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Learning of Renewable Energy Sources in Elementary School Based on Digital

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ABSTRACT

The purpose of this study was to analyze the understanding and knowledge of energy sources from the definition, types and benefits of using digital-based learning methods. This research was conducted on grade elementary school students in the city of Pandeglang, Indonesia using 20 question questionnaires as the object of assessment, the questionnaire was distributed at the first meeting and continued with material at the next meeting then at the final meeting the students would fill out the questionnaire again. The same as the evaluation material. The question questionnaire was distributed through social media such as whatsapp and manually using writing paper. These results indicate that the scores obtained by the students showed an increase. This proves that the students already know the basic material that has been given and understand the material that has been taught at the previous meeting. The material taught about renewable energy sources is the meaning of renewable energy, types of renewable energy, the use of renewable energy and how to save energy. The main reason for the success in this research is that the material is given to students using powerpoint media which is packaged in an attractive way so that students are enthusiastic about learning, besides that, each meeting will be filled with discussion sessions and activities to watch learning videos obtained through YouTube media which aims to to increase students' knowledge about renewable energy sources. With this learning method, students are more enthusiastic in doing learning as evidenced by students who are actively answering the questions that have been asked.

1. Introduction

Learning is a process of interaction between students, educators and learning resources in a learning environment. Learning is an assistance provided by educators so that the process of knowledge transfer occurs, mastery of skills and the formation of attitudes and self-confidence of students. So in other words, learning can be interpreted as a process to help students learn well. The learning process for children usually begins when they enter elementary school, which is the most basic level of formal education in Indonesia. Elementary school is usually taken within 6 years starting from grade 1 to grade 6. Primary school students are generally between the ages of 6 to 12 years. In Indonesia, every citizen is required to participate in basic education activities, namely elementary school and high school. In line with this opinion, Suryana stated that early childhood has a uniqueness that needs to be considered so that serious services are needed in service and guidance (Supriadi, 2013).

At the elementary school level, the material starts from very basic things, such as counting, reading and writing and is equipped with other basic sciences such as natural sciences, social sciences and religious education. The media used in elementary school learning usually use books that are already available in the library. One of the subjects in student learning is in the field of renewable energy sources. Renewable energy sources are sources of energy that come from nature that can be used freely, can be used continuously and unlimitedly. Every activity carried out requires a resource, be it renewable or not. However, the use of energy sources that are too massive will make the environment chaotic and damaged. Finally, the results of the disposal of these energy sources can be harmful to health and are called pollution. Early Childhood Education Institutions in Indonesia provide care, education, and development services for children up to the age of six and or six to eight years (Sudrajat, 2009).

There are many papers that discuss renewable energy sources. Pramana and Cipta (2018) said that the use of fossil energy for electricity generation has triggered the electricity crisis in Indonesia and also fossil energy has an impact on increasing environmental pollution. Dependence on fossil energy needs to end by utilizing alternative energy potentials that exist throughout Indonesia such as hydropower, wind, geothermal, and biomass. But there are shortcomings regarding how to prevent and handle environmental pollution. Then Indartony and Maryanti (2009) said that utilization of renewable energy resources as raw materials for the production of electrical energy has advantages, including; firstly it is relatively easy to obtain, even obtained for free, meaning that operating costs are very low, secondly it does not recognize waste problems including the production process does not cause an increase in earth's temperature, and most importantly is not affected by rising fuel prices. However, there are shortcomings regarding the role of the Government in encouraging the use of alternative energy, especially geothermal energy as an alternative in dealing with the energy crisis in Indonesia. The utilization is not only for the electricity sector but is extended to other sectors. Then Partahi, (2017) said that energy is an important issue that has colored the history of environmental debates. The use of fossil fuels is believed to produce by-products that pollute the environment. Among other things that have been widely documented is the content of sulfur and exhaust gases that interfere with health. The sulfur content is the cause of acid rain. Greenhouse gases (CO2) result in climate change. The use of coal as fuel for power generation results in the accumulation of radioactive content around the generator site. Then Yesung, (2020) said that socialization of the use of alternative and renewable energy must be instilled early on to the younger generation. They must be aware that we cannot continue to rely on energy sources from fossil fuels because the number of mine is very limited and is decreasing every time. We must take advantage of other resources that are all around us and are available in abundance. Among these energy sources are biogas, biomass and solar energy.

Therefore, analyzing teaching on renewable energy sources starting from the definition, types and benefits is the goal of this research. This research was conducted using a digital-based conventional method to 40 elementary school students in the city of Pandeglang, Indonesia, in the form of a question

questionnaire packaged in google form media. The test aims to determine the extent to which elementary school class students' basic understanding of the material to be taught. The learning process is carried out through the google meet platform using power point and youtube learning media.

The novelties in this research are (i) renewable energy sources are one of the materials that are very easy to learn for elementary school students; (ii) learning is conducted online and filled with fun activities for students; (iii) encourage students to further explore their creativity and understanding outside of the material being taught.

The success of the learning that has been carried out will be determined by posttest, where the questions given are the same as the questions before starting the lesson. The results of the posttest can also be used as evaluation materialnya for further activities. The results of the posttest that have been carried out show that most of the students experienced an increase in grades. This is due to the learning that has been done regarding the material that has been prepared. Learning is intended to increase students' insight and understanding in energy source material and increase reading interest beyond the material that has been taught. The main reason for success in the learning process is the activeness of students in conducting discussions and interspersed with watching learning videos at each meeting.

2. Methods

The research method used in this study is a digital-based learning method which was carried out to 30 elementary school students in the Pandeglang district of Indonesia. Learning is carried out using power point as a learning medium that is packaged as attractively as possible so that students are interested in the material being taught and are active during discussions. The success in this learning is evidenced by the results of the pretest-posttest which contains 20 questions. The questions given at the pretest are the same as the posttest results which aim to find out the extent to which students understand how to absorb the material and can be used as evaluation material. The pretest and posttest questions are shown in Table 1.

Table 1. Pretest and Posttest Questions

NO	ABOUT
1	Does electricity include energy?
2	Is petroleum a renewable energy source?
3	Is coal a renewable energy source?
4	Is wind a renewable energy source?
5	Can burning smoke pollute the environment?
6	Can sunlight be converted into electrical energy?
7	Is there a way to reduce pollution?
8	Can the use of motorized vehicles cause pollution?
9	Can bicycles cause pollution?
10	Can reforestation reduce CO2 levels?
11	Can petroleum be exhausted?
12	Can windmills convert kinetic energy into electrical energy?
13	The fan converts electrical energy into energy?
14	Batteries convert energy….. into electrical energy
15	Does lightning include electricity?
16	What does PLTU stand for?
17	What is an object that conducts electricity called?
18	Objects that do not conduct electricity are called?
19	Heat energy is also known as energy?

20	Kinetic energy is also known as energy?

3. Results and Dicussion

Based on Table 1 showing the average value of the results of the pretest and posttest conducted on grade elementary school students in the city of Pandeglang, Indonesia using 20 question questionnaires as the object of assessment, the questionnaire was distributed at the first meeting and continued with material at the next meeting then at the final meeting the students would fill out the questionnaire again.

Table 1. Average Pretest and Postest Scores

Data	Pretest	Postest
The number of student	30	30
Average	63.3	78

Based on the results of the pretest and posttest on Table 1, the increase was not too significant, as shown in the table showing that in number 1 the total number of students correct was 70%, then at the time of posttest it increased to 86%. This shows the results of the learning program has been successful. Likewise with number 2 which also increased from 73% to 86%, so that the final result was 63.3% for the pretest and 78% for the posttest result with an increase of 14.7%. This is in line with what is described by motivation is a person's drive, desire, need to carry out certain activities. So that motivation can also be defined as a force that drives the direction and determination of action towards a goal. Motivation is a certain action starting from an impulse (Rahma *et al*., 2019). One of the ways to improve the quality of education and teaching is to choose a strategy or method of delivering subject matter in order to improve student learning outcomes, especially science lessons. For example, by guiding students to be actively involved in the learning process and being able to help students develop according to their intellectual level, it will further strengthen students' understanding of the concepts being taught. This understanding requires interest and motivation. Without interest, it indicates that students do not have the motivation to learn. With an interesting learning program, it will make students motivated to continue learning and have more curiosity about what they are learning. The results of this increase will be explained in Table 2.

Table 2 Student's Scores

Question number	Pretest (%)	Postest (%)
1	70	86
2	73	86
3	66	76
4	63	83
5	76	73
6	63	73
7	70	76
8	73	73
9	63	76
10	60	83
11	63	76
12	63	86
13	66	86
14	43	66
15	56	83
16	53	73

17	66	76
18	50	60
19	63	83
20	66	86

Based on results pretest and also posttest on the table 2 that has been conducted showing enough increase good, proven with the average score of students at the time of the pretest was 63.3 while at posttest of 78. This occur caused by giving material that has been conducted During study this take place. Referring to Froebel, that children learn and develop through games, and the Montessori theory sees the active participation of children in understanding the material and environment that has been prepared as a means to acquire knowledge. In addition, the theory of John Dewey which states that children learn through games for that children are thirsty for opportunities to participate in games related to daily activities. Piaget's theory of cognitive knowledge, as well as Vygotsky's belief that social interaction is important for children to develop. The curriculum areas for preschool are targeted at skills, readiness, academics, language and literacy, character education, well-being and a healthy life, independence, music and the arts (Rusdiana, 2018).

In line with research by Kim that early childhood education is designed to provide opportunities for teachers and students to learn and teach online during the COVID-19 pandemic (Kim, 2020). To support this learning, it is required that during the COVID-19 pandemic, educators are required to teach using digital technology, carried out for 20 to 30 minutes per meeting session. One of the supporters of learning that uses digital technology is the edutainment application, which contains content that conforms to standards. Based on the results of the research and observations above, it is necessary to make efforts to maximize the competence of prospective educator students in designing effective learning interactive, inspiring, fun, challenging, motivating students to actively participate and provide sufficient space for initiative, creativity and independence in accordance with the talents, interests, and physical and psychological development of the participants educate.

The difference in these results indicates that there are differences between the learning outcomes of each student. This difference is influenced by several factors that come from outside and from within students. This is in line with Wasliman (Susanto, 2013) which states that learning outcomes are influenced by several factors, namely: 1) Internal factors are factors that originate from within students, which affect their learning abilities. 2) External factors; Factors originating from outside the student's self that affect learning outcomes are family, school and community. Family circumstances affect student learning outcomes.

The results of the study (Arlianti, 2017) The ability of students to interact to communicate the subject matter is very lacking. This is marked by the low interaction between students and teachers in learning, both interactions that occur between students and teachers and students with students. Based on the results of research on science learning, fifth grade elementary school students in Cluster VI have a positive relationship. By looking at the research data, it shows that learning using the guided discovery method can improve student learning outcomes. This can be seen from the more stable students' understanding of the material presented by the teacher

The results of the study as seen from table 2 the value has increased. As for the discussion

i. For question number 1 regarding "Is electricity including energy? ", the results have increased. This is because students already know that electricity is one of the energies of the material that has been studied.
ii. For question number 2 regarding “Is petroleum a renewable energy source? ”, the results have increased. This is because students already know the difference between renewable energy sources and non-renewable energy sources from the material that has been taught.

iii. For question number 3 regarding "Is petroleum a renewable energy source? ", the results have increased. This is because students already know the difference between renewable energy sources and non-renewable energy sources.

iv. For question number 4 regarding "Is wind a renewable energy source? ", the results have increased. This is because students already know the difference between renewable energy sources and non-renewable energy sources from the material that has been taught.

v. For question number 5 regarding "can burning smoke pollute the environment? ", the results have increased. This is because students already know what causes environmental damage from the material that has been delivered.

vi. For question number 6 regarding " can sunlight be converted into electrical energy?", the results have increased. This is because students already know what energy sources can be converted into electrical energy from the material that has been taught.

vii. For question number 7 regarding "Is wind a renewable energy source? ", the results have increased. This is because students already know the difference between renewable energy sources and non-renewable energy sources.

viii. For question number 8 regarding "is there a way to reduce pollution? ", the results have increased. This is because students already know and understand ways to reduce pollution from the learning that has been done.

ix. For question number 9 regarding "can the use of motorized vehicles cause pollution? ", the results have increased. This is because students already know what things can cause pollution caused by excessive use of energy from the material that has been taught.

x. For question number 10 regarding "can bicycles cause pollution? ", the results have increased. This is because students already know what to do to reduce the negative impact of using non-renewable energy sources from the material that has been taught.

xi. For question number 11 regarding "can reforestation reduce CO2 levels? ", the results have increased. This is because students already know and understand what must be done to reduce environmental pollution generated by the use of energy sources from the learning that has been done.

xii. For question number 12 regarding " can petroleum be used up?", the results have increased. This is because students already know the types of energy sources from the material that has been taught.

xiii. For question number 13 regarding "Can windmills convert kinetic energy into electrical energy? ", the results have increased. This is because students already know how to use renewable energy sources from the material that has been taught.

xiv. For question number 14 regarding "The fan converts electrical energy into energy? ", the results have increased. This is because students already know how to use energy wisely from the material that has been taught.

xv. For question number 15 regarding "Battery stones convert energy ….. into electrical energy? ", the results have increased. This is because students already know the sources of energy around us from the material being taught.

xvi. For question number 16 regarding "Is lightning including electricity? ", the results have increased. This is because students already know what are the sources of energy around us from the material that has been taught.

xvii. For question number 17 regarding "What is an object that can conduct electricity called? ", the results have increased. This is because students already know and understand the properties of energy based on the material that has been taught.

xviii. For question number 18 regarding "What is an object that does not conduct electricity is called? ", the results have increased. This is because students already know and understand the properties of energy based on the material that has been taught.

xix. For question number 19 regarding "Heat energy is also known as energy i? ", the results have increased. This is because students already know the difference in energy sources from the material that has been taught.

xx. For question number 20 regarding "Heat energy is also known as energy i? ", the results have increased. This is because students already know the difference in energy sources from the material that has been taught.

4. Conclusions

Learning science about renewable energy sources using the zoom meeting learning method to 30 elementary school students showed quite good results. The results of the learning that have been carried out by students are evaluated in the form of pretest-posttest showing various results, but most of the students experienced an increase in grades. The comparison of students' average scores between the results of the pretest and posttest increased after the students did the learning. This factor is supported by digital learning methods that are packaged in an attractive manner so that students become more active and do not feel bored in carrying out learning activities and discussions. That way, the learning method is very dependent on the success of students. The method used in the learning process must be concrete and interesting so that students can focus on carrying out learning activities.

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6. Authors Note

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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