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Analysis of Needs Seawater Purification Devices by Utilising Solars Panels a Physics Learning Media

Ernidawati*, Zulia Ulfa, Mitri Irianti, Zuhdi Ma'aruf, Nur Adh Dhuha, Rayatul Akbar
FKIP, Universitas Riau, Pekanbaru, 28292, Indonesia

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* *Corresponding author:*

E-mail: ernidawati@lecturer.unri.ac.id

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A B S T R A C T

This study aims to analyze the needs seawater purification devices by utilising solars panels as a medium for learning physics, the research method used is descriptive with a survey approach, involving 23 teachers and 73 students in junior high and senior high schools in Riau Province. The survey results showed that most students felt that learning physics was difficult to understand, especially in renewable energy materials. The experimental method is the main choice in learning physics, but the limitations of experimental tools, include seawater purification devices by utilising solars panels, inhibits hands-on learning. This tool is not only relevant to support contextual physics learning but also provides insight into the use of renewable energy. This tool helps students understand the concept of physics, the use of this seawater purifier also provides an opportunity to teach students about very relevant environmental issues, such as the scarcity of clean water. The results of the study indicate that the provision of this tool is very necessary to improve students' understanding of physics concepts in a concrete and applicable manner.

1. Introduction

The learning process is an interaction between teachers and students to achieve educational goals. Success in achieving these goals is highly dependent on the role of the teacher, who not only functions as a transmitter of material, but also as a guide who supports the development of students comprehensively, both in terms of attitude, physical, and psychological aspects. In teaching and learning activities, teachers need to create a pleasant atmosphere so that students do not feel bored or fed up quickly (Wulandari et al., 2023). Learning that is often considered difficult by students must have a solution so that the learning can run according to its objectives. One of the learnings that is difficult according to students is physics learning.

Physics is often considered a challenging subject because it does not only rely on memorization but also requires a deep understanding of its basic concepts. (Rose Amanda Puri & Riki Perdana, 2023) The success of physics learning is largely determined by the ability of students to understand concepts. Physics is an experimental science, so that in its learning, experimental activities are needed to understand physics concepts accurately (Ernidawati et al., 2022). According to Mcdermott conceptual understanding is the understanding of basic concepts and principles in physics (Dessie et al., 2024). Physics learning is part of science education that involves processes, scientific attitudes, and scientific results. In studying physics, students are not only directed to understand the theories, concepts, or laws of physics but are also expected to be able to understand the mechanisms of the occurrence of these physical phenomena (Erlinawati, C. E., Bektiarso, S., & Maryani, 2019).

Physics learning in schools often faces challenges in making abstract concepts easier for students to understand. Many theories in physics are difficult to imagine in everyday life, so a more practical and contextual approach is needed. To overcome these problems, interesting learning media are needed that can help students understand the concepts given. The existence of this media can facilitate the delivery of material from teachers to students so that students can easily understand the learning (Rahayu et al., 2022). Learning media are tools used to convey messages and information during learning (Tambunan, 2021). The appropriate media to show the application of abstract material is a prop or experimental tool. With the right media, students can more easily relate what they learn to what is happening around them.

Media is a service that combines the needs of technology and communication as well as the need for sophisticated things because media has a significant role (Saleh & Syahruddin, 2023). Learning media is one of the main components that plays a significant role in supporting the learning process, apart from the teaching methods applied (Fitri et al., 2023). The importance of learning media in physics is not only limited to tools that can describe phenomena but also how these media can connect theory with reality.

Physics learning is often considered difficult because of the many theories that students must understand. Therefore, real experiments and applications are very important to make the concepts easier to understand. According to Djamarah, the experimental method is a learning approach that allows students to actively experience and prove for themselves the material being studied. Through this method, students are fully involved in doing, proving, and concluding independently regarding a particular object, condition, or process (Subekti & Ariswan, 2016). One of the physics materials that requires experiments or aids is alternative energy or renewable energy. This material requires an assistant media so that it is not only explained using the lecture method, by using other methods such as experiments can help students so that students can see directly the application of the material presented.

From the results of research conducted by (Lestari & Sucahyo, 2023) It is known that for alternative energy or renewable energy materials, there is still minimal teaching with the help of media or teaching aids, so according to researchers, using media or teaching aids in learning alternative energy materials is very important. Therefore, the development of a seawater purifier using solar panels to be used as a learning medium is very much needed by teachers. A seawater purifier is a tool that aims to reduce or eliminate the salt content contained in seawater, so that it can produce purer fresh water (Ernidawati et al., 2021). seawater purification devices by utilising solars panels, can improve students' critical thinking skills (Amin et al., 2022).

Where the purifier not only teaches the concept of renewable energy, but also encourages students to identify problems, make assumptions, and draw conclusions based on practical experience. The right learning media can improve students' understanding and motivation to learn (Rahim et al., 2022). The use of appropriate technology and learning media can enrich the learning experience and improve students' critical skills (Muhamad Dah et al., 2024). Utilizing energy sources for the seawater purification process is one of the most efficient and renewable ways. One of the effective and sustainable energy sources is solar energy which can be converted into electrical energy using solar panels.

Solar energy is one of the most environmentally friendly energy sources and can be used for various needs. This solar energy is a very good energy to be developed in Indonesia. This is because Indonesia is one of the countries located on the equator (Hasrul, 2021). In terms of seawater purification, solar panels can be an efficient and affordable solution, with a solar-powered seawater purifier, students can learn firsthand about how solar energy can be used for various purposes, including converting seawater into fresh water that can be used for human consumption.

This solar-powered seawater purifier is one option that can be implemented in Indonesia considering the abundant availability of solar energy and the vast sea (Oktavianus Ama ki'i, 2015). By integrating seawater purification technology using renewable energy sources, students not only learn about the water purification process but also understand how renewable energy can be applied in real solutions to address environmental challenges. This approach not only raises their awareness of the importance of renewable energy, but also provides practical experience that can enrich their conceptual understanding of sustainability and technological innovation, both locally and globally (Hoque et al., 2023).

In addition to helping students understand physics concepts, the use of this seawater purifier also provides an opportunity to teach students about very relevant environmental issues, such as clean water scarcity. The problem of clean water availability is a major challenge in many places in the world. The need for clean water continues to increase along with rapid population growth, encouraging humans to seek quality and guaranteed water sources to meet future needs (Wahyuni & Junianto, 2017). Indonesia has great potential to utilize the abundance of sea water as an alternative source of odor materials to meet the

needs of clean water for the community. One method of processing sea water into fresh water is through the desalination process, which can be done by utilizing solar energy to support the distillation process or purification of sea water into fresh water (Dewantara et al., 2018).

Based on the results of the journal review conducted (Ernidawati et al, 2024), The use of seawater purifiers is still rarely applied in the field of education. From the results of the study, seawater purifiers tend to be implemented more for the needs of the general public. Therefore, researchers will conduct a study to analysis of needs seawater purification devices by utilising solars panels as a physics learning medium to determine its relevance in the learning process.

This study aims to analyze the needs seawater purification devices by utilising solars panels as a medium for learning physics. The study was conducted by distributing questionnaires in several secondary schools in Riau Province. The purpose of this study was to understand how physics learning is carried out in these schools and what methods are most often used. In addition, this study also aims to evaluate the suitability of the use of seawater purification devices by utilising solars panels in the school environment and learning process.

2. Methodology

This study uses a descriptive method with a survey approach, which aims to describe the need for learning media seawater purification devices by utilising solars panels. the study was conducted in several junior and senior high schools in Riau Province in the 2023/2024 academic year. The survey approach was chosen to collect direct data from teachers and students regarding their perceptions of Physics learning, especially on renewable energy material. The data collection instrument used was a questionnaire consisting of seven closed questions, which were designed to measure students' and teachers' perceptions regarding the level of difficulty of Physics learning, the learning methods and media used, the availability of seawater purifiers in schools, and the need for experimental tools to support renewable energy learning.

3. Results and Discussion

After collecting data from the questionnaire on the analysis of need seawater purifier using solar panels in physics learning conducted on 23 teachers and 73 students from several junior high and senior high schools in Riau Province, the results of the analysis can be presented by displaying the percentage of answers from respondents.

Results of the q questionnaires regarding physics learning can be seen in Figure 1 below:

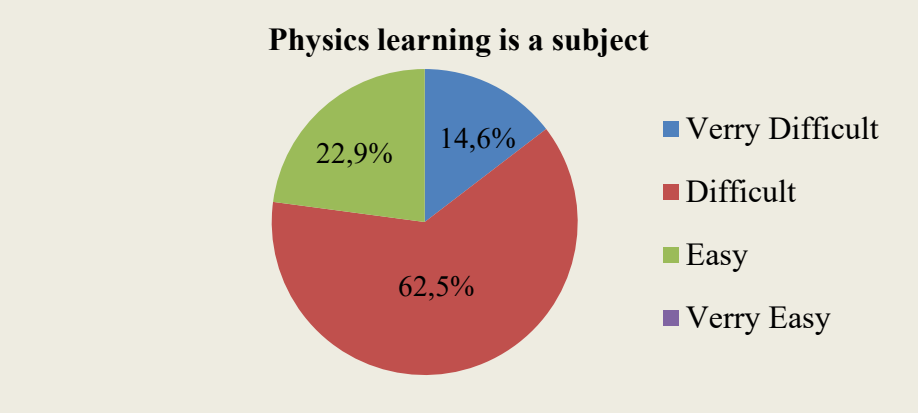

Figure 1. Survey Diagram of the Difficulty Level of Physics Learning According to Respondents

The results of the questionnaire responses by students and teachers showed that the majority of students and teachers, namely 62.5%, stated that learning physics was difficult. Meanwhile, as many as 22.9% of students and teachers felt that learning physics was easy, and only 14.6% stated that physics was a very difficult subject. No students or teachers stated that physics was a very easy subject.

These data indicate that most students still have difficulty understanding physics. The high percentage in the "difficult" category indicates the need for improved learning methods that are more innovative and support a practical understanding of physics concepts. This can include the use of appropriate teaching aids, an experiment-based approach, or the application of more interactive learning technology.

In addition, the presence of students who feel that physics is "easy" indicates that effective learning has been felt by a small number of students. This can be input for evaluating learning strategies so that they can be more evenly distributed so that students who experience difficulties can be helped. The results given by respondents regarding the methods frequently used in learning can be seen in Figure 2 below:

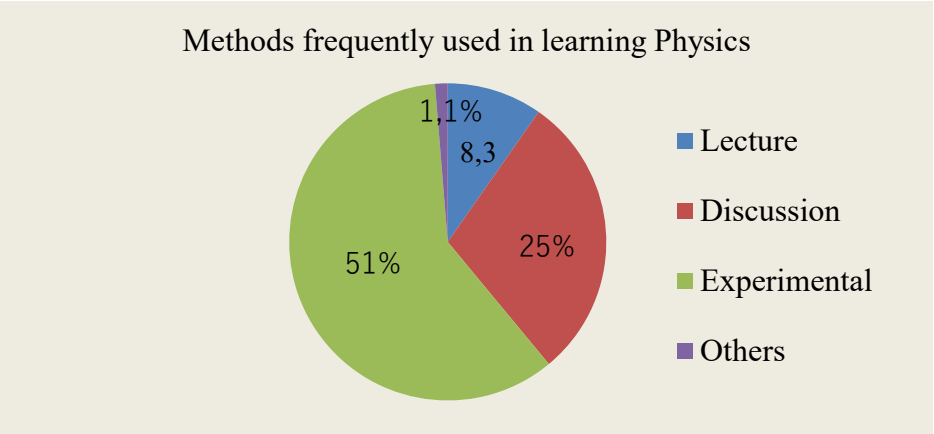

Figure 2. Survey Diagram of Frequently Used Methods in Physics Learning

The results of the questionnaire responses by students and teachers showed that the experimental method is the most frequently used in physics learning, with the highest percentage. On the other hand, the discussion method is also quite dominant, while the lecture method is only used by a small portion with a percentage of 8.3%. Meanwhile, other methods have a very small portion compared to other methods.

These data indicate that the experimental method is the main choice in physics learning, which is by the characteristics of this subject which requires direct observation and practice to understand concepts concretely. However, the existence of a significant discussion method also shows that there are efforts by teachers to involve students in the problem-solving process and collaborative learning. On the other hand, the lecture method with a low percentage indicates that this approach tends to be less popular or rarely used in physics learning. This is understandable considering that the lecture method is often one-way and does not actively involve students. Meanwhile, the results and explanation regarding media types can be seen in Figure 3 below:

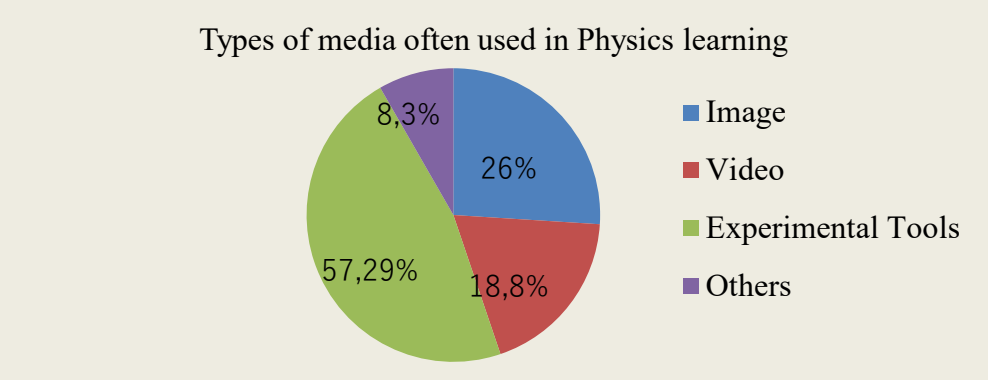

Figure 3. Survey Results Diagram of Types of Media Frequently Used in Physics Learning

The results of the questionnaire showed that experimental tools were the most frequently used media in physics learning, with a dominant portion compared to other types of media. Meanwhile, image media was also widely used, followed by video, while other media had a very small percentage.

These data show that experimental tools are the main choice because this media allows students to practice directly and observe real physics phenomena. The use of experimental tools in physics learning is very effective in helping students understand abstract concepts more concretely. This is in line with the characteristics of physics subjects that require a practice-based approach to improve student understanding. On the other hand, image and video media are still quite often used. Image media helps to simplify complex physics concepts through visualization, while video provides a more dynamic understanding by presenting demonstrations or simulations of a physics concept. However, the use of video and image media still has limitations because of its more passive nature

compared to experimental media. Results and explanations for the types of media that are suitable for learning can be seen in Figure 4 below:

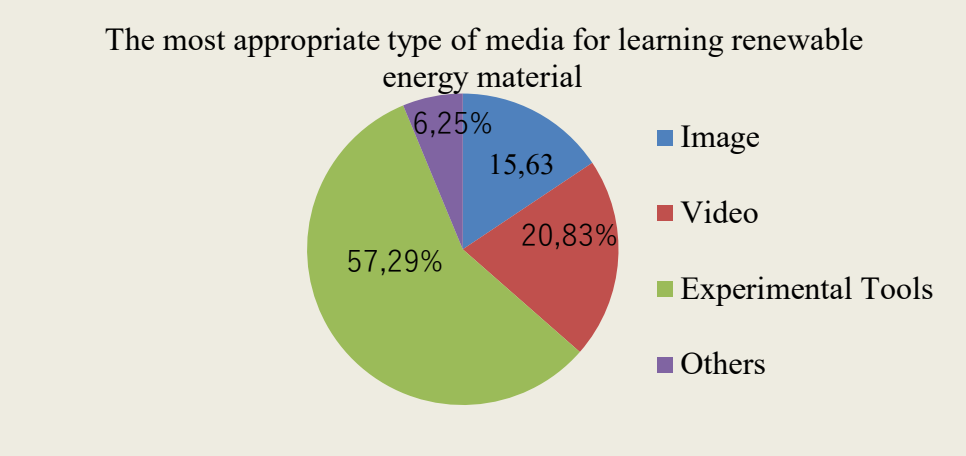

Figure 4. Survey Diagram of the Most Appropriate Media for Learning Renewable Energy Material

Based on Figure 4, experimental tools are the most appropriate media for learning renewable energy, with the highest percentage. This indicates that a hands-on approach is highly effective in helping students understand concepts concretely. Video media is also quite popular because it can present visualizations of phenomena that are difficult to observe directly, while images serve as supporting materials to clarify concepts. Other media have a very small proportion, possibly due to their lack of relevance or infrequent use. Therefore, based on the survey results provided by teachers and students, experimental-based media is considered the primary choice for learning physics, as it supports the characteristics of the subject, which require direct observation, while other media serve as complementary tools.

For the results of the statement regarding the seawater purification experimental tool using solar panels, the explanation can be seen in Figure 5, Figure 6, and Figure 7 below:

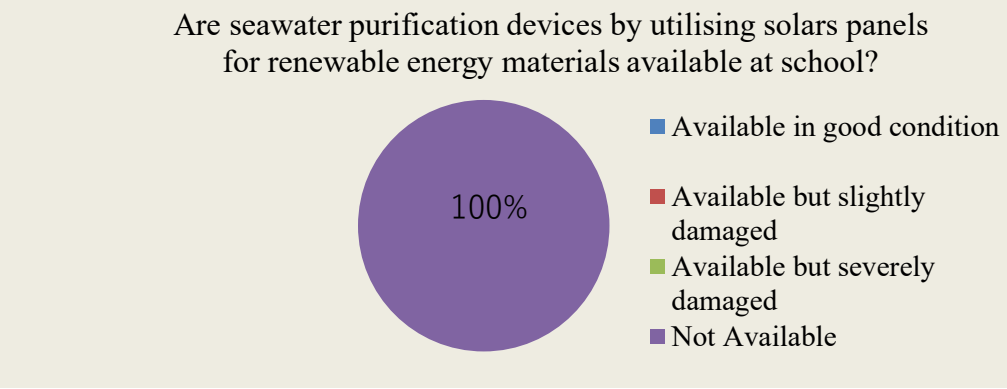

Figure 5. Survey Diagram of the Availability of Seawater Purification Devices by Utilising Solars Panels in Schools

Based on the pie chart, the majority of respondents stated that the seawater purification devices by utilising solars panels for renewable energy material does not yet exist in schools. This indicates the limitations of experimental facilities related to renewable energy that can be used in the learning process.

Therefore, the provision of appropriate experimental tools is very much needed by students, especially in renewable energy materials. With this experimental tool, students can learn through direct experience, so that their understanding of the concept of renewable energy will be deeper and more applicable. This data is an important basis for proposing the procurement or development of learning media that support practice-based learning methods.

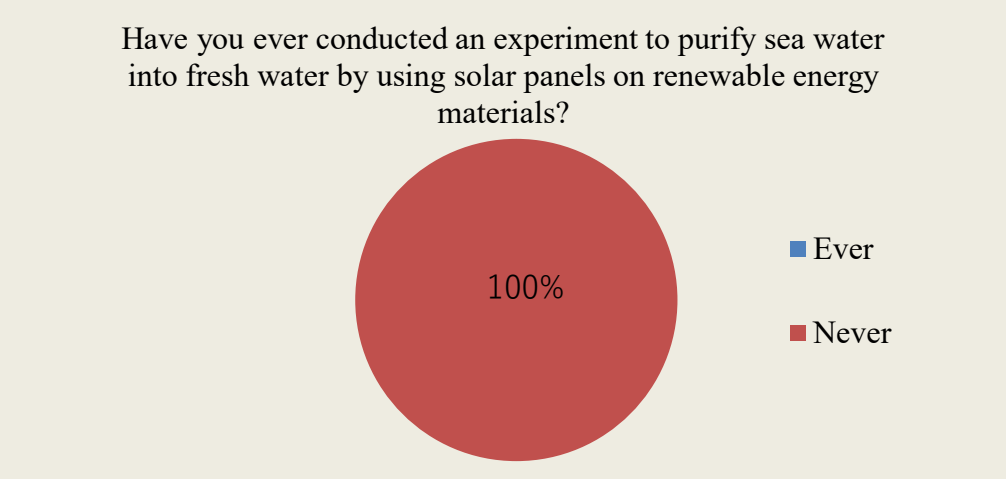

Figure 6. Survey Diagram on Students' Experience in Conducting Seawater Purification Experiments Using Solar Panels

The results of the questionnaire in the diagram above show that all respondents stated that experiments with assistance seawater purification devices by utilising solars panels for learning about renewable energy materials has never been done before. This shows that the use of learning media based on seawater purifiers is still relatively new and has not been widely introduced in formal learning environments. Thus, the application of this tool has great potential to become a learning innovation that not only provides new learning experiences for students but is also able to improve their understanding of the concept of renewable energy more concretely. This innovation can also support direct practice-based learning efforts, which are believed to be able to improve students' science process skills and the relevance of learning to everyday life problems, such as the need for environmentally friendly energy and water resource management.

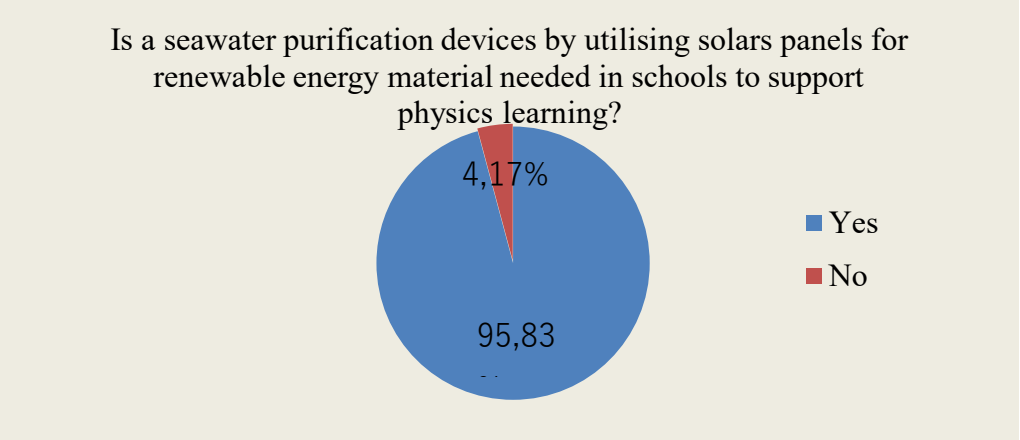

Figure 7. Survey Diagram on the Need for Seawater Purification Devices By Utilising Solars Panels to Support Physics Learning in Schools

Based on the pie chart, the majority of respondents stated that the seawater purification devices by utilising solars panels for renewable energy material is needed in schools. This shows that this tool can be used as a relevant learning medium to support students' understanding of renewable energy material, especially through a practical approach.

Support for the creation of this experimental tool is important because it can help students understand the concept of renewable energy more concretely and applicatively. Experiment-based learning provides students with direct experience, which not only improves theoretical understanding but also science process skills.

4. Conclusion

The results of this study revealed that physics learning, especially on the topic of renewable energy, is still considered challenging by most students and teachers. This difficulty is largely due to the limitations of learning media that support the teaching and learning process, especially experimental-based media that allow students to learn through direct practice. In this context, seawater purification devices by utilising solars panels emerged as a potential solution that can answer these challenges. This tool is not only relevant to learning renewable energy material, but also provides students with the opportunity to understand physics concepts concretely through direct application. In addition, this tool can be an effective medium in bridging physics theory with its application in everyday life, such as the use of solar energy to meet clean water needs.

However, this study also found that seawater purification devices by utilising solars panels not widely available in schools, although the need for learning media like this is considered very urgent. Therefore, the development and implementation of this tool are highly recommended to support more innovative, relevant, and contextual physics learning. Its provision is expected to improve the

quality of learning in a way that not only helps students understand concepts more deeply but also hones their skills in solving real problems, such as sustainable energy and water resource management.

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