Development of a Non-Text Book on Environmental Literacy-Based Plastic Waste Management as a Learning Source for High School Students in Asahan

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Abstract. The research instrument is an assessment sheet for material expert validators, learning design experts and assessment of Biology teacher responses and student responses. The results of the assessment of the feasibility of the contents of the book from material experts are included in the "Very Good" category with a percentage of 90.2%. The results of the design expert's assessment included the "Very Good" category with a percentage of 93%. The results of the responses of Biology teachers and students to books get a percentage of 90.6% and 90.7% in the "Very Good" category. The results of the test of the effectiveness of non-text books on environmental literacy-based plastic waste processing are quite effective with an N-Gain percentage of 70.6%.

Keywords: Nonteks Books, plastic waste, environmental literacy

1 Introduction

Education is an important process in the national development of a nation and state. In the process of national development, quality human resources are absolutely necessary. One of them is the formation and cultivation of the nature of environmental care. It is time to lead to the formation and cultivation of an awareness of caring for the environment and the natural surroundings. The formation of environmental awareness can be done with a branch of science that is closely related to human life and the environment, namely Biology (Nur.dkk, 2020).

Many environmental problems faced by the world and Indonesia are caused by human attitudes and behavior towards the environment. Individual behavior towards the environment reflects their environmental literacy. The solution to overcome environmental problems is to develop a community that has environmental literacy and has more responsible behavior towards the environment (Mega, 2017)

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Basically, if it is processed properly, the problem of plastic waste can be solved. One of them is by processing plastic waste into oil, as well as other waste processing that can produce products that can be sold in the market, such as those found in Kisaran, Asahan district. The results of the questionnaires and observations showed that there were still few high school textbooks in Asahan that utilized sources from the environment around students as seen from the results of questionnaires (only 35% of books used sources from the environment) and interviews with teachers at the school. While the results of the interview with the resource person for processing plastic waste, Mr. Suyadi in Mekar Sari Village, Buntu Pane District, Asahan Regency, processing waste into oil shows that it is still rare for residents to use waste properly.

Asahan Regency has a fairly large area, but the final landfill in the Asahan area is still very minimal, but if the waste can be processed and used as a learning resource it is relevant and close to the daily lives of students. So based on this background, the research wants to develop a non-text book on processing waste into oil based on environmental literacy as a learning resource for students in Asahan.

2 Research Method

This research is a research and development (Research and Development) which is a type of research that is used to produce a product. This research is to develop non-text books, so this research is also known as Research and Development (R&D) research. The non-text book development model used is the development model according to Thiagarajanya, which is 4-D (four-D models) which consists of four stages, (Trianto, 2009), namely the define stage, the design stage, the develop stage and desseminate stage (spread). The researcher chose the 4 (four) D development model to develop non-text books because it was more detailed and systematic.

3 Result

The stages that have been carried out in the implementation of the development of the non-text book on Plastic Waste Processing in Asahan refers to the 4-D development model developed by Thiagarajan which consists of the Define, Design, Development & Disseminate stages. These stages are described in this chapter, as follows

At this definition stage, it aims to determine and define the needs that are carried out by analyzing the objectives and limitations of the Plastic Waste Processing book in Asahan. The stages that have been carried out are as follows: Preliminary Analysis, Book Content Analysis, Teacher Needs Analysis, Student Needs Analysis.

At the planning stage, what is done is to design a non-text book for processing plastic waste based on environmental literacy with the learning objectives that have been described in the definition stage. Therefore, the design for the manufacture of non-text books was carried out with the stages of material preparation, preparation of book writing formats and initial design. The following format is made in a non-text book on environmental literacy-based plastic waste processing as follows: 1) book size: 14.8 x 21.0 cm; 2) book thickness: 1 cm; 3) book color: white; 4) paper color: white.

At this development stage, starting from conducting field research to obtain information and the process of making plastic waste into fuel oil, the data obtained is then used in compiling a Plastic Waste Processing book and becomes the initial product of the development stage. After the initial product is finished, then this book is assessed by the validator using a questionnaire, there are two phases in the product assessment, namely the assessment of the expert team and the assessment by teachers and students. The assessment of the design expert serves to examine the correctness of the design design and the assessment of the presentation of non-text books on plastic waste processing. Material expert assessment serves to find out the material that is summarized according to the criteria and does not widen from the material that should be. This stage is carried out to revise the product (book) that has been developed, and then the product will be tested on class X high school students with an instrument in the form of product responses that have been developed.

Based on the data obtained by research with the title "Development of a Non-Text Book of Plastic Waste Processing Based on Environmental Literacy as a Learning Resource for High School Students in Asahan" there are four sources of data obtained from four questionnaires, there are four questionnaires, namely a validation sheet filled out by a team of material experts, validation by a team of design experts, the response of teachers in the field of biology studies and responses by students

The product that has been developed by the researcher is a non-text book on processing plastic waste that is structured and systematic in accordance with the learning objectives and the needs of students in order to achieve the learning objectives. The development of non-text books uses Thiagarajan's four-D (4-D) model development with four stages, namely define, design, development and disseminate. The goal in developing this non-text book is to produce quality book products that can increase students' insight and knowledge.

4 Discussion

Based on the results of validation from material experts and design experts on the feasibility of the non-text book on plastic waste processing based on environmental literacy that was developed, it shows that: 1) material validation by material experts shows a percentage of 87% which is categorized as "Very Good", 2) Design validation by design experts based on the average presentation with a value of 93% which is categorized as "Very Good". The results of the validation show that the non-text book for processing plastic waste based on environmental literacy can be said to be valid after because the results of the category analysis are in accordance with predetermined criteria. Furthermore, the non-text book can be tested for its effectiveness. In accordance with the previous development research regarding the development of non-text books by Rofi'ah and Sulifah (2021) the results of the assessment of the results of quantitative data analysis that have been validated by the validator with an average percentage of book value of 85.75% are included in the very valid eligibility criteria. And according to Rozana (2021) non-text books are said to be very valid and ready to be used in the field if they have a value between 81.1-100%.

Furthermore, apart from being seen from the validation results from the experts, the researchers also conducted an assessment of the biology subject teachers and class X students. The results of the research on non-text books by the teacher showed a percentage of 90% with a very good category. While the assessment of grade X SMA 2 Kisaran students shows an

average percentage of 88.9% which is declared very good category. This is in accordance with the research of Najmah, Dhormono and Maulana (2022) in the development of scientific books, the assessment obtained an average score of 93% which is included in the "very good" category.

After seeing the results of the subsequent validation of non-text books on environmental literacy-based plastic waste processing, the data from the N-Gain test results also proves that the book is able to influence student learning outcomes. The N-Gain test data in the control class and experimental class show that the non-text book on waste management based on environmental literacy is included in the quite effective category with a percentage of 70% experimental class while the control class is 27.1%. This is in accordance with the research of Astuti, Muhammad and Aminuddin (2021), namely the development of the book to get an average N-Gain value of 0.8 in the high category, and a percent score of 80% in the effective category.

5 Conclusion

Based on the results and discussion in the previous chapter, it can be concluded from this research as follows: The feasibility of presenting non-text book learning on plastic waste processing based on environmental literacy according to learning design experts is included in the "Very Good" category with a percentage of 93%. The feasibility of presenting a non-text book on plastic waste processing based on environmental literacy according to material experts is "Very Good" with a percentage of 90.2%. The teacher's assessment of the non-text book of processing plastic waste based on environmental literacy is included in the "Very Good" category with a percentage of 90.6%. Students' assessment of non-text books on environmental literacy-based plastic waste processing is included in the "Very Good" category with a percentage of 90.7%.

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