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Senior High School Students' Literacy Profile on Energy Conversion Process

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Abstract

One of the factors supporting the success of the energy transition program is community literacy. The purpose of this study is to provide an overview of the energy literacy profile of students in the energy conversion process. This study used a survey method by distributing energy literacy questionnaires to students of class XII MIPA at the State Senior High School in West Java, Indonesia. The results showed that the majority of student literacy was in a low category (41.9%). The percentage of students who answered correctly on the knowledge aspect of energy conversion was 62.6%, knowledge of physics concepts in energy conversion was 37.4%, knowledge of aspects of energy conversion benefits was 40.0%, and the best attitude related to hydropower by 50.3%. This study concludes that the students' energy literacy level, primarily in energy conversion, is still in the low category. Therefore, energy education to improve students' energy literacy is still very much needed.

Keywords: energy conversion, energy literacy, energy education, renewable energy

Abstrak

Salah satu faktor pendukung keberhasilan program konversi energi adalah literasi masyarakat. Tujuan dari penelitian ini adalah untuk memberikan gambaran tentang profil literasi energi peserta didik dalam proses konversi energi. Penelitian ini menggunakan metode survei dengan menyebarkan instrumen literasi energi melalui angket kepada 31 siswa kelas XII MIPA SMA Negeri di Jawa Barat. Hasil penelitian menunjukkan bahwa sebagian besar literasi peserta didik menunjukkan kategori rendah (41,9%). Persentase siswa yang menjawab benar pada aspek pengetahuan konversi energi sebesar 62,6%, pengetahuan konsep fisika dalam konversi energi sebesar 37,4%, pengetahuan aspek manfaat konversi energi sebesar 40,0%, dan sikap terbaik terkait PLTA sebesar 50,3%. Penelitian ini menyimpulkan bahwa tingkat literasi energi peserta didik dalam konversi energi masih dalam kategori rendah. Oleh karena itu, pendidikan energi untuk meningkatkan literasi energi peserta didik masih sangat dibutuhkan.

Kata Kunci: konversi energi**,** literasi energi, pendidikan energi, energi terbarukan

1. Introduction

Recently, the production and consumption of electrical energy have been the primary concern of the Indonesian government since fuel energy is continuously dwindling [1], [2]. However, this reduced fuel energy is not accompanied by lowered electrical consumption. In 2020, electrical production decreased by 0.97%, while electrical consumption rose by 1%. The highest contributor to substantial electrical energy consumption is the household sector (49,7%), followed by the industrial (29.4%) and

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commercial or business sector (17,4%) [3], [4]. The dominating household sector in electrical consumption indicates that Indonesians wastefully consume electrical energy.

The government has shown a great attempt to reduce fuel energy consumption, such as by implementing the 10% cut program. However, those programs did not function properly. One of the reasons for the non-efficient program operation is society's low energy literacy. This low energy literacy is also observed among the students [10]–[12]. Energy literacy represents the fundamental knowledge related to energy, along with the comprehension of energy production and consumption, as well as their effects on the environment, resulting in wise behavior and attitude in using the energy [5]–[9]. Further, excellent energy literacy also results in participation in asking their surrounding people to use energy wisely.

The threat posed by the energy crisis accentuates the importance of energy literacy. Low energy literacy indirectly results in more consumptive use of energy. This effect has also been found in students. Students with minimum literacy tend to be more consumptive in using energy. Previous studies on energy literacy are dominated by examination of students' knowledge of energy production and energy-saving attitude [13]–[15], with minimum studies on the aspect of energy conversion. Therefore, this study aims to illustrate students' literacy profile on the energy conversion process.

2. Research Method

This study used a survey method to identify and describe students' energy literacy, particularly on the energy conversion process. Our population was twelfth-grade natural science program senior high school students in Sumedang, West Java. From that population, we gathered 31 samples using simple random sampling. In collecting the data, we used Google Forms, which was disseminated from 8 to 13 April 2022.

Our questionnaire consisted of 20 close-ended items which had been validated by the validators. The questionnaire items were distributed into four sub-skills, namely the understanding of the hydroelectric power process, physical concepts associated with the hydroelectric process, the benefits of the hydroelectric proses, and the best attitude in supporting the energy conversion through the hydroelectric process. The questionnaire items distribution is presented in Table 1.

Table 1. Items Distribution on Students' Energy Literacy Questionnaire

Domain	Aspect	Item Number	Type of Item
Cognitive	Knowledge of the energy conversion process	1,2,3,4,5	Multiple choice with four alternative answers
	Physical concepts on the energy conversion process	6,7,8,9,10	
	Advantages of energy conversion	11,12,13,14,15	
Affective	Supportive behavior toward energy conversion	16,17,18,19,20	Multiple choice, with causal-effect type

In this study, we garnered quantitative data from the student's responses to the energy literacy questionnaire. Further, the obtained data were analyzed using descriptive statistic techniques. The formula used to estimate the students' energy literacy score is presented in the following formula [16]

$$NP = \frac{R}{SM} x100\% \quad (1)$$

Descriptive:
NP : literacy energy score
R : score of the items with the correct answer
SM : maximum score

The calculation result was interpreted using the category listed in Table 2.

Table 2. Category for Energy Literacy Score Interpretation

Score Range	Category
86-100	Extremely high
72-85	High
58-71	Sufficient
43-57	Low
<43	Extremely Low

Source: Ratnawulan and Rusdiana [16]

3. Results and Discussion

Students' literacy profile on energy conversion in hydroelectric process is illustrated in figure 1.

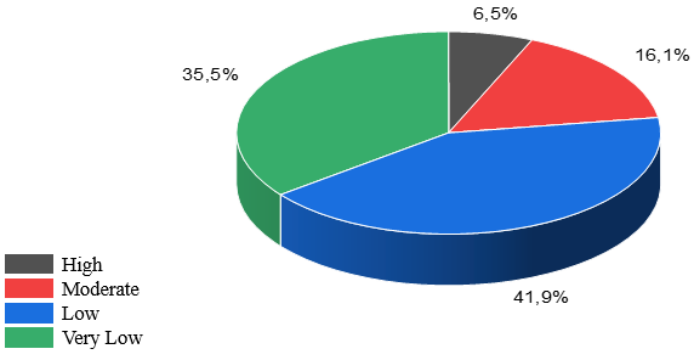

Figure 1. Distribution of Students' Literacy Profile

Of the total respondents involved in this study, the majority of them (41.9%) had a low energy literacy level. Meanwhile, only 6.5% of respondents had high literacy. This finding is linear with the findings reported in previous studies [14], [17]–[20].

Students' low literacy level is induced by numerous factors, one of them is their insignificant literacy in every aspect of energy literacy. The respondents' literacy level on every aspect of energy conversion in the hydroelectric process is presented in Figure 2.

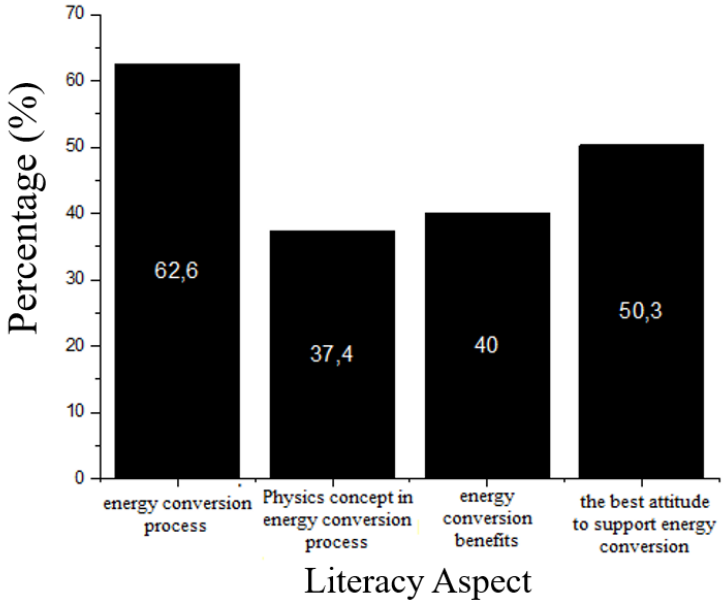

Figure 2. Students' Literacy Level in Every Aspect

Students' literacy level in the energy conversion process is categorized as sufficient, with an average score of 62.6%. The lowest literacy level was observed in the aspect of physical concepts involved in the energy conversion process, with an average percentage of 37.4%. Most of the respondents expressed their difficulties in understanding the concept of mechanical energy and potential energy. Similarly, in the aspect of energy conversion benefits, primarily in the hydroelectric process, the respondents scored 40.0%, on average, which was classified as extremely low,

In the aspect of the most supportive attitude toward the energy conversion process, the respondents attained a 50.3% average score, classified as sufficient. Their lowest score was identified in the attitude of using energy-saving products.

As shown in Figure 2, the achieved average literacy score on the energy conversion employing the four correlated features is 47.6%, categorized as low. This finding is in accordance with the study reported by Erniwati et al. [21]. Following our results in the four aspects of energy literacy, we conclude that the twelfth-grade natural science senior high school students' literacy in the energy conversion process is still low, primarily in West Java, Indonesia.

4. Conclusions and Suggestions

This study successfully illustrates the state senior high school students literacy profile on the energy conversion process in West Java, Indonesia. In general, students' energy conversion process literacy falls to a low level. Only 47% of our respondents gave the correct responses to the statements provided in the questionnaire.

However, this study also possesses limitations as it only used the hydroelectric process as the energy conversion. Therefore, future studies are suggested to investigate students' literacy on energy conversion using the other type of power plants.

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