



Development of E-Book Based Domestic Waste Treatment Teachingbook

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ABSTRACT

The existence of classrooms as face-to-face spaces will change to "cyber classrooms" in the era of 21st-century education. After the COVID-19 pandemic, "cyber classroom" and "real classroom" guidelines are the choices made in the learning process. The research aims to: (a) develop E-book-based textbooks, (b) analyze the feasibility level of textbooks as lecture materials in the network, and (c) determine the effectiveness of using e-book-based textbooks. This research design is development research. The development model used is Research Development Research, better known by the abbreviation RDR. Of the ten stages of the development model of Borg and Gall, the last stage, namely dissemination was not carried out in this study because it was related to product publishing and product implementation in the field on a wide scale. In the RDR model, there are three activities, namely preliminary research, development of teaching materials, and implementation of effectiveness test activities. The data were analyzed using descriptive statistics. The results showed that: (a) textbooks developed based on the results of literature studies and research on settlements in coastal areas, (b) Feasibility test results by material expert validators and media experts each obtained a value of 85.5% with the category "Very Feasible", and 82% with the category "Very Feasible", (c) the effectiveness of e-book-based textbooks as teaching materials belongs to the high category. The research concludes that the e-book-based domestic waste treatment textbook "Very Feasible" is used and has high effectiveness as teaching material in the Basic Environmental Design and engineering course.

Keywords: *textbook, E-book, Effectiveness, Feasibility, Validator.*

1. INTRODUCTION

A vital part of the national education system that contributes to the advancement of science and technology and the education of the populace is higher education. The three dharma of higher education: education, research, and community service, are duties that universities must carry out. One of the state's tertiary institutions, Medan State University (UNIMED), has a policy to raise both the number and quality of research through initiatives that improve academics' capacity for doing research and the productivity of science. According to RI Law No. 12, 2012, research is an activity done methodically using scientific techniques to gather knowledge, data, and information for testing and understanding. Educational research can be carried out through the development of teaching materials as an

effort to improve the quality of students' teaching and learning processes [1].

Environmental challenges are only one of the many worldwide problems that educational research is crucial in helping to solve [2][3]. Inadequate environmental learning in schools contributes to the persistence of environmental issues with a behavioral origin in daily life. As educators, lecturers are required to be able to create instructional materials that use the environment as a source of student learning, referring to the necessity of environment-based learning. This learning tool is crucial for pupils because it may be utilized as a scientific reference. Making it more straightforward for students to master specific abilities is one of the purposes of learning materials.

A type of printed document that may be created as a learning resource is a textbook [4]. To facilitate the learning process, instructors might utilize textbooks as a reference tool. The process of creating textbooks must consider a few factors, such as the accessibility of the reference materials used in their creation, the characteristics of textbook users, and the requirements of the curriculum. Errors in human conduct toward the environment will be impacted by a lack of understanding of ecological principles in environmental education. Students who have taken the Environmental Engineering and Construction Design course report that the knowledge material and issues with domestic wastewater management are relatively challenging to understand, according to an analysis of the need for textbooks with the object of undergraduate students in the UNIMED Building Engineering Education Study Program. It is difficult to grasp since material knowledge and environmental concerns are too theoretical and need more context. Additionally, this information has yet to be backed up by research and practical projects that aid students in understanding ideas, principles, and techniques relating to material knowledge and environmental issues.

This research aims to: (a) develop E-book-based textbooks, (b) analyze the feasibility level of textbooks as lecture materials in the network, and (c) determine the effectiveness of using e-book-based textbooks. This research design is development research.

2. METHODS

Development research was used for the study's design. The development approach employed is Research Development Research, often known as RDR (Borg & Gall, 2003). This study did not include the final step of the Borg and Gall development model's ten stages—dissemination/dissemination since it involves widespread product issuance and field deployment. The RDR approach consists of three actions: preparatory research, creating instructional materials, and the execution of activities for effectiveness assessment. Development using blogs as online classrooms and IT-based learning resources for content, instructional materials, and learning media. The learning device to be developed is in the Basics of Design and Environmental Engineering course. The position of the course in the IQF curriculum PTB Study Program is the main course and is required to weigh 2 credits.

The process of creating learning tool items is carried out in stages. The RDR model's development process was used in this study, and it is as follows: preliminary research, product development, and a test of the product's efficacy. Results from preliminary research are utilized to create new items. Documentation and observation

studies were used for the preliminary research. As part of the product development process, the next phase is to conduct several tests. Four steps made up the product development process: (1) expert trials pertinent to the research field; (2) small-scale field trials (12 students); (3) large-scale field trials (1 class = 34 students); and (4) product efficacy testing. The product effectiveness test aims to understand more about how well product development works when it comes to field learning. Examining the variations in student learning outcomes scores obtained before and after treatment allows one to determine the success of a product. The difference between pretest and posttest scores is the popular name for the difference in learning outcomes scores.

The study is situated in UNIMED's Department of Building Engineering Education, which is at Jln. Willian Iskandar Pasar V in Medan. 180 students from the Faculty of Engineering, Department of Building Engineering Education, UNIMED, 2022 made up the study's population. The sample in this study consisted of up to 57 students from two classes of the Building Engineering Education study program who studied the Fundamentals of Design and Environmental Engineering course. Random sampling is the process used to choose the sample. Primary data and secondary data are the two forms of data that will be gathered for this project. While the secondary data takes the shape of learning document data, the primary data takes the form of the efficacy of utilizing the blog as a lecture hall. Material and learning media specialists will evaluate the accuracy of the content, instructional resources, and learning media. In this study, there were three different types of data analysis: (a) data analysis from experts, (b) data analysis from product trials, and (c) data analysis from experimental outcomes.

The answers of the questionnaire were triangulated with information from the interviews and other sources. The insights drawn from the analysis's findings are applied to the blog's revision as a classroom and to newly created teaching aids. Up until a viable development product is achieved, the product is continuously revised using the data analysis findings from field testing. The learning effects of the Basic Environmental Design and Engineering course were examined using quantitative data analysis from the product efficacy test in this scenario. The Gain score will be used to assess conceptual mastery or cognitive analysis of data. Gain, defined as the difference between 70 posttest and pretest scores, shows an improvement in pupils' conceptual comprehension or mastery after learning is complete. The N-gain test is carried out to determine the increase in learning outcomes between before and after learning.

3. RESULT & DISCUSSION

A draft textbook that has undergone small-scale validation and readability testing was produced [5] because of research on the production of textbooks on ecologically based domestic wastewater management. The average percentage of the assessment findings, with extremely valid assessment criteria, was determined to be 85.5% based on the results of validation by environmental specialists, particularly environmental material. Data from material expert validation findings summarized. The average score of the evaluation of book design by media and learning design specialists using relevant criteria is 90.2%. The validator's comments and suggestions are used as the basis for improving and revising the developed domestic wastewater management textbooks [5-15]. The produced book design is presented in the section below on Figure 1.

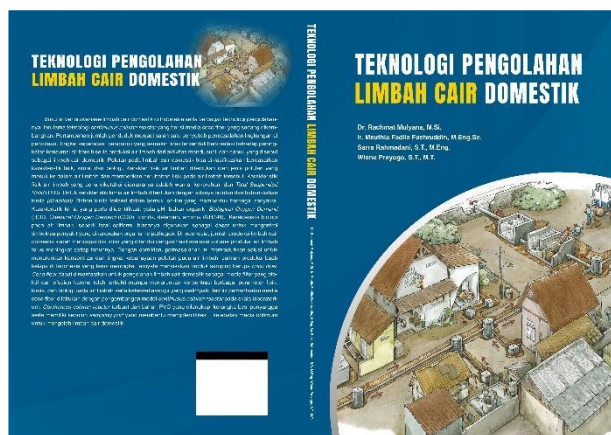


Figure 1. Domestic wastewater treatment technology.

This textbook was created with the availability of learning resources for environmental engineering and building design materials for building engineering education students in mind. The physical size of the book must be considered while creating textbooks. These textbooks are B5 size (17.6 x 25 cm), which is in conformity with ISO standards. With Times New Rowman font-oriented right and left, the chosen font size is 11 pt (except for tables, which use font size 9 pt). Reading lengthy texts is made much easier by the usage of right- and left-aligned paragraphs, which also make it simpler for readers to keep focus while reading.

To create textbooks that meet the course's learning objectives, lecturers must first gather material from a variety of literature sources, including textbooks, scholarly papers, journals, and popular culture. Following that, information is organized, packaged, and produced as instructional materials based on the needs of the students. The textbook's material was created using the UNIMED building engineering education study program's current curriculum. For the environmental

engineering and building design courses, the textbook material refers to Competency Indicators in the RPS. Additionally, the user perspective is considered while textbooks are being created. The criteria of applicability, consistency, and relevance must guide the creation of textbooks.

According to the relevance (relatedness) concept, the content created should be related to the acquisition of competences that students must acquire. According to the consistency (constancy) concept, the quantity of textbook key topics must and should be matched to the number of competences to be attained. The book's content, which is based on the adequacy concept, aids students in developing a range of capabilities. The systematic presentation of content is a crucial component of creating textbooks since the students are better able to comprehend the material thanks to the material's orderly organization. To help students understand the skills they should possess after studying the textbook, learning goals are presented at the beginning of each chapter. Material should not be too little and not too much. If it's too little, it won't help achieve competency and if it's too much, it won't be effective. The interaction between reading text and viewing visuals should be taken into consideration while textbooks are being created. Images should be able to clarify and facilitate understanding of the reading text. The choice of graphics must thus complement the reading text's topic. The selection of pictures is subject to several requirements, including that they relate to the reading text's primary ideas, fit into the broader discussion material, and be somewhat close to the original image.

The average percentage of the results of the evaluation of textbook material, which is equivalent to 96.15% with extremely valid criteria, is based on the findings of the validation of material specialists. The level of the content is in accordance with the objectives, making domestic wastewater management textbooks acceptable for use after review. Domestic wastewater management textbooks were designed in accordance with the demands of the domestic wastewater management course. With relevant criteria, the average score of the evaluation of book design by media and learning design specialists is 90.2%. With extremely valid criteria, students in the group trial scored an average of 95.7% of their textbooks. After being updated in accordance with the requirements, the domestic wastewater management textbooks that have been generated are generally good and appropriate for usage. The product of the development process, which takes the form of textbooks that have been revised based on the validator's comments and recommendations, aims to make textbooks better while keeping in mind the reason why they were created in the first place.

The fact that the material of this domestic wastewater management textbook aligns with the competencies that students need to master is a benefit of the product currently in development. Competency indicators are used as a guide while creating book materials. Students are also expected to grasp more about environmental challenges and connect principles to real-world situations because this textbook was written with the environment in mind. The domestic wastewater management textbook's limitations stem from the fact that it has only reached the field trial stage of development and has not yet been evaluated for its efficacy in actual classroom settings. This textbook only covers the topics covered in lectures that are especially related to the environment.

4. CONCLUSION

This research and development produce biology textbooks based on the environment which have been validated by material experts, media experts and learning, and have gone through a limited trial process, namely individual trials and small group scale trials, so that they are in accordance with the material needs and student characteristics.

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