nilai kearifan lokal dan karakter siswa. *Quantum: Jurnal Inovasi Pendidikan Sains*, 10(1), 45. <https://doi.org/10.20527/quantum.v10i1.5877>
- Haubold, H. J., Mathai, A. M., & Pyenson, L. (2020). Space Science and Technology Education, Teaching, Research. *Space Policy*, 53(53), 1–3. <https://doi.org/10.1016/j.spacepol.2020.101384>
- Hekmah, N., Wilujeng, I., & Suryadana, I. G. P. (2019). Web-LKS IPA terintegrasi lingkungan untuk meningkatkan literasi lingkungan siswa. *JurnaSul Inovasi Pendidikan IPA*, 5(2), 129–138. <https://doi.org/10.21831/jipi.v5i2.25402>
- Hollweg, K. S., Taylor, J. R., Bybee, R. W., Marcinkowski, T. J., McBeth, W. C., & Zoido, P. (2011). Developing a framework for assessing environmental literacy. In ... for Environmental North American Association for Environmental Education. <http://www.naaee.net>

- Indrawan, I. P. O., & Mahendra, I. G. J. (2021). E-Learning terintegrasi kearifan lokal Bali berbasis 4c pada mata pelajaran IPA. *Jurnal Pedagogi Dan Pembelajaran*, 4(3), 511. <https://doi.org/10.23887/jp2.v4i3.41415>
- Khoiri, A., & Sunarno, W. (2018). Pendekatan etnosains dalam tinjauan fisafat. *SPEKTRA : Jurnal Kajian Pendidikan Sains*, 4(2), 145. <https://doi.org/10.32699/spektra.v4i2.55>
- Liang, S. W., Fang, W. T., Yeh, S. C., Liu, S. Y., Tsai, H. M., Chou, J. Y., & Ng, E. (2018). A nationwide survey evaluating the environmental literacy of undergraduate students in Taiwan. *Sustainability (Switzerland)*, 10(6), 1–21. <https://doi.org/10.3390/su10061730>
- Mihanpour, H., Khashij, M., Shamsizadeh, Z., Gholami, M., Ebrahimi, A., Rezaeipandari, H., Malekahmadi, R., Arsham, A., Parizan, F., & Jafari, V. (2018). Assessment of the awareness, attitude and environmental literacy about environmental issues and challenges (Case study: Yazd citizen's view in 2017). *Preprints*, Nov(November), 1–11. <https://doi.org/10.20944/preprints201811.0375.v1>
- Muna, L. R., Udaibah, W., & Mulyatun. (2016). Pengembangan modul pembelajaran kimia berorientasi etnosains dengan mengangkat budaya batik Pekalongan. *Unnes Science Education Journal*, 5(3), 1418–1423. <http://journal.unnes.ac.id/sju/index.php/usej>
- Nasution, R. (2021). Analisis tingkat literasi lingkungan mahasiswa FKIP Universitas Mulawarman dengan transformasi skor NELA (National Environmental Literacy Assessment). *Jurnal Ilmiah BioSmart (JIBS)*, 7(1), 38–51. <https://doi.org/10.30872/jibs.v1i1.423>
- Negev, M., Sagy, G., Garb, Y., Salzberg, A., & Tal, A. (2008). Evaluating the environmental literacy of Israeli elementary and high school students. *Journal of Environmental Education*, 39(2), 3–20. <https://doi.org/10.3200/JOEE.39.2.3-20>
- Nurwidodo, N., Romdaniyah, S. W., Sudarmanto, S., Rosanti, D., Kurniawati, K. & Abidin, Z. (2021). Analisis profil berpikir kritis, kreatif, keterampilan, kolaboratif, dan literasi lingkungan siswa kelas 8 SMP Muhammadiyah sebagai dampak pembelajaran modern. *Bioscientist: Jurnal Ilmiah Biologi*, 9(2), 605–619. <https://doi.org/10.33394/bioscientist.v9i2.4642>
- Pamungkas, A., Subali, B., & Linuwih, S. (2017). Implementasi model pembelajaran IPA berbasis kearifan lokal untuk meningkatkan kreativitas dan hasil belajar siswa. *Jurnal Inovasi Pendidikan IPA*, 3(2), 118. <https://doi.org/10.21831/jipi.v3i2.14562>
- Pertiwi, U. D., Atanti, R. D., & Ismawati, R. (2018). Pentingnya literasi sains pada pembelajaran IPA SMP abad 21. *Indonesian Journal of Natural Science Education (IJNSE)*, 1(1), 24–29. <https://doi.org/10.31002/nse.v1i1.173>
- Pulungan, N. A. (2017). The comparison of student achievement and student activity in kooperatif learning with TPS and STAD at Topic of Cellin Senior High School. *Jurnal Pendidikan Biologi*, 10(1), 24–31. <https://doi.org/10.24114/jpb.v7i2.10362>
- Puspasari, A., Susilowati, I., Kurniawati, L., Utami, R. R., Gunawan, I., & Sayekti, I. C. (2019). Implementasi etnosains dalam pembelajaran IPA di SD Muhammadiyah Alam Surya Mentari Surakarta. *SEJ (Science Education Journal)*, 3(1), 25–31. <https://doi.org/10.21070/sej.v3i1.2426>
- Rokhmah, Z., & Fauziah, A. N. M. (2021). Analisis literasi lingkungan siswa SMP pada sekolah berkurikulum wawasan lingkungan. *Pensa E-Jurnal : Pendidikan Sains*, 9(2), 176–181. <https://ejournal.unesa.ac.id/index.php/pensa/article/view/37765/33947>
- Santoso, R., Roshayanti, F., & Siswanto, J. (2021). Analisis literasi lingkungan Siswa SMP. *JPPS (Jurnal Penelitian Pendidikan Sains)*, 10(2), 1976–1982. <https://doi.org/10.26740/jpps.v10n2.p1976-1982>
- Subianto, B., & Ramadan, Z. H. (2021). Analisis implementasi program adiwiyata di sekolah dasar. *Jurnal Basicedu*, 5(4), 1683–1689. <https://doi.org/10.31004/basicedu.v5i4.900>
- Susanti, S., & Purmintasari, Y. D. (2015). Pengaruh penerapan metode pembelajaran SQ3R (survey, question, read, recite, and review) terhadap hasil belajar mahasiswa Program Studi Pendidikan Sejarah IKIP PGRI Pontianak. *Jurnal Edukasi*, 13(1), 97–104. <https://doi.org/10.31571/edukasi.v13i1.23>
- Susilastri, S. D., & Rustaman, N. Y. (2015). Students' environmental literacy profile in school-based nature and in school that implement the Adiwiyata program. *Seminar Nasional Konservasi Dan Pemanfaatan Sumber Daya Alam 2015*, 263–269. <https://pdfs.semanticscholar.org/ed14/54bc4c6fb9aa7e9db7ac34060f7cdeb3ff5.pdf>
- Susongko, P., Ratu, I. M., & Hayati, M. N. (2020). Tes kemampuan berfikir tingkat tinggi untuk mengukur literasi lingkungan hidup bagi siswa sekolah menengah pertama dengan aplikasi model rasch. *Pancasakti Science Education Journal*, 6(2), 93–100. <https://doi.org/10.24905/psej.v6i2.127>

- Syofyan, H., & Sumantri, M. S. (2019). Pengembangan awal bahan ajar IPA di sekolah dasar. *JPD: Jurnal Pendidikan Dasar*, 10(1), 52–67. <https://doi.org/10.21009/10.21009/JPD.081>
- Wang, X., & Hamilton, H. J. (2003). DBRS: A density-based spatial clustering method with random sampling. *Lecture Notes in Artificial Intelligence (Subseries of Lecture Notes in Computer Science)*, 2637, 563–575. https://doi.org/10.1007/3-540-36175-8_56
- Widiyawati, Y., Nurwahidah, I., Sari, D. S., Masykuri, M., & Budiyanto, C. W. (2021). The 21 st century science learning: HOTS and digital literacy among junior high school students in Semarang, Indonesia. *Journal of Physics: Conference Series*, 1842(1), 1–13. <https://doi.org/10.1088/1742-6596/1842/1/012081>