

## **Evaluating the awareness of 8th grade pupils, Chua Hang 1 secondary school, Thai Nguyen city, Thai Nguyen province, Vietnam on energy saving**

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**ABSTRACT:** *Assessing pupils' awareness of energy saving is essential. The evaluation results are the basis for developing programs and organizing the implementation of education to raise awareness for pupils about energy saving. This research was conducted based on three methods: method of analyzing and synthesizing documents; sociological investigation method and Descriptive statistics method. Research results show: The awareness of 8th grade pupils of Chua Hang 1 secondary school about energy saving reached 6.70 points, which is considered quite good. However, raising awareness among pupils at Chua Hang 1 secondary school is essential to build energy saving habits. The board of directors of Chua Hang 1 secondary school is ready to support the implementation of an educational program to raise awareness for pupils about energy saving at the school.*

**Keywords:** *Awareness assessment, energy saving, Chua Hang 1 secondary school, pupils*

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### **I. INTRODUCTION**

Energy saving is an urgent requirement in the current context due to scarcity of resources, pressure to protect the environment, and huge socio-economic benefits. Fossil energy sources such as oil and coal are gradually running out, while energy demand is increasing, pushing up energy prices and causing risks to energy security [1, 2]. Renewable energy sources such as solar, wind, and hydroelectricity, although growing, cannot immediately completely replace traditional energy sources [3]. At the same time, wasteful use of energy leads to increased greenhouse gas emissions, contributing to global warming and climate change. The consequences of climate change include increased storms, floods, droughts, and loss of biodiversity, directly affecting human lives and livelihoods. This poses a big challenge for every country in finding sustainable solutions to ensure energy security and environmental protection.

Saving energy not only helps reduce living costs for households and businesses, but also reduces dependence on imported energy sources, enhancing national energy security. Furthermore, this contributes to building sustainable consumption habits, raising community awareness about environmental protection and ensuring resources for future generations [4, 5]. Therefore, saving energy is not only the responsibility of the government but also of each individual and organization in society.

In Vietnam, the Government has been implementing many policies and programs to promote energy saving and efficient energy use. Most recently, the Vietnam National Energy Development Strategy to 2030, vision to 2045 was signed and approved by the Prime Minister of the Socialist Republic of Vietnam on March 1, 2024. Strategy The target is that the ratio of energy savings to total final energy consumption compared to the normal development scenario is about 7 - 10% in 2030 and about 14 - 20% in 2045: "Firmly ensure national energy security; Providing adequate, stable, high-quality energy at reasonable prices for rapid and sustainable socio-economic development, ensuring national defense and security, improving people's lives, and contributing to ensuring national defense and security. protect the ecological environment. Carrying out energy transition makes an important contribution to meeting the net zero emissions target by 2050. The energy industry develops harmoniously between sub-sectors with synchronous and smart infrastructure, reaching an advanced level. of the ASEAN region. Building a competitive, transparent, and efficient energy market, consistent with socialist-oriented market economic institutions. Exploit and effectively use domestic energy resources combined with reasonable energy import and export; Thoroughly practice energy saving and efficient use. Proactively produce a number of key equipment in energy sub-sectors; Upgrade and build advanced and modern power transmission and distribution grids" [6].

However, for these policies to be truly effective, there needs to be high participation and awareness from all walks of life, especially the younger generation. Middle school pupils are an important target group,

not only because they are the current energy consumers but also the ones who will decide how energy is used in the future.

Thai Nguyen city is the cultural, economic and political center of Thai Nguyen province, with an area of 222.12 km<sup>2</sup>, population by the end of 2022 is 358,986 people, population density reaches 1,616 people/km<sup>2</sup>, the highest in the province [7]. Thai Nguyen. In the 2023-2024 school year, the whole city has 149 preschools, elementary schools, and middle schools [8]. Chua Hang I secondary school is located in the north of Thai Nguyen city, 3km from Thai Nguyen city center. The school belongs to the Department of Education and Training of Thai Nguyen city with a total area of 8,006 m<sup>2</sup>, belonging to group 8 of Chua Hang ward, Thai Nguyen city. Chua Hang I secondary school has applied the combination of environmental education or environmental education programs into its subjects. At the same time, Chua Hang I secondary school also organizes extracurricular programs that integrate propaganda on environmental protection and energy saving for pupils in anniversary programs, rallies. Chua Hang I secondary school is located in an area that has been developing strongly in recent times, where pupils' energy saving awareness and behavior can greatly affect the surrounding community. Assessing the awareness of 8th grade pupils about energy saving not only helps to better understand their level of knowledge and attitude towards this issue, but also creates a basis for building programs. Appropriate education and extracurricular activities to raise awareness and energy saving skills.

Assessing the awareness of 8th grade pupils at Chua Hang I secondary school about energy saving is very necessary. Pupils of middle school age are in the stage of forming long-term habits and awareness. Educating and encouraging energy saving right from the time they are in school helps children build habits of efficient and sustainable energy consumption. Pupils are not only current energy consumers but also those who convey knowledge and awareness of energy saving to their families and communities. Evaluating and raising awareness of children will have a positive impact on the surrounding environment. Assessing awareness of energy saving contributes to the implementation of the country's sustainable development goals, especially those related to energy and the environment. This helps build a young generation that is conscious and takes positive action in protecting resources and the environment. The assessment results will provide important data for educational managers and local authorities in developing and implementing educational programs and policies on energy saving. This ensures that educational activities are designed and implemented effectively, meeting the needs and current situation of pupils. Awareness assessment also helps measure the effectiveness of energy saving educational programs and activities that have been and are being implemented at schools. From there, lessons can be drawn and future programs can be improved.

This research, therefore, not only has theoretical significance but also has high practical value. It contributes to orienting energy-saving education for pupils, helps build sustainable habits and lifestyles, and spreads the message of environmental protection to families and communities. Educating and raising awareness about energy saving helps the young generation better understand the importance of protecting resources and the environment, thereby contributing to building a sustainable future. Through that, research contributes to society's common goals of protecting resources, minimizing environmental pollution, and moving towards sustainable development.

## **II. RESEARCH METHODS**

### *Method of analyzing and synthesizing documents*

This method helps the authors analyze aspects and link collected information sources. From there, we consider the problem fully and comprehensively, selecting important information to serve the construction of an overview of the research problem.

Documents used in this study include the 2022 Statistical Yearbook of Thai Nguyen province, topics related to energy and energy saving from Government agencies, the Ministry of Industry and Trade and other agencies; general information about Chua Hang I secondary school; documents on energy management as well as published scientific works on assessing community awareness of energy saving. After being classified and systematized, the documents are the basis for the author group to build a general overview and determine an appropriate approach to the research problem. From there, the authors conducted a survey and assessed the awareness of 8th grade pupils at Chua Hang I secondary school about energy saving.

### *Sociological investigation method*

The sociological survey method by questionnaire for 8th grade pupils at Chua Hang I secondary school was used in combination with the actual survey method. The authors conducted an investigation with 126 pupils in 3 classes: 8A, 8B, 8C. The survey content focused on the following aspects: Pupils' understanding, attitude and actions about energy saving.

After surveying with a questionnaire, the authors compiled the survey and assessed pupils' awareness of energy saving according to the criteria of knowledge, attitude and behavior with the following rating scales:

- + Low level: from 0% to 30%, convert to point: 2points;
- + Average level: from 30% to 60%, convert to point: 4points;
- + Fairly high level: from 60% to 80%, convert to point: 8points;
- + High level: from 80% to 100%, convert to point: 10points.

Student awareness is estimated through the average value of knowledge, attitude and behavior assessments. Accordingly, the weights of knowledge, attitude and behavior are equal and equal to 1. The rating scale is as follows [9]:

- + Low level awareness: from 0 to 2.5 points;
- + Average level of awareness: from above 2.5 to below 6.5 points;
- + Fairly good awareness: from 6.5 to under 8.5 points;
- + Good awareness: from 8.5 points.

#### Descriptive statistics method

This method is used to synthesize survey results through questionnaires, thereby drawing conclusions about pupils' awareness of energy saving issues.

### III. RESULTS AND DISCUSSION

The awareness of 8th grade pupils at Chua Hang I secondary school about energy saving is evaluated through pupils' knowledge, attitude and behaviors with equal weights. Assessment of pupils' understanding and attitude is carried out based on the following criteria: Concept of energy, energy saving; recognize types of energy; consequences of not saving energy; actions that can save energy. Student behavior is evaluated through the number of energy saving activities they have performed, the name of the energy saving activity and what they would like to do to save energy if they become an energy ambassador.

#### ASSESSMENT OF KNOWLEDGE AND ATTITUDE

The results of the investigation conducted in January 2024 showed:

- + 16/126 pupils know the concept of energy;
- + 67/126 pupils know that the most commonly used energy source today is fossil energy (oil, coal);
- + 93/126 pupils know that solar and wind energy are renewable energies;
- + 121/126 pupils know that saving energy is everyone's responsibility;
- + 115/126 pupils know that saving energy is using energy effectively and reasonably;
- + 88/126 pupils recognized that turning on electrical equipment during physical education (when pupils study outdoors) is an activity that wastes energy in school. In particular, pupils are also aware that using drinking water to wash towels and hands also wastes energy because the process of producing drinking water uses energy.

The percentage of pupils who know the concept of energy is very low, accounting for 12.7% of the total number of pupils interviewed. The percentage of pupils who know commonly used energy sources today is at an average level (53.17%). While the percentage of pupils understanding responsibility, actions that waste energy is quite high and high. Specifically in Figure 1.

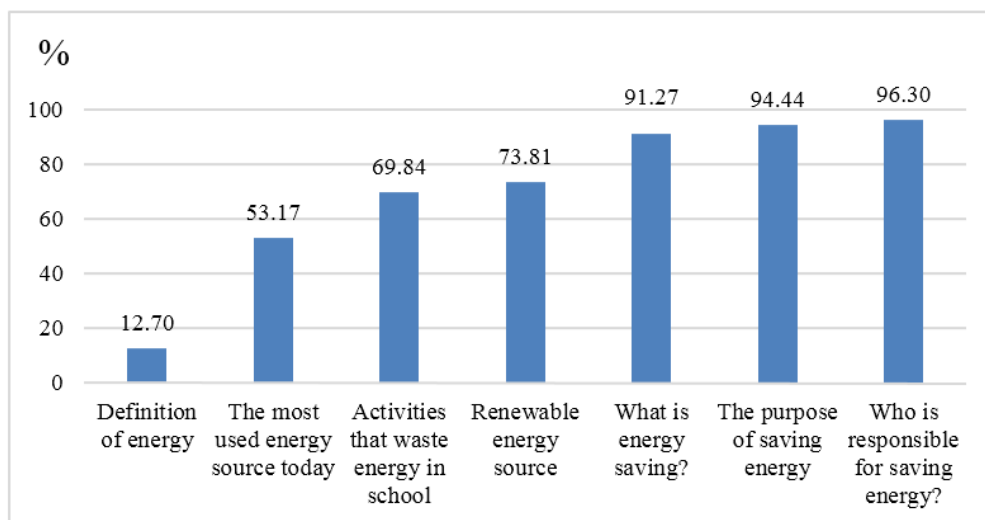


Fig. 1 Percentage of pupils with correct understanding of energy and energy saving

In particular, regarding pupils' understanding of the harmful effects of wasteful use of energy, the survey recorded: 65.87% of pupils believe that wasteful use of energy causes a lack of energy to use. used now and in the future, while causing depletion of fossil energy sources (coal, oil) and environmental pollution. About 26.19% of pupils think that wasting energy will lead to 1-2 of the 3 problems mentioned above. Only 7.94% of pupils surveyed were not aware of the consequences of wasting energy.

Regarding the group of daily actions that can save energy, 8th grade pupils of Chua Hang 1 Middle School have a high level of understanding. Most pupils are aware of energy saving actions including: Buying electrical appliances with a 5-star energy label or energy saving label; Setting the air conditioner to a reasonable cold temperature with a fan; Using public transportation (bus...); Regularly maintain your motorbike according to schedule; Using improved stoves for cooking; Using personal water bottles instead of single-use plastic bottles; Installing rooftop solar power systems and using solar power equipment; Making the most of sunlight and natural wind; Replacing incandescent light bulbs with LED lights; Unplug when not in use; Limit electricity use during peak hours; Turning off electrical devices when going out (Table 1). At the same time, 88.89% of pupils are also aware of actions that can waste energy such as using personal transportation, opening the refrigerator door many times or using a clothes dryer on a sunny day.

**Table 1. Some daily activities that can save energy and percentage of pupils choosing activities**

No.	Daily activities that can save energy	Percentage (%)
1	Buying electrical appliances with a 5-star energy label or energy saving label	77.78
2	Setting the air conditioner to a reasonably cold temperature with a fan	57.14
3	Using public transportation (bus...)	83.33
4	Regularly maintain the motorbike	76.98
5	Using improved stoves for cooking	66.67
6	Using personal water bottles instead of single-use plastic bottles	90.48
7	Installing rooftop solar power systems and using solar power equipment	83.33
8	Making the most of sunlight and natural wind	89.68
9	Replacing incandescent light bulbs with LED lights	58.73
10	Unplug when not in use	95.24
11	Limit electricity use during peak hours	87.30
12	Turning off electrical devices when going out	95.24

The general assessment of pupils' knowledge and attitude about energy saving is quantified through the conversion formula stated in the research methods section. Pupils' understanding and attitude are expressed through 9 criteria, the criteria have equal weight (Table 2).

**Table 2. Assessment of pupils' knowledge and attitude about energy saving**

No.	Evaluation criteria	Percentage (%)	Conversion points
1	Definition of energy	12.7	2
2	The most used energy source today	53.17	4
3	Activities that waste energy in school	69.84	8
4	Renewable energy source	73.81	8
5	What is energy saving?	91.27	10
6	The purpose of saving energy	94.44	10
7	Who is responsible for saving energy?	96.30	10
8	Understanding the consequences of wasting energy	65.87	8
9	Daily activities that can save energy	81.90	10
	<i>Evaluation score = [(1)+(2)+(3)+...+(9)]/9</i>		<b>7.80</b>

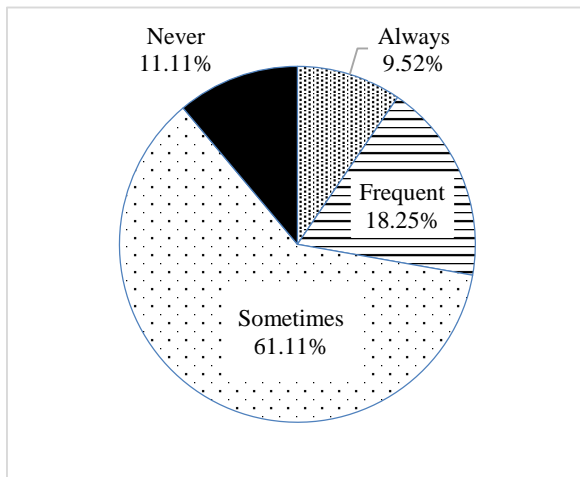
The survey results also showed that 95.25% of 8th grade pupils at Chua Hang I secondary school thought that saving energy is very important. This shows pupils' positive attitude toward energy saving. Most pupils believe that if they do not save energy, in the future renewable energy sources will be exhausted, the environment will be seriously polluted and people will not have enough energy to use. Some other reasons given by pupils include energy affecting human life, saving energy helps reduce electricity bills, protecting the environment and helping people have a better life. Pupils are also aware of the importance of energy saving for protecting national energy sources, protecting the environment and reducing greenhouse gas emissions. Chua Hang I secondary school pupils have a fairly good understanding of energy saving due to a number of important factors. First, modern education programs have actively integrated topics of environmental protection and

energy saving into the teaching content of many subjects, such as Natural Sciences and Citizenship Education. These lessons not only provide theoretical knowledge but also provide practical examples and practice exercises, helping pupils better understand how to apply energy saving measures in daily life. Second, Chua Hang I secondary school has had a number of extracurricular activities or propaganda activities that incorporate energy saving content to help pupils consolidate the knowledge they have learned. In addition, the use of information and communication technology in teaching also makes an important contribution to raising pupils' awareness of this issue. Another important factor that contributes to improving pupils' understanding of energy and energy saving is the mass media. Through videos, articles, and communication campaigns on mass media and social networks, pupils have access to rich and updated information about energy saving. Extensive propaganda campaigns from the government and non-governmental organizations have also spread and encouraged energy saving awareness in the community, thereby positively influencing student awareness. All of these factors have helped pupils gain a fairly good understanding and attitude towards energy saving.

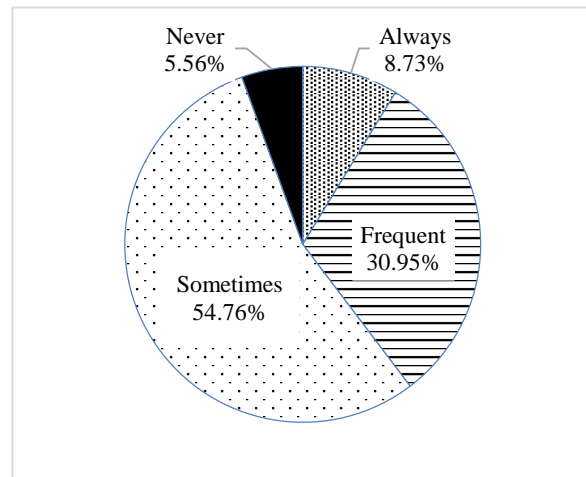
The knowledge and attitude of 8th grade pupils of Chua Hang I secondary school about energy saving reached 7.8 points, at a fairly good level.

### ASSESSMENT OF ACTIONS

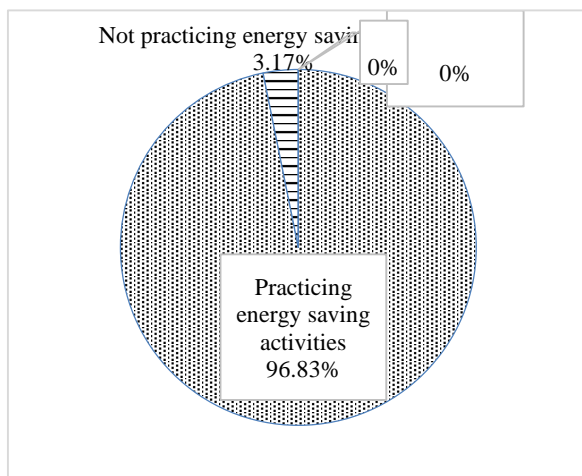
Evaluating pupils' actions on energy saving is done through the following criteria: Implement dynamic actions to save energy every day; Share knowledge and activities about energy saving with friends and family; willingness to participate and activities that encourage people to save energy.



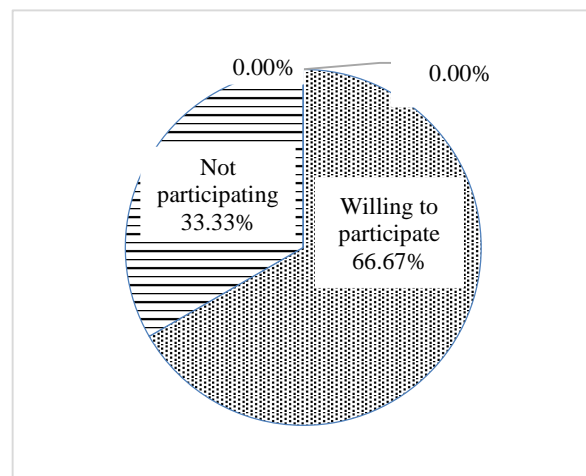
**Fig. 2** Level of student participation in energy saving activities



**Fig. 3** Level of knowledge sharing about energy saving with friends and families



**Fig. 4** Practicing energy saving activities



**Fig. 5** Level of willingness to participate in activities that encourage the community to save energy

Figures 2, 3, 4 show that: Although up to 96.83% of pupils or pupils' families have practiced energy saving, the level of pupils is mainly at an irregular level. Of these, 61.11% of pupils sometimes do it and 54.76% sometimes share it with friends and family. The percentage of pupils who do not save energy and do not share it with the community is quite high with 11.11% of pupils not doing it and 5.56% of pupils not sharing energy saving information. This shows the need to build energy saving habits for pupils.

The survey results also showed that: 15.85% of pupils performed 3 actions, 48.41% of pupils performed 2 energy saving actions, 33.33% performed 1 action and 2.38% of pupils did not take any action. The 3 most common actions taken by pupils include regularly using bicycles, turning off lights and electrical appliances when not in use. In addition, pupils of Chua Hang I secondary school also carry out many other energy saving activities shown in Table 3.

Figure 5 shows that: 66.67% of pupils are willing to propose and participate in activities to encourage the community to save energy. The remaining pupils were not willing to participate because they did not yet understand the nature of the necessary activities. Activities proposed by Chua Hang I secondary school pupils to encourage the community to save energy are shown in Table 3.

**Table 3. Energy saving activities and activities proposed by pupils of Chua Hang I secondary school to encourage the community to save energy**

<b>Energy saving activities of pupils at Chua Hang I secondary school</b>	<b>Activities proposed by pupils of Chua Hang I secondary school to encourage the community to save energy</b>
<ol style="list-style-type: none"> <li>1. Regularly use bicycles</li> <li>2. Turn off all electrical equipment when not in use or when going out</li> <li>3. Use personal water bottles</li> <li>4. Use solar energy</li> <li>5. Use public transportation</li> <li>6. Use LED lights</li> <li>7. Avoid opening the refrigerator too many times</li> <li>8. Do not use fans or air conditioners when it is cold</li> <li>9. Use cars and motorbikes powered by solar energy</li> <li>10. Turn off the faucet when not in use and do not waste it</li> <li>11. Lock the gas stove to avoid leaks</li> <li>12. Propagating energy saving and using renewable energy</li> <li>13. Set the air conditioner to a reasonable temperature</li> <li>14. Do not turn on the power when there is enough natural light</li> <li>15. Dry clothes in the sun instead of using a dryer</li> <li>16. Earth hour response</li> <li>17. Limit electricity use during peak hours</li> <li>18. Waste classification</li> </ol>	<ol style="list-style-type: none"> <li>1. Take energy saving actions</li> <li>2. Organize extracurricular activities on the topic of energy saving</li> <li>3. Organize practical activities on energy saving</li> <li>4. Propagating environmental protection and energy saving</li> <li>5. Encourage the community to use energy reasonably through projects, training sessions, and energy saving competitions</li> <li>6. Make a propaganda video about saving energy</li> <li>7. Establish a club to propagate energy saving</li> <li>8. Organize a drawing competition for pupils about energy saving</li> <li>9. Build a network of propagandists</li> <li>10. Create groups, forums, and fanpages on Facebook to encourage the community to save energy</li> <li>11. Participate in energy saving projects and programs</li> <li>12. Develop an energy saving plan at home</li> <li>13. Organize campaigns at cultural houses, post on social platforms, share with neighbors, family, and friends about energy saving</li> <li>14. Design solar energy systems for schools</li> </ol>

General assessment of energy saving behavior is quantified through the conversion formula stated in the research methods section. This assessment is calculated based on 5 criteria, each with equal weight (Table 4). In particular, with the criteria Student participation in energy saving activities and Knowledge sharing about energy saving with friends and families, the authors choose a level of frequent or higher as the basis for evaluation. Criteria for the number of energy saving actions, the authors choose a level of 2 or more actions as the basis for evaluation.

**Table 4. Assessment of pupils' actions about energy saving**

No.	Evaluation criteria	Percentage (%)	Conversion points
1	Student participation in energy saving activities	27.78	2
2	Knowledge sharing about energy saving with friends and families	39.68	4
3	Practicing energy saving activities	96.83	10
4	Taking 2 or more energy saving actions	49.21	4
5	Willingness to participate in activities that encourage the community to save energy	66.67	8
	<b>Evaluation score = [(1)+(2)+(3)+(4)+ (5)]/5</b>		<b>5.60</b>

Evaluation of energy saving actions of 8th grade pupils at Chua Hang I secondary school reached 5.60 points. Thus, student behavior is ranked at an average level.

Pupils have an average level of energy saving actions due to a number of reasons. First of all, although pupils have knowledge about energy saving, the transition from awareness to practical action requires time and specific guidance. Second, the influence from the family and community environment also plays an important role. If families and communities do not implement or encourage energy-saving measures, pupils may lack the motivation and opportunities to apply what they have learned. In addition, energy-saving devices and technologies often require initial costs, making it difficult for many families to invest. Furthermore, pupils' daily living habits have not been consistently adjusted to comply with energy saving measures. Finally, education and propaganda programs on energy saving in some schools are still limited in both content and form, not attractive enough to persuade pupils to act positively. All of these factors have contributed to an average level of energy-saving actions among middle school pupils.

#### **EVALUATING THE AWARENESS OF 8TH GRADE PUPILS AT CHUA HANG I SECONDARY SCHOOL ABOUT ENERGY SAVING**

Student awareness is determined through the average value of knowledge, attitude and behavior assessments, specifically as shown in Table 5.

**Table 5. Evaluating the awareness of Chua Hang I secondary school pupils about energy saving**

No.	Evaluation criteria	Conversion points
1	Knowledge and attitude about energy saving	7.80
2	Action to save energy	5.60
	<b>Evaluation score = [(1)+(2)+(3)+(4)+ (5)]/5</b>	<b>6.70</b>

The awareness of 8th grade pupils of Chua Hang I secondary school about energy saving reached 6.70 points, which is considered quite good.

This is thanks to a combination of many educational and social factors. First of all, the school curriculum has integrated content related to environmental protection and energy saving. Second, widespread propaganda campaigns from the government and non-governmental organizations along with mass media and social networks have spread the message of energy saving deeply in the community. From there, pupils can access a lot of information. Finally, support and encouragement from the family, with the implementation of energy saving measures at home, has also helped pupils have the opportunity to practice and consolidate knowledge effectively.

Although pupils already have quite good awareness about energy saving, raising awareness among pupils at Chua Hang I secondary school is essential for a number of important reasons. First of all, better awareness of energy saving will help pupils not only apply saving measures in daily life but also become environmentally responsible citizens in the future. Second, continuously updating and expanding knowledge will help children keep up with new technologies and methods in using energy efficiently, thereby enhancing creativity and problem-solving abilities. In addition, middle school pupils are at an age when it is easy to form habits, and reinforcing awareness about energy conservation will help them build good and sustainable habits in the long term. Besides, when children are equipped with good knowledge and skills, they can become media ambassadors, spreading the message of energy saving to family, friends and the community. Finally, raising awareness about energy saving also contributes to sustainable development and environmental protection, contributing to society's common goal of minimizing the impact of climate change. Therefore, continuing to educate and raise awareness for pupils about energy saving is a necessary and meaningful investment.

## **ABILITY TO APPLY EDUCATIONAL PROGRAM TO RAISE AWARENESS ABOUT ENERGY SAVING AT CHUA HANG I SECONDARY SCHOOL**

Currently, energy issues are of concern to the whole community. Saving energy is the responsibility of everyone regardless of age, ability, level, wealth or poverty. Saving energy inside and outside of school as well as raising pupils' awareness of energy saving receives special attention from the Board of Directors of Chua Hang I secondary school and the school's teachers, because this is an issue. The environment is important, not only locally or regionally, but has become a problem for the whole world.

Through the survey results, it clearly reflects the pupils' limited understanding of energy saving. Besides, Chua Hang I secondary school also wants to organize an extracurricular program for pupils but has not been able to do so. Therefore, the School Board of Directors has created the best conditions for surveys on pupils' awareness to be conducted in the School. This is the basis for accurately determining the need to organize educational activities to improve pupils' understanding of current environmental issues in general and energy saving in particular. From there, pupils' environmental protection behaviors are formed and maintained in daily life in a long-term and effective way.

Through the results of the investigation, it is necessary to develop and implement an educational program to raise awareness for pupils about energy saving. The board of directors of Chua Hang I secondary school is ready to support the program to be implemented at the school.

### **IV. CONCLUSION**

The knowledge and attitude of 8th grade pupils of Chua Hang I secondary school about energy saving reached 7.8 points, at a fairly good level.

Evaluation of energy saving actions of 8th grade pupils at Chua Hang I secondary school reached 5.60 points. Thus, student behavior is ranked at an average level.

The awareness of 8th grade pupils of Chua Hang I secondary school about energy saving reached 6.70 points, which is considered quite good.

Although pupils already have quite good awareness about energy saving, continuing to educate and raise awareness for pupils is a necessary and important investment in building good habits. The board of directors of Chua Hang I secondary school is ready to support the implementation of an educational program to raise awareness for pupils about energy saving at the school.

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