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Article

Analysis of the Level of Knowledge of Renewable Energy and Energy-Efficient Behavior Among Students at SMP 1 Ma'arif 1 Ponorogo

Galih Eka Saputra[1]*, Rohmat Rizal Al Qodri[2], Setia Ningrum[3], Tri Indah Setiyorini[4], Ida Ardyana[5], Mughniatul Ilma[6]

[1,2,3,4,6] UIN Kiai Ageng Muhammad Besari Ponorogo, Indonesia
[5] SMP Ma'arif 1 Ponorogo, Indonesia

** Corresponding Address: galihmipa4@gmail.com*

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ABSTRACT

This study aims to determine the level of students' knowledge about renewable energy and energy-saving behavior at Ma'arif 1 Ponorogo Junior High School. This study was conducted using a quantitative descriptive method with a total of 70 students as respondents. Data collection was carried out using a questionnaire containing two variables, namely knowledge about renewable energy and energy-saving behavior. Data analysis was performed using descriptive statistical analysis. The results of the study showed that the average knowledge of renewable energy among students was 70.97 in the good category, and the average energy-saving behavior among students was 68.34 in the good category. Overall, the results of this study indicate that students' knowledge of renewable energy supports the formation of energy-saving behavior among students.

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INTRODUCTION

Indonesia is a country rich in natural resources, which include all natural elements that encompass aspects of life and physical aspects that are used to meet human needs, thereby improving human welfare. Based on Law No. 4 of 1982, Article (5), natural resources are part of the environment consisting of human resources, biological resources, non-biological resources, and man-made resources. Energy resources are a type of natural resource used to obtain energy, such as coal, oil, natural gas, waterfalls, sunlight, windmills, and others. Energy is the ability to do work. In general, there are two categories of energy, namely those grouped based on availability and those grouped based on origin. Resources based on origin are divided into two, namely primary energy and secondary energy. (Solikah & Bramastia, 2024).

Indonesia, as a country consisting of many islands, has great potential in new and renewable energy sources (EBT) to be developed. These sources include energy from water, sunlight, wind, geothermal heat, ocean waves, biomass, and nuclear energy. However, the wealth and variety of EBT potential in Indonesia has not been fully utilized due to the high initial investment required. Nevertheless, the government is optimistic about promoting the

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use of EBT through regulations stipulated in the Regulation of the Minister of Energy and Human Resources, namely Permen ESDM No. 53/2018, concerning the utilization of EBT in the provision of national electricity generation. This new renewable energy comes from sources that can be continuously renewed, such as hydropower, solar power, wind power, and also from sources that can be produced sustainably such as biomass (Desti, 2022).

Based on Indonesia's energy projections for 2019, energy consumption in the country continues to increase every year. By 2025, electricity demand is projected to grow by approximately 11-12% in each scenario, reaching 576.2 TWh (BaU), 537 TWh (PB), and 520.7 TWh (RK). By 2050, growth is projected to reach around 6-7%, with a total of 2,214 TWh (BaU), 1,917.9 TWh (PB), and 1,625.2 TWh (RK). Until 2050, the household sector will remain the main contributor to electricity demand in all scenarios, followed by the industrial and commercial sectors. One source of energy is electricity. To control electricity consumption, steps must be taken to conserve electricity usage. Energy conservation is one way to reduce consumption so that energy is not wasted (Khulaemi, 2021).

The increase in energy use in Indonesia is caused by various factors, such as population growth, increased electricity consumption, and growth in transportation and industry. Therefore, efforts to conserve energy are needed. Energy conservation encompasses all actions aimed at reducing the costs of various energy-consuming devices. Energy conservation measures include several steps, such as reducing energy consumption, maintaining energy-using equipment, and using alternative energy sources or environmentally friendly equipment (Fauzi et al., 2024). Energy-saving behavior can be instilled in students through education on renewable energy awareness and knowledge (Dewi & Setyaningsih, 2020).

In creating students who are aware of energy conservation, educators in schools must prepare students to become members of society who have the knowledge, attitudes, and behaviors necessary for energy consumption. Energy-saving behavior in students is the actions taken by students in an effort to reduce consumption and replace activities that require energy. Students' knowledge about energy can be applied to solve everyday problems through scientific knowledge related to energy conservation in human life. Efforts to address energy-saving behavior issues are very important for students to provide education, socialization, and energy conservation education to future generations (Napis et al., 2023).

With the existence of energy-saving behavior among students, efforts can be made to save energy consumption and improve the cost efficiency of energy use. Therefore, energy conservation measures are needed to support energy-saving behavior among students. Energy-saving behavior among students requires appropriate knowledge and understanding. Students' understanding of the proper use of energy can foster their knowledge in energy-saving efforts so that they are able to calculate the energy consumption required (Firdaus et al., 2021).

Knowledge about the importance of saving energy is not only applied by students at home, but students' energy-saving behavior must also be applied at school. Energy conservation activities can begin by instilling values of awareness about the importance of energy conservation in the school environment (Dewi & Setyaningsih, 2020). In this case, educators are expected to prepare students to have good knowledge and attitudes and wise behavior in consuming energy (Bahij et al., 2020). This study aims to determine the level of students' knowledge about renewable energy and energy-saving behavior at Ma'arif 1 Ponorogo Junior High School.

METHOD

The research method used in this study is quantitative with a descriptive research type. Quantitative descriptive research is a type of research that describes the content of a research variable and does not test a specific variable hypothesis(Nurhabiba et al., 2023). Thus, the final

result of this research is a description of the research regarding the conditions of the variables studied numerically.

This study used a population of students enrolled at SMP Ma'arif 1 Ponorogo. The sample was determined using purposive sampling, where each individual was given the same opportunity and rights. In this study, a sample of 70 students consisting of eighth and ninth grade students at SMP Ma'arif 1 Ponorogo was used.

The data collection techniques used in this study were questionnaires and documentation. Documentation techniques were used to collect tabulated data from the questionnaires completed by students. Questionnaires were used as the main instrument to measure two research variables, namely knowledge of renewable energy and energy-saving behavior. The questionnaire was compiled and measured using a Likert scale. The Likert scale used in this study was in the form of scoring for each question in the research variables presented in Table 1 below.

Table 1. Scores for Respondents' Answers to the Renewable Energy Knowledge and Energy-Saving Behavior Questionnaire

No	Answer	Score Item Question
1	Strongly agree	4
2	Agree	3
3	Disagree	2
4	Strongly disagree	1

The data analysis technique used in this study employs descriptive statistical analysis. Descriptive statistics are used to process quantitative data obtained from questionnaires. The data analysis conducted in this study includes frequency, percentage, and mean values for each research variable. The results of the descriptive statistical analysis that has been carried out are then presented in the form of frequency distribution tables and diagrams to describe the conditions of the research variables objectively and comprehensively. Data analysis for each variable was performed using the following formula:

$$\text{Score for each variable} = \frac{\text{score obtained}}{\text{maximum score}} \times 100$$

The data for each variable that has undergone data processing is then categorized based on the ranges specified in table 2.

Table 2. Distribution Table Category Each Variable

No	Score for each variable	Category
1	81-100	Very good
2	60-79	Good
3	40-59	Fairly good
4	20-39	Not very good
5	0-19	Very poor

The data for each variable that has been categorized based on the categories in Table 2 is then calculated to obtain the number of categories and presented as a percentage in a pie chart. The formula used to calculate the percentage of each variable category is:

$$\text{Percentage of each variable (\%)} = \frac{\text{number of categories of respondents}}{\text{number of respondents}} \times 100\%$$

RESULT AND DISCUSSION

The results of this study show that knowledge of renewable energy can foster energy-saving behavior in students. The average results of energy knowledge and energy-saving behavior are presented in the following bar chart:

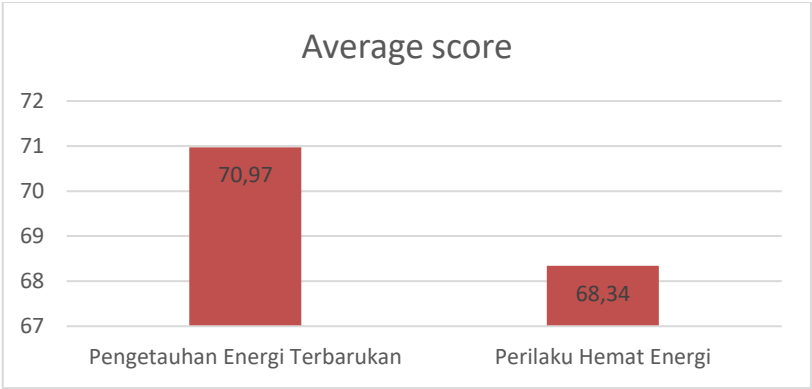

Figure 1. Average diagram of renewable energy knowledge and energy-saving behavior.
Source: personal data

The results of this study show that the average score for the renewable energy knowledge variable is 70.97 and is categorized as good. The average score for the energy-saving behavior variable is 68.34 and is categorized as good. The average scores for both variables are categorized as good because the scores obtained are in the range of 60-79.

Hasil kategori presentase pada variable pengetauhan energi terbarukan disajikan dalam bentuk diagram lingkaran berikut :

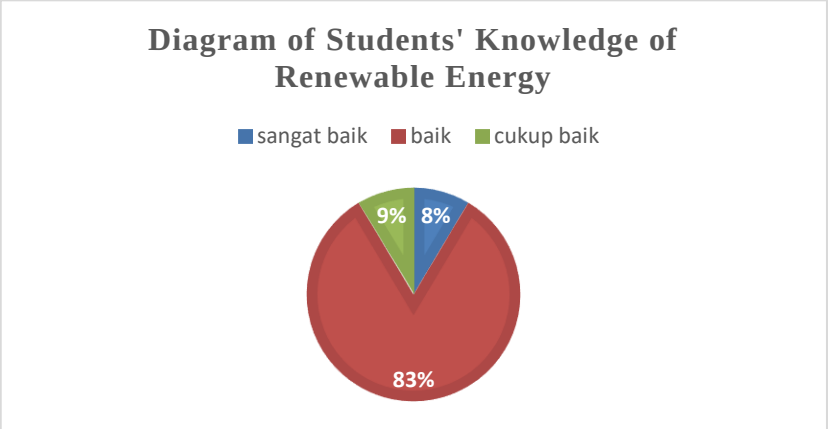

Figure 2. Diagram showing the percentage of knowledge about renewable energy.
Source: personal data

The results of this study show that the percentage of knowledge of renewable energy is very good at 8%, the percentage of knowledge of renewable energy is good at 83%, and the percentage of knowledge of renewable energy is fairly good at 9%. The results of the percentage categories for the energy-saving behavior variable are presented in the following pie chart:

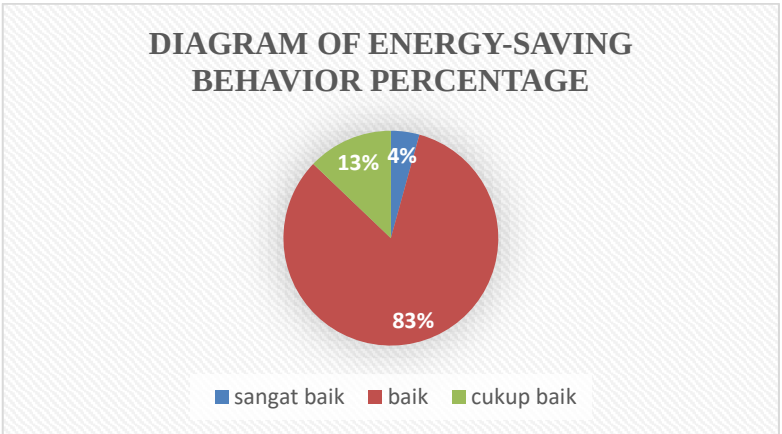

Figure 3. Diagram of energy-saving behavior percentages.
Source: personal data

The results of this study show that the percentage of knowledge of renewable energy is very good at 8%, the percentage of knowledge of renewable energy is good at 83%, and the percentage of knowledge of renewable energy is fairly good at 9%.

Renewable energy knowledge includes indicators of the ability to recognize examples of renewable energy, distinguish between renewable and non-renewable energy, understand its benefits to the environment, and be aware of the impacts of its use. The analysis results show an average score of 70.97, which is categorized as good. Most students (83%) are in the good category, 8% are in the very good category, and 9% are in the fairly good category. No students were categorized as "poor" or "very poor."

These findings indicate that students have understood the basic concepts of renewable energy such as solar, water, and wind energy, as well as the importance of applying this energy in maintaining environmental sustainability. These results are in line with the findings of a study by Diantari et al. in 2019, which stated that an increase in energy knowledge among junior high school students has an effect on their awareness and concern for sustainable energy issues. (Diantari et al., 2019).

Energy-saving behavior measures students' tendency to conserve energy through daily habits and the influence of their social environment. The average energy-saving behavior score was 68.34, which is considered good. The majority of students demonstrated positive behaviors, such as turning off lights or electrical appliances that are not in use, as well as adjusting energy use to their needs.

However, the results on several negative items indicate that some students are still inconsistent in their energy-saving practices, such as leaving electrical appliances on without use. These results support research conducted by Septina et al. in 2024, which explains that students' energy-saving behavior is influenced by factors such as habits, self-control, and support from the learning environment. (Septiana et al., 2024).

The results of the comparison show a positive correlation between the level of knowledge and energy-saving behavior. Students who have a high understanding of renewable energy also exhibit better energy-saving behavior. Theoretically, these findings are consistent with Ajzen's theory of planned behavior, which states that a person's behavior is influenced by their intentions, while intentions are influenced by knowledge and attitudes towards that behavior. This means that the higher the students' knowledge about the benefits of renewable energy, the more likely they are to apply energy-saving behaviors in their daily lives. (Ajzen, 1991).

The results of this study indicate that students at Ma'arif 1 Ponorogo Junior High School have good knowledge and energy-saving behavior. This indicates that education and socialization related to renewable energy at the junior high school level have had a positive impact on the environmental awareness of students. Knowledge of renewable energy plays an important role in shaping energy-saving attitudes and behaviors.

DeWaters and Powers explain that energy literacy consists of three main components: cognitive knowledge, affective attitudes, and actual behavior. Individuals who have a good understanding of energy tend to be more aware and responsible in their daily energy use (DeWaters & Powers, 2018). The results of this study also support Artini's view that strengthening energy literacy among students through contextual learning can improve pro-environmental behavior. By understanding the benefits of renewable energy, students find it easier to adopt energy-saving habits both at home and at school (Artini, 2025).

Most students showed good results, but there were still 8.57% of students in the "fairly good" category. This indicates the need for increased hands-on experience in energy education, such as alternative energy experiments, projects to build simple solar-powered devices, or energy conservation campaigns in the school environment. According to research conducted by Kusuma et al. in 2023, which states that direct student involvement in project-based learning has a significant effect on increasing energy awareness and behavior (Kusuma et al., 2023).

Thus, increasing knowledge of renewable energy not only has an impact on cognitive understanding, but also on the formation of energy-saving and environmentally conscious character. Schools can act as agents of change by integrating renewable energy concepts into science subjects and environmental-themed extracurricular activities.

CONCLUSION

The results of the study indicate that the level of knowledge of students at Ma'arif 1 Ponorogo Junior High School regarding renewable energy is classified as good, with an average of 70.97, and energy-saving behavior is also classified as good, with an average of 69.97. of 70.97, and their energy-saving behavior is also categorized as good with an average of 68.34. Therefore, based on this research, it can be concluded that most students already have knowledge about the importance of utilizing renewable energy and are trying to apply energy-saving behavior in their daily lives.

REFERENCE

Ajzen, I. (1991). The Theory of Planned Behavior. *Handbook of Theories of Social Psychology: Volume 1*, *50*, 438–459.

Artini, D. A. (2025). Menumbuhkan Pemahaman Konsep Energi Intelektual Pada Siswa Sekolah Dasar Dengan Metode Gamifikasi. *INTELEKTUAL: Jurnal Ilmiah Multidisiplin Mahasiswa Dan Akademisi*, *1*(2), 37–47.

Bahij, A. Al, Nadiroh, N., Sihadi, S., & Amrullah, F. (2020). Analisis Pengaruh Literasi Energi Terhadap Hemat Energi Pada Siswa Sekolah Dasar. *Edukasi: Jurnal Penelitian Dan Artikel Pendidikan*, *12*(1), 1–10. https://doi.org/10.31603/edukasi.v12i1.3401

Desti, I. (2022). Literature Review : Upaya Energi Bersih Dan Terjangkau. *Jurnal Sains Edukatika Indonesia*, *4*(1).

DeWaters, J. E., & Powers, S. E. (2018). Corrigendum to "Energy literacy of secondary students in New York State (USA): A measure of knowledge, affect, and behavior" [Energy Policy 39 (2011) 1699–1710](S0301421511000073)(10.1016/j.enpol.2010.12.049). *Energy Policy*, *117*(March), 278. https://doi.org/10.1016/j.enpol.2018.03.030

Dewi, F. I. R., & Setyaningsih, E. (2020). Intervensi untuk Perubahan Perilaku Hemat Energi Siswa. *Prosiding Seminar Nasional Unimus*, *3*, 373–382. http://prosiding.unimus.ac.id

Diantari, R. A., Tasdik, D., Erlina, Syarif, H., Jumiati, Soewono, S., & Indradjaja, I. M. (2019). Sosialisasi Energi Baru Terbarukan Untuk Pelajar SMP Annida Al Islamy Duri Kosambi, Cengkareng. *Terang*, *1*(2), 105–112. https://doi.org/10.33322/terang.v1i2.313

Fauzi, M. I. R., Naila, I., & Afiani, K. D. A. (2024). Perilaku Hemat Energi Pada Siswa Sekolah Dasar: Studi Kualitatif Deskriptif. *Janacitta*, *7*(2), 157–169. https://doi.org/10.35473/jnctt.v7i2.3314

Firdaus, Karim, S. A., & Imran, A. (2021). Penghematan dan Penggunaan Energi Listrik Bagi Warga Kelurahan Parang Bugisi Malino. *Seminar Nasional Pengabdian 2021*, 798–802.

Khulaemi, A. (2021). Seminar Nasional TREnD Perilaku Hemat Energi pada Generasi Milenial. *Seminar Nasional TREnD Technology of Renewable Energy and Development FTI Universitas Jayabaya Agustus 2021*, 112–120.

Kusuma, E. M. V., Santoso, G., Solehun, & Wardiningtias, B. D. E. (2023). Pengaruh Pembelajaran Berbasis Proyek Terhadap Kesadaran Lingkungan Sekolah dan Keluarga Untuk Meningkatkan Ketakwaan Kepada Tuhan YME dan Berakhlak Mulia Di Kelas 1. *Jurnal Pendidikan Transformatif (JPT)*, *2*(4), 289–309.

Napis, Farhan, M., Rahmatulloh, Hakim, A. R., & Apriyanto, M. T. (2023). Meningkatkan Kesadaran Masyarakat Dalam Budaya Hemat Energi Melalui Penyuluhan Efisiensi Penggunaan Listrik Rumah Tangga. *Jurnal Pendidikan Dan Pengabdian Masyarakat*,

6(2), 107–115.

Nurhabiba, F. D., Misdalina, & Tanzimah. (2023). Kemampuan Higher Order Thinking Skill (HOTS) Dalam Pembelajaran Berdiferensiasi SD 19 Palembang. *Didaktik : Jurnal Ilmiah PGSD FKIP Universitas Mandiri*, *09*(03), 410–421. https://doi.org/10.48175/ijarsct-13062

Septiana, I. R., Kholidah, N., Wijayanti, M., Yunanto, I., Wardhana, A. T., Daniar, R., & Ningsih, A. S. (2024). Sosialisasi Perilaku Hemat Energi Dan Pemanfaatan Sampah Menjadi Energi Pada Siswa Sma Sains Alumnika Palembang. *Jurnal Pengabdian Kolaborasi Dan Inovasi IPTEKS*, *2*(4), 1246–1254.

Solikah, A. A., & Bramastia, B. (2024). Systematic Literature Review : Kajian Potensi dan Pemanfaatan Sumber Daya Energi Baru dan Terbarukan Di Indonesia. *Jurnal Energi Baru Dan Terbarukan*, *5*(1), 27–43. https://doi.org/10.14710/jebt.2024.21742