The Energy Change Props from Used Goods to Reduce Impact of Environmental Pollution in the Land of Anim ha

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Abstract. Efforts in the world of education to reduce the impact of environmental pollution in the land of Anim Ha are to utilize waste as a learning medium. This research aims to develop learning media in the form of teaching aids using used items. Learning media are made in the form of teaching aids for wind power generation. This visual aid can be used to show the change of energy from wind energy to motion energy and motion energy to electrical energy. The results of observations using visual aids were developed, namely the resulting voltage of 0.4 volts with wind speeds of 2.4 m/s and 4.5 m/s. The coach made still has the disadvantage of a small dynamo so that the voltage generated was small.

1. Introduction

The Land of Malind or commonly referred to as the Land of Anim Ha which means "real man" [1]. One of the environmental problems in the future was the trash that was scattered everywhere. Public awareness of the importance of protecting the environment was still very low [2]. This was indicated by the large amount of plastic waste that fills the flood gates in Merauke [3]. This plastic trash piled up and clogged the floodgates, causing flooding. Besides, there was also a lot of garbage scattered on the streets. Do not miss the garbage in the market area of Wamanggu Merauke also contributes to the production of plastic waste which was quite large. The previous year on March 17, 2019, there was a quite severe flood in Merauke. The reason was because of rubbish that closes waterways so that rainwater stagnates and floods people's homes. Not only at home, but the trash also floods a variety of workplaces and schools so that this was very disturbing citizens' activities. As an area that still has the largest forest area in Indonesia [4], waste was a threat to the sustainability of forests in Merauke.

One of the efforts of the Merauke government to control plastic trash was outlined in Regent Regulation number 23 of 2019. This regulation was related to reducing the use of plastic bags. The application of this regulation has been implemented by several minimarkets in Merauke. The mini-market does not provide plastic bags, but instead provides shopping bags made of cloth and can be used repeatedly. This effort was quite helpful in minimizing the use of plastic bags. Also, the government provides a street sweeper that operates every hour at 4:00 in the morning local time. The provision of garbage transport motorcycles in small alleys has also been sought by the regional government of Merauke. Various efforts that have been carried out by the government require support and scholarship from the community. Therefore the community also must protect their environment.
Efforts that can be made in the field of education to reduce plastic trash was to recycle the waste into a learning medium. The media in question can be in the form of teaching aids that can be used in learning both outside the classroom and inside the classroom. By making learning media using trash, at a minimum can help reduce environmental pollution. This was because plastic trash does not undergo composting and does not decompose so that it can damage the environment. The use of plastic trash as a learning medium was expected to be able to build awareness of students in loving the environment [5].

Through learning media, students can get information in the form of messages related to learning material that was learned. Learning media are tools to stimulate the thoughts, feelings, attention, and interests of students to learn [6]. One of the benefits of using learning media was to increase students' motivation in learning activities. Also, learning media can be used to improve various abilities [7] such as problem-solving, analogy transfer [8] and self-diagnosis [9], mental models [10], understanding concept and student independence [11] and so on.

Props are one of the learning media commonly used in learning in the form of practicum. Props are most often used in learning science especially in the field of physics. Through visual aids, abstract physics material can be transformed into concrete and realistic. For example the concept of gravitational force, we cannot see the existence of gravitational force because it was an abstract thing. However, by using an object dropped from a certain height we can observe the symptoms of gravity. Through props, abstract physical concepts can be learned by recognizing the symptoms.

The condition of teaching aid was said to be good was to provide convenience following the learning objectives. There are certain criteria in the selection of teaching aids to support learning. The first criterion was the compatibility between the teaching aids and the material to be taught. This means that in choosing teaching aids to be used in learning must adjust to the material being taught. This means that not just any learning media that can be used. The second criterion was the ease of obtaining props and in its design. Props are not only provided in the laboratory but can be obtained from the environment around us. For example, when a teacher wants to explain the concept of Pascal law in learning physics, the teacher does not have to use the tools provided in the laboratory. The teacher may use plastic which was perforated on various sides and then filled with water. This was an example of the ease of obtaining props. If the props you want to use are difficult to obtain, the solution that the writer offers was to use a virtual laboratory in learning. The next criteria are ease of use, guaranteed use, financial capacity, and also ease of storage and maintenance.

Props can be obtained in the surrounding environment. Therefore making props can make use of existing resources in the surrounding environment. Efforts to empower resources that are easy, inexpensive and effective towards the achievement of learning objectives, namely the empowerment of used materials, reality (schools, homes, settlements), and objects that have special value. Used goods were one of the materials that can be empowered to make props. Used items that are no longer used will become rubbish and will increase the contribution of rubbish in the surrounding environment. This means that used goods that are not used will automatically contribute to pollution in the environment.

This research was focused on making learning media using waste. The learning media created are visual aids that can show changes in the form of energy from wind energy to motion energy and electrical energy. The use of waste as a teaching aid was one of the contributions that can be given to realize the Manokwari Declaration [12]. It was hoped that these teaching aids can be made and developed by school teachers so that they can most help reduce plastic waste in the surrounding environment, especially on the land of Anim Ha.

2. Method
This research was included in the research development using the ADDIE method (analyze, design, develop, implementation and evaluation). Analysis of needs was based on environmental problems that occur in Merauke. The results of the analysis are then described and form the basis for developing
the teaching aids. In this study used items/trash around the environment to create outdoor learning media. The design of the teaching aid was modified in such a way as to suit the wind resources in Merauke. Props that have been made are implemented on the 2nd floor of the mosque At-Taklim of Musamus University and Payum Beach. The measuring instrument used was an anemometer to measure wind speed and a multimeter to measure the voltage generated.

3. Result and Discussion
Props including learning tools that are very helpful in explaining abstract physics material to students. One of the biggest problems in the Merauke area was rubbish scattered everywhere. Garbage becomes a very disturbing object, especially trash which creates unpleasant odors. One place that produces a lot of garbage every day was the market. In Merauke, the biggest market was the Wamanggu market. The condition of the Wamanggu market page can be seen in Figure 1. Trash that was piled up and littered if not transported immediately will cause unpleasant odors. Not only in the market, but trash was also a problem in residential areas, shops, and even schools. This trash can even clog the drainage which can cause flooding.

![Figure 1. Condition in the Wamanggu Market](image_url)

The problem of trash in Merauke also had an impact on flooding in Merauke some time ago. Foods that occurred in Merauke in 2019 are very disturbing to the community. Because the activities of the community became very disturbed. In picture 2 it appears that the flood began to recede in one of the elementary schools in Merauke. One of the efforts to empower used goods (trash) in the field of education was to recycle used goods into props.
The development of learning media was one of the efforts to utilize trash to be used as a medium for learning. The focus of making this learning media was adjusted to the purpose of using the media which was to show students how the energy form changes from wind energy to motion energy, and the change of motion energy into electrical energy. This media can be called energy change props. The selection of energy change props because Merauke was an area whose territory was close to a suitable coastal area so that wind was the potential to be utilized in using the learning media for wind power generation for students. This media can be used in learning outside the classroom. The design of this media was presented in Figure 3.

Part 1 (one) was a propeller that shows the change in wind energy into motion energy. Part 2 (two) was a dynamo that will convert motion energy into electrical energy. The other part was the connecting cable (part 3), the socket (part 4), the wind balancer (part 5), and the retaining frame (part 6). The propeller used to make this learning media was a former laptop fan blades that are not used anymore. The socket used was used goods repaired by the researcher so that it can function again. The wind balancer was made from used jerry cans that are formed under the needs of the learning media created. The retaining frame was also made of used material that was recycled by researchers so that it can be reused. The retaining frame was made of used pipes that leak and are connected using glue and T-shaped pipes. These materials are made of plastic which if not recycled will contribute to environmental pollution. This was because the plastic material was difficult to decompose. The
The dynamo used was a dynamo purchased by itself because the dynamo function was important for converting movement energy into electrical energy.

Supporting tools used to make this learning media are 12 cm bolts of 1 piece, duct tape, scissors, glue, T-shaped pipe, and funnel-shaped pipe. Furthermore, the tools used to measure wind speed and the resulting voltages are Anemometer and Multimeter. The learning media created are presented in Figure 4.

![Figure 4. The Energy Change Props](image)

The teaching aids made can be used as a medium in learning to demonstrate the process of changing energy from wind energy to motion energy, and motion energy to electrical energy. The procedure for using these wind power generation props was as follows:

1. Calibrate anemometer and multimeter
2. Prepare props for wind power generation.
3. Put the props in a windy place.
4. Place the anemometer next to the teaching id to measure the wind speed.
5. Let the wind blow to move the propeller.
6. Allow a few moments until the wind starts to stabilize the propeller.
7. Measure the voltage generated by connecting the multimeter cable with the cable from the dynamo.
8. Read the measurement results, and record the results.

Based on observations, the process of energy changes that occur in wind power generating props begins with the wind triggering the propeller on the props to rotate. In this process, there was a change of energy from wind energy into motion energy. The rotation of the propeller then triggers the rotation of the coil on the dynamo. This rotation then causes the induction of GGL. This then produces electrical energy when measured using a multimeter. The rotation of the coil can produce electricity, which was the process of changing energy from motion energy to electrical energy. The work process of energy change props was presented in Figure 5.

![Figure 5. The Work Process of Energy Change Props](image)
The experiment using props was carried out on Payum Beach, Merauke. Observational data are presented in Table 1.

Table 1. Data Observation

| Location                  | Date         | Time | Wind Velocity (m/s) | Voltage (volt) |
|---------------------------|--------------|------|---------------------|----------------|
| 2nd floor of the Mosque   | December 15, 2019 | 09.00 | 2.8                 | 0.4            |
| 2nd floor of the Mosque   | December 15, 2019 | 09.05 | 1.5                 | 0.3            |
| 2nd floor of the Mosque   | December 15, 2019 | 09.10 | 2.5                 | 0.4            |
| 2nd floor of the Mosque   | December 15, 2019 | 09.15 | 2.9                 | 0.4            |
| Payum Beach               | January 12, 2020   | 09.00 | 4.5                 | 0.4            |
| Payum Beach               | January 12, 2020   | 09.05 | 3.6                 | 0.3            |
| Payum Beach               | January 12, 2020   | 09.10 | 4.5                 | 0.4            |
| Payum Beach               | January 12, 2020   | 09.15 | 5.5                 | 0.5            |

Based on observational data using wind power generation props, it was found that an average wind speed of 2.4 m/s and 4.5 m/s can produce an average voltage of 0.4 volts. This means that the stress generated in this observation can still be magnified using a larger dynamo. The potential of the wind in Merauke was quite high at a certain time so that it can be used to use wind power generating aids as a learning medium. The results of observations using a multimeter to measure the current received, the resulting current was direct electric current (DC). The resulting voltage was smaller than 1 volt. If referred to the concept of wind power generation, the voltage obtained was influenced by the number of turns of the coil on the dynamo, the strength of the bar magnet used, the dynamo used, and the speed of movement in and out of magnets in the coil. The teaching aids made can not only show demonstrations of energy changes but can also measure the amount of electrical energy produced following the existing wind speed.

Energy change props aids can be used in learning natural science at the elementary school level. Basic competence related to the 3rd Core Competency that was by the 2013 curriculum namely "understanding various energy sources, changing forms of energy, and alternative energy sources (wind, water, solar, geothermal, organic fuel, nuclear) in everyday life". Furthermore, the basic competency was related to the 4th core competency, namely "presenting reports on observations and searching for information on various changes in the form of energy". This teaching aid can be used in learning activities, especially in the energy change sub material.

When viewed in terms of availability and ease of design, these props can be made by teachers by utilizing used materials found in the surrounding environment. The design was also easy to connect the material used following the procedures previously described. Under the results of observations that have been made, obtained a voltage that was not large so that the possibility was very small to be electrocuted. Besides, the wind speed was not too large so that if exposed to the propeller the students do not experience serious injuries. Furthermore, in terms of the funds needed, it was quite minimal because the material used was in the form of used goods so that not much funds are spent in making these props. Thus energy change props can be used in learning and are quite safe for elementary school level students.

4. Conclusion
The use of waste as a teaching aid for energy change at least reduces the impact of environmental pollution. Some plastic waste can be converted into goods that can be used in the long run, in the form of props. The observation of teaching aids shows that the voltage generated was 0.4 volts. The
resulting voltage can be enlarged using a dynamo that was larger in size. Hopefully, in the future, prototypes of wind power plants can be made by utilizing waste so that it can reduce environmental pollution, especially in Merauke.

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