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Artikel

Development of KOLEKTIF Teaching Aids (*Educative Learning Boxes*) based on Education for Sustainable Development on Climate Change Material for Class VII Middle SchoolSeptina Haniatuz Zahrah^{1*}, Nela Nur Fadila², Sela Sri Mulyani³^{1,2,3} Institut Agama Islam Negeri Ponorogo, Ponorogo*Septinazahrah@gmail.com**Info Artikel**

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ABSTRACT

Climate change has now become one of the problems that has a major influence on sustainable development. Efforts to preserve the environment are a responsibility and challenge for the young generation now and in the future. Through good environmental management and utilization, this is one way to ensure the availability of existing natural resources. Education about understanding environmental problems for society is very important so that they are aware and can make good decisions for the environment and society. This research aims to produce teaching aids based on Education For Sustainability (ESD). The development of teaching aids as a learning resource uses the R&D (Research and Development) research method which is used to produce certain products and test the product's effectiveness. The development model used is ADDIE which includes analysis, design, development or production, implementation or delivery and evaluations. The instrument used in this research is an expert validation sheet for ESD teaching aids. Data analysis techniques consist of display analysis, quality analysis and ESD approach analysis. The percentage of feasibility test results for ESD-based climate change teaching aids by media experts and material experts obtained an average of 90% and 91% with very good criteria, so it can be concluded that the ESD-based teaching aids developed are suitable for use as a learning medium for participants. educate.

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INTRODUCTION

Along with the rapid development of science and technology, this indirectly requires the younger generation to be ready to face various existing challenges. One of the challenges that the current generation must be ready to face is the world of education. 21st century education is expected to be able to form a generation that is innovative, creative and competitive, and has critical reasoning (Kurniawan, 2023). Education in the 21st century requires students to have a broad mindset. Apart from that, the skills that students must have include critical thinking skills, problem solving, communication, collaboration and creativity.

One of the subjects in school that plays an important role in realizing these skills is Natural Sciences.

Science learning is closely related to nature and the surrounding environment which is one of the focuses in sustainable development. Science learning for junior high school students has several concepts that are interconnected between one concept and another. Science is one of the lessons that plays an important role in the creation of Education for Sustainable Development (ESD). The integration of science into the principles of sustainable development can be used as a point of view in fostering an attitude of curiosity in students and also generating broad new ideas. ESD is an approach that provides teaching and learning based on the ideals and principles underlying sustainability. UNESCO (2020) states that ESD is expected to be able to help students develop knowledge, skills, attitudes, competencies and values in the form of problem solving abilities related to the environment, economic sustainability and a just society for current and future generations. (Purnamasari, 2021).

In class VII science lessons there is material about climate change contained in KD 3.9, namely analyzing climate change and its impact on ecosystems. This is closely related to the concept of Education for Sustainable Development (ESD) which provides awareness and abilities to everyone, especially the younger generation, who contribute to sustainable development now and in the future (Nurhikmah, 2022). Proper and orderly delivery of learning material is very useful in increasing students' understanding of climate change material so that learning activities become effective. An effective learning process occurs if the learning media used has an impression on students, so that the media is able to help students understand the lesson. Apart from that, it must also help teachers in facilitating the delivery of material. One of the learning media that can make it easier to convey material to students is teaching aids. Teaching aids are tools that help teachers make it easier to convey the concepts being taught so that students can easily understand the material.

The urgency of developing climate change teaching aids is as an aid in classroom learning activities so that teachers in explaining the message presentation are not too verbal, making it easier for students to understand the message conveyed (Syaffruddin Nurdin, 2016). Thus, the urgency of media in learning has a very important position. In fact, the position of media is said to be parallel to methods in learning activities, because methods and media have good cooperation in supporting the learning process which is carried out in accordance with the teacher's needs in teaching.

Based on this background, research was conducted with the title "Development of KOLEKTIF Teaching Aids (Educative Learning Boxes) based on Education for Sustainable Development on Climate Change Material for Class VII Middle School". The aim of this research is to develop science teaching aids that help students understand climate change material and its impact on ecosystems. Apart from that, it also makes students think to be able to analyze the relationship between material and daily life.

METHODS

The research method used in this research is the R&D (Research and Development) research method. R&D is a research method used to create new products or develop and test the effectiveness of products that will later be developed in the world of education. The development model used is ADDIE which includes analysis, design, development or production, implementation or delivery and evaluations (Dick et al, 2005). The analysis stage is a process for analyzing the need for development in a product and the feasibility of developing that product by identifying problems that exist in products that have been implemented. At this stage, we analyze student characteristics in the learning process and analyze needs (Yunus et al., 2015).

The design stage involves designing the concept and content in the product. The design must be written on each product content clearly and in detail. At this stage the design is still conceptual which will later form the basis of the subsequent development process. The next stage is the development stage, at this stage the product design that has been created is realized. In this stage everything that supports the learning process must be prepared. At this stage the teaching aids must be ready to be implemented in learning activities. The implementation stage is the stage in applying the teaching aids that have been created to obtain feedback from students. Meanwhile, the final stage is conducting an evaluation. The evaluation stage is carried out to see whether the teaching aids that have been developed are successful or not (Hakky et al., 2018).

The instrument used in this research is an expert validation sheet for ESD teaching aids by filling out an assessment questionnaire. Data analysis techniques consist of display analysis, quality analysis and ESD approach analysis. The validity test is carried out by testing the teaching aids to validators, namely material experts and media experts.

Validation of the suitability of the tool is reviewed from several aspects in Table 1.

Table 1. Aspects and criteria for experts

No.	Aspect	Indicator
1.	Eligibility of content	1. Effectiveness 2. Suitability of the material with the teaching aids
2.	Props as media Learning	1. Media display 2. Ease of use of media 3. Communicative and interactive 4. Security for students

The formula used in processing data from media experts and material experts uses the following equation:

$$\text{Evaluation} = \frac{\text{frekuensi setiap aspek}}{\text{jumlah frekuensi semua}} \times 100\% \quad (\text{Firmansyah, 2021}).$$

After getting the percentage value, we draw conclusions from the data into a graph with the following criteria:

Table 2. Validator assessment interpretation criteria

No	Percentage Rate (%)	Validation
1	<50 %	Not enough
2	50% - 64 %	Enough
3	65%- 79 %	Good
4	>80 %	Very Good

RESULT AND DISCUSION

The results in making ESD-based science teaching aids (Education for Sustainable) are in two stages, namely the development stage of ESD-based science teaching aids and the testing stage of ESD-based science teaching aids against experts. The collective teaching aid for climate change material is a three-dimensional box-shaped model that can demonstrate the phenomenon of climate change, including the causes of climate change and the impacts that occur due to climate change. Meanwhile, research on making collective teaching aids uses the ADDIE model with a description of the results in the form of research stages for developing props, which include analysis, design, development, implementation and evaluation stages.

The analysis stage is carried out by analyzing the students' character when learning science. At this stage, we conducted interviews with science teacher experts by asking questions about the characteristics of students in class VII and to find out students' responses in science learning activities. The results of interviews with class VII teachers found that students were less motivated in science learning activities because they were not linked to real life and the processes that occurred in climate change were still abstract. Apart from that, in learning activities, teachers still use the lecture method and lack the use of learning media. This causes students to feel bored in receiving the material.

Based on the results of the analysis regarding student characteristics through interviews, this research requires the stages of developing a modified learning design on science subjects. This is because in learning science material the teacher only teaches it in a lecture manner without any teaching aids which makes students have difficulty understanding the material. Meanwhile, the science learning media developed in research focuses on climate change material. Even though climate change material can be related to real life, there are still many students who misperceive the greenhouse effect, because they think that the greenhouse effect is the process of increasing temperature that occurs in a greenhouse, even though what is meant by the greenhouse effect is an increase in temperature. Earth's temperature is caused by the trapping of hot temperatures in the atmosphere, which in principle is similar to the concept of a greenhouse (Rizal, 2019).

The design stage is designing a collective teaching aid (educational learning box) as in Figure 1. The design of this teaching aid explains the picture regarding the causes and impacts of climate change. Therefore, the existence of collective learning media can help students combine theory with contextual events because students can see directly the phenomena contained in the teaching aids so that students become motivated to be enthusiastic and more active in learning activities so that it makes it easier for them to understand material, this is in line with Alhaddad's (2012) statement that students aged 7-11 years already have the ability to think logically about concrete events and are able to classify objects into different forms. Collective learning media on climate change material is designed as in Figure 1.



Figure 1. Climate Change Demonstration Tool

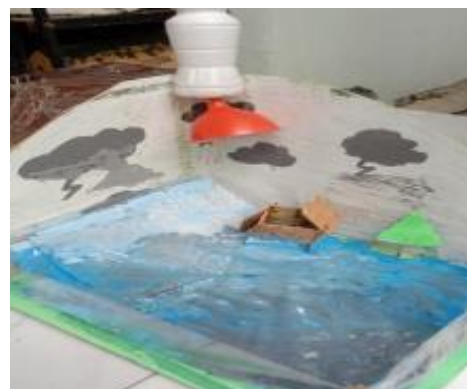
This stage of developing collective teaching aids was based on findings in the field which showed students' lack of enthusiasm for science learning activities, so an interesting learning media was needed to stimulate students' enthusiasm for learning. Collective teaching aids based on education for sustainability (ESD) are made from plywood boards, used items to educate students to care more about the environment, especially waste. So that indirectly, students have participated in sustainable development. The props are given three sections

with each section having a different discussion. The first partition with the widest size contains miniature buildings, factories, car smoke, and damage to trees which explains the causes of climate change. As seen in figure 2



Figure 2. Causes of climate change

The second partition shows the huge impact of climate change, namely prolonged drought due to lack of water supply, which is shown by miniature houses, dry trees, dead crows and human skulls. Many plants and animals died and mass starvation occurred due to the lack of water supply. Apart from that, in this second partition there is a thermometer and a lamp which is used as an indicator of changes in the earth's temperature trapped in the atmosphere. In this section, the teaching aids function as a medium to help students observe how the heating process occurs which has an impact on increasing temperatures on earth. The third section contains the impact of climate change, namely high intensity rain with miniature houses, used bottles and funnels as well as simulating rain from used bottles which causes flooding. A clearer form of this prop can be seen in Figure 3.



Impact of climate change, drought and

Figure 3.
flooding



The teaching aid climate students are the material objective of

implementation of this collective is able to help teachers explain change material to students so that more enthusiastic in understanding presented by the teacher. The main this implementation is to be able to

guide students to achieve competency and ensure the achievement of learning objectives. Apart from that, according to Sagala, et al (2019) the main aim of implementation is to ensure that at the final stage of testing the teaching aids, students are able to gain skills, activeness and knowledge in learning. The implementation of the collective teaching aids is by explaining the concept of climate change, then students are divided into several groups to observe the phenomena that occur in miniatures as well as the increase in temperature that occurs in the drought phenomenon and the comparison of temperatures that occur in the drought phenomenon and the continuous rain phenomenon. . After completing the implementation of the teaching aids to students, the next stage is the evaluation.

The evaluation stage is a process carried out to find out whether the teaching aids developed have been successful or not through assessment by two validators, namely material experts (science teachers) and media experts. The evaluation stage contains several aspects, namely aspects of the suitability of the content and aspects of teaching aids as learning media. The content feasibility aspect has several indicators, namely effectiveness and suitability of the material with the teaching aids. The results of validation by material experts can be seen in Table 3. Meanwhile, validation by media experts is in Table 4.

Table 3. Results of Validation of Teaching Aids by Material Experts

<i>Assessment Aspects</i>	<i>Average score per-Component</i>	<i>Maximum score per-Component</i>	<i>Per-Aspect assessment percentage</i>	<i>Eligibility criteria</i>
Suitability	4,5	5	90%	Very good
Completeness	4,6	5	93,3%	Very good
Convenience	4	5	80%	Good
Clarity	5	5	100%	Very good
	Whole		91%	Very good

Table 4. Results of Validation of Props by Media Experts

<i>Assessment Aspects</i>	<i>Average score per-Component</i>	<i>Maximum score per-Component</i>	<i>Per-Aspect assessment percentage</i>	<i>Eligibility criteria</i>
Effectiveness	4,6	5	93,3%	Very good
Convenience	4,5	5	90%	Very good
Suitability	4,5	5	90%	Very good
Completeness	4,5	5	90%	Very good
Communicative and interactive	4,3	5	86%	Very good
Whole			90%	

Based on the results of the calculation analysis, the overall score percentage obtained from material experts was 91% with very good criteria. In the conformity aspect it was 90% which was in the very good category, 93.3% in the completeness aspect which was in the very good category, 80% in the convenience aspect with good criteria and 100% in the clarity aspect with very good criteria. According to material experts, collective teaching aids are worth testing with revisions according to suggestions. The advice given by the material expert is that the teaching aids developed are in accordance with the climate change material, only that a manual for operating the teaching aids is needed to use them. This is only natural because the validation of existing manuals is not very optimal and interesting. The solution to overcome this problem is to create a more complete and interesting guidebook. This is in accordance with research conducted by Martin et al, (2015), who explained that in the research they conducted there was an emphasis on the completeness of the teaching aids manual.

The suitability aspect here relates to the presentation and suitability of using the ESD approach on teaching aids. The ESD approach in making teaching aids is able to give students the opportunity to prepare for the future (envisioning), improve their critical thinking skills (critical thinking), work together (partnership), participate in making decisions (participation in decision) and think systematically (systematic thinking). . Apart from that, in the learning activities there will be an implementation of climate change events with ESD, where they are interconnected to discuss sustainable development issues. The climate change material in the teaching aids discusses significant challenges to the environment, global economy and human health with changes that affect future generations that are very sustainable with sustainable development. Not only are future generations at risk, certain regions are already experiencing the impacts of climate change. So that in learning climate change material will be connected to the ESD context as an effort to encourage students to understand what sustainable development is (Suprastowo, 2010). In this climate change material, the teacher will explain the impacts of climate change events on the environment, economy and social, so that students are aware of the importance of protecting the environment as an effort to preserve the environment and play an active role in realizing sustainable development.

The results of the assessment carried out by media experts overall received a score with a percentage of 90% consisting of an effectiveness aspect of 93.3% which is in the very good criteria. The second aspect, namely the convenience aspect, is 90% of the very good criteria. The third aspect is the conformity aspect with a percentage of 90% which is in the very good criteria. The fourth aspect is the completeness aspect with a percentage of 90% which is in the very good criteria. The last aspect is the communicative and interactive aspect with a percentage of 86% which is in the very good criteria. According to media experts, collective props are worth testing with revisions according to suggestions. The advice given by media experts is that the teaching aids that are developed should be made as easy as possible so that the delivery does not make things difficult for the teacher. This is because in designing teaching aids it is designed so that the lesson material presented is interesting and integrated with other material. This is in accordance with research conducted by Juwairiah (2013), which explains the requirements that props must have, namely attractive shape and color, but in designing props they must be simple and not complicated, so that we will later revise the shape of the props so that simpler and less complicated.

This research is in line with research conducted by Aulia Mutiara Sari and Arif Widyatmoko, developing global warming teaching aids made from used materials to instill the character of caring for the environment. The aim of this research is to produce global warming teaching aids that can teach class VII students at SMP Negeri 15 Semarang about the dangers posed by global warming, so that the character of caring for the environment can be instilled in the students. An environmentally caring attitude is characterized by an attitude of protecting the surrounding environment, such as throwing away rubbish in its place, using used goods and planting green trees.

CONCLUSION

The development of teaching aids for climate change material based on Education for Sustainable Development (ESD) consists of two stages, namely the stage of developing teaching aids and the stage of testing ESD-based teaching aids with material experts and media experts. The development stage begins with an analysis of student criteria. Then the next stage is planning which contains the design of ESD-based collective teaching aids. The next stage of development consists of making props according to the plan. Next is the implementation stage, at this stage the teaching aids are ready to be used in learning. Lastly is the evaluation stage of several aspects by media experts with an overall percentage score of

90% with very good criteria and worthy of being tested with revisions according to suggestions. Then an assessment from material experts with a percentage score of 91% with very good criteria and worthy of being tested with revisions. In this way, the teaching aids developed have fulfilled the validity procedures and can be continued to the small group and large group testing stages in order to obtain props that are suitable for use.

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