


A Research Based of Supplementary Book as Students' Learning Resource on Mangrove Ecosystem Materials

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Abstract

This Research aims (1) to analyze the validity of supplementary book on research-based which is developed according to experts, media and user; (2) to analyze the effectiveness of supplementary book research-based to enhance the results of the study. This study used a modified Borg & Gall development model. The method used to analyze the validity of supplementary book, which is tested the components of feasibility and readability. The feasibility component test was given to materials experts, media experts and users, while the readability test was given to 27 students. The effectiveness of supplementary book is done in SMA N 8 Semaang, using the Pre Experimental Design type One Group Pretest Posttest Design with a sample of 72 students. Validity and effectiveness test results were analyzed using quantitative descriptive method. Supplementary book effectively used in learning can be seen through KKM and N-Gain results. The results shows that; (1) supplementary book on research based reach very valid criteria according to experts, media and user; (2) supplementary book on research based developed effective as students learning outcomes proven by achieving 100% Minimum Criteria (KKM) and N-Gain in the medium criteria. This is also supported by affective aspects with excellent criteria and psychomotor aspects with highly skilled criteria. Supplementary book on research based on mangrove ecosystems are stated to be very valid and effective towards students' learning outcomes.

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INTRODUCTION

Learning resources have an important role in the learning process because it will help teachers and students to achieve the learning goals. One of the learning resources is a place or surrounding natural environment and books. Biology textbooks provide considerable lessons in the learning process (Sitepu, 2005) and play important processes in the learning process (Sothayapetch *et al.*, 2012). In 2013 curriculum, textbooks and student worksheets (LKS) are used by teachers and students as guidance for teaching and facilitate students to master the learning. This is in accordance with the results of observations done at three Public High Schools and two Private High Schools in Semarang. Textbooks and student worksheets (LKS) that are currently used are still common and have not linked with surrounding natural environment. According to (Birch & Burnet., 2009; Alimah, 2012) learning resources or learning media that utilize concrete environments provide more effective and efficient learning that can optimize students' cognitive understanding.

Students necessary are given an additional learning resources, which are arranged based on the use of the surrounding environment. One of the local potential in Semarang, which can be used as a learning resource is mangrove ecosystems in Tapak Tugurejo. This environment is an ecosystem that has flora and fauna with unique characteristics and different adaptive ability. Mangrove ecosystems are the example of the right environment to be used as an additional learning resource and suitable for ecosystem materials. The results of the research on mangrove ecosystems in Tapak Tugurejo are used as preparation material for creating a supplementary book.

The use of supplementary book based on the results of research on mangrove ecosystems in Tapak Tugurejo is expected to provide an environment character-based education for students which is one type of conservation character and can be developed

during the learning process (Leksono *et al.*, 2013). Based on the description, the objectives of this study are (1) to analyze the validity of supplementary book using research-based developed by experts, media and users; (2) analyze the effectiveness of supplement book using research-based on learning outcomes.

METHODS

This research is a development research based on science research or beginning with it and using the Borg & Gall (1983) model in seven stages. They are Research and Information Collecting, Planning, Developing preliminary forms of products, Preliminary field testing, Main product revision, Main field testing & Operational product revision.

Developing activities began with conducting Research and Information in three Public High Schools and two Private High Schools, then Planning product development. Next, Developing Preliminary Form of Product or product draft development. Products Draft that have been used at Preliminary Field Testing or small scale trials. At this stage, validation is done by the experts, media and users. The experts and selected media are lecturers who have the ability in their fields. In addition, the selection of teachers as experts and media was carried out by biology teachers. The initial draft of the product was then carried out for the readability tests on 27 students. The results of validation and readability tests in the form of validity scores and readability scores were developed as well as suggestions for further product improvement.

The next stage is Main Product Revision, the validated product is then revised based on suggestions from experts and users, they are teachers and students. Then, the revised product is tested on the Main Field Testing or large-scale trials. The samples in this study were 72 students from SMA Negeri 8 Semarang. Large-scale trials aim to analyze the effectiveness of products on learning outcomes.

The effectiveness of students' cognitive learning outcomes can be seen through standard criteria (KKM) and N-Gain. On other hand, the assessment of affective and psychomotor aspects are also used for supplementary data. At the large-scale trial stage, the user is giving a responses score and suggestions for the products which are used in the learning process. Next, suggestions from users will be used in the Operational Product Revision stage or product improvements as the result from large-scale trials.

Quantitative descriptive and qualitative descriptive were used for the data analysis technique. Quantitative descriptive analysis was used to analyze data in the form of scores obtained from the results of validation questionnaires, readability tests, teacher and student responses questionnaires, observation sheets, and student learning outcomes tests. Qualitative descriptive analysis was used to analyze descriptive data in the form of suggestions and responses from validators and tested subjects.

RESULTS AND DISCUSSION

Based on the Research and Information Collecting stage was obtained from five high schools in Semarang. The information said that learning process had used the 2013 curriculum. Teaching materials and student learning resources were textbooks and worksheets compiled by the MGMP team throughout Semarang. Ecosystem materials presented in

textbooks and students worksheets is still in general, there is no development of material, less image illustrations, colorless, it does not has conservation-minded and it isn't on research-based. Students expect additional books on ecosystem materials which have interesting designs and lots of information, so they can complete the existing books. So far, the ecosystem materials is taught by direct instruction, discussion and practicum methods. In general, students consider the materials of the ecosystem to be interesting to learn but tends to be boring. So that activities, motivations and student learning interests in that materials need to be improved.

In the Planning stage, resulting a supplementary book designs that includes cover design, materials content, and other developed components. The component in the conservation-minded ecosystem supplement book consist of the front cover, remarks, preface, table of contents, guidelines for using the book, basic competence (KD), introductory materials, illustration of the observations area, mangrove and mangrove fauna, interaction between ecosystem components, bibliography, glossary, index, biography of the author and back cover. Supplementary book is designed using the coral draw application, B5 of paper size, and a combination of glacial fonts on the cover, arial fonts on the contents and other varying font sizes. Images used in this books are the result of the personal documentation, but there are also those that taken from references written with copyright information.

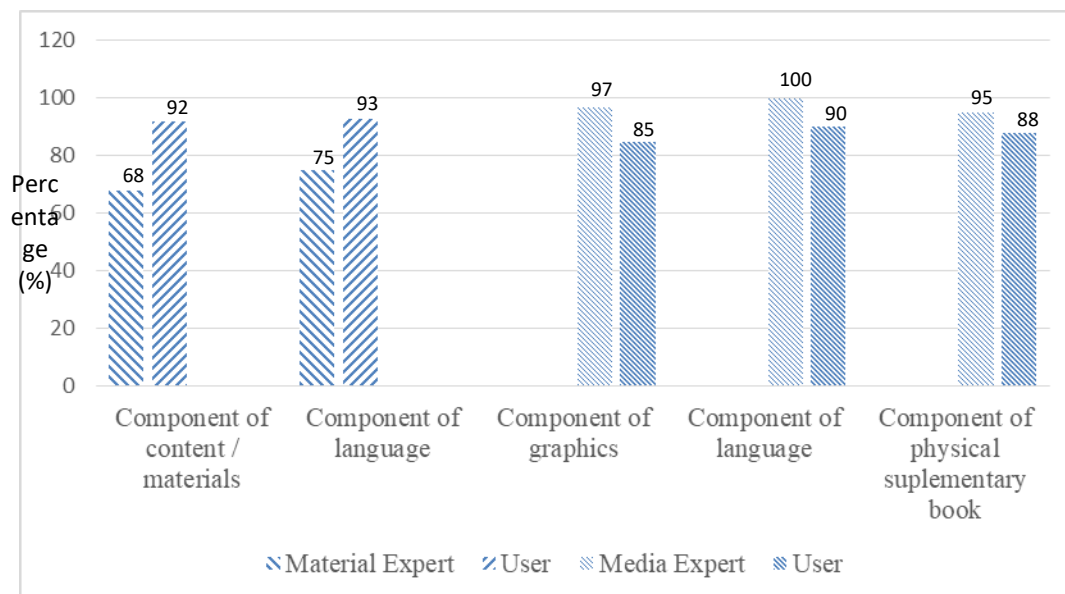


Figure 1. Results of the supplementary book validation by Material Experts,

Media Expert & User

In the Developing phase of the preliminary form of product, the supplementary book that have been completed, then printed using B5 paper size, Ivory paper in the cover and CTS in the contents. Then, it would be used in the Preliminary field testing stage. At this stage, they are validated by experts, media and users. Product validation by materials experts and media was carried out by lecturers who mastered in their respective fields. While, product validation by users is done by teachers and students. This charts are presented in Figure 1.

Based on the results of the validated supplementary book materials, the average percentage of the experts in the components of content/materials and language components reached valid criteria. Meanwhile, the percentage results of average teachers as users achieved very valid criteria. In the component of graphics, language and physical components of supplementary book have an average percentage according to media experts and teachers as user, that was also achieving very valid criteria.

There was a mistake among theory, concepts, principles and laws in this book. For instance, mangrove groupings consist of true mangroves and associated mangroves. If it was

reviewed in theory and concept, mangrove is an ecosystem component consist of major components such as true mangroves and minor components which are associated mangroves. The grouping is based on mangrove adaptability. Mangroves in the major group can only live in mangrove environments (tides). While the minor group can live outside of the mangrove environment (not directly affected by tides). Major or minor mangroves will grow if they are in accordance with the environment where they live. Mangroves have a self-defense system when environmental conditions threaten their lives, but if their self-defense gets weaker because the environment of their life does not support it, then they will die directly. The introductory material in this book on mangroves generally needs to be explained coherently, so that the readers can be more understand the mangroves based on theory, concepts, principles and law.

Conservation knowledge need to be appeared in supplementary book, for example regarding the efforts to keep and utilize the mangrove ecosystem wisely. In addition, there are pictures of aquaculture surrounded by mangroves in the introduction of the book, so that it is not in accordance with the substance of the discussed materials. The placement of image illustrations needs to be adjusted to the

materials or information discussed, so that it is more communicative and students are easy to understand. Students' understanding with the textbooks because of the simplicity of the sentence used and easy to understand (Wahyuni *et al.*, 2015). Supplementary book has grammatical accuracy, indicated by using Indonesian language in accordance with EYD (Enhanced Spelling), the integrity of meaning in each related information, the existence of interrelated materials and information, consistency for using the terms, and the accuracy of writing scientific names for example by tilting letters (italic). Language is a medium used to convey messages from speakers to listeners. Languages need to be presented as well as possible, so that the message conveyed can be easy to understand.

Teaching materials meet the components of grammar if the written information or messages can be communicated to the reader logically and easily accepted based on student's cognitive stage of. Writing a book must be in accordance with a language that is easily understood by students and also in accordance with EYD (Enhanced Spelling). A research in Thamrin (2014) shows that grammatical feasibility in teaching materials must fulfill several aspects, namely sentence structure accuracy, sentence effectiveness, encourage critical thinking, conformity of students' intellectual level, accuracy of grammar spelling and consistency in the use of terms and symbols.

Based on the advice given by media experts and teachers as the user of information, every mangrove must be the same, for example by presenting the description of the species, parts of the species (roots, leaves, flowers and seeds), location of species and benefits of species. In addition, it must be explained logically and chronologically depend on the condition of discovered species. The consistency of the systematic presentation will stimulate the interest of readers to continue reading the next part. illustration presented does not need to be excessive, it must be in accordance with presented materials and

information. The introduction in the supplementary book must contain interesting information to read. The presence of glossary and index can make it easier for readers to understand foreign terms (Masrur *et al.*, 2017). The language used in the book must be adjusted with level of students' development, so that the message delivered is easy to understand and appearing students' curiosity.

Students are motivated by the presence of a supplementary book compiled based on research conducted by the results of student observations with activities during the learning of ecosystem materials using supplementary book. It is considered to be an interesting book to read, so they won't feel bored. This is due to the selection of letters and font sizes that are appropriate, so that it becomes one of the factors of students' interest. The quality of the paper has a good effect on the printed results, so that the color of the image and photo has good quality, too. Almost all the illustrations on covers and contents of the supplementary book are based on documentation which describes the content/teaching materials as it is the character of the object. Green and white are the main colors in this book. These colors are valued and considered to be supplementary book which is not boring, so it can attract the interest of readers.

The cover design and contents of this supplement book are adjusted with the mangrove theme. The colors used are natural colors like green. The factual images are a complementary component in a teaching materials (Hanifah, 2014). Interesting teaching materials can create a pleasant learning atmosphere that helps students to understand the concepts and learning materials. Teaching materials equipped with illustrations and images can visually provide a real picture of the substance that learned by the students. A teaching materials must have attraction to make students want to learn it. The attractiveness of teaching materials can be placed in several parts such as covers and contents by presenting the images or illustrations (Mustafa & Efendi, 2016). Students are tend to fond of teaching

materials which is compiled with designs and images as well as it is not too thick (Imtihana *et al.*, 2014).

A supplementary book on ecosystem materials with conservation perspective is arranged by the aim for instilling and developing caring attitudes towards the conservation of natural resources. The mangrove area in Tapak, Tugurejo naturally brings benefits to the surrounding community in the fields of education / knowledge and economic. This supplementary book gives the message that planting and taking care for the plants around us, do not cut down unless it is needed, use plants wisely, do not hunt animals, protect and preserve animals around us, maintain the living places of flora and fauna for their preservation, assume that the nature occupied is entrusted. This supplementary book contains the principles of conservation according to UNNES which include protection, preservation, and sustainable usage, for both conservation of natural resources and the environment of human resources, arts and culture.

Furthermore, according to the results of readability tests conducted on 27 students and they have taken ecosystem materials, supplementary book is very feasible to be developed and used in learning process. This is because the supplementary book is presented to be easy to read, using the appropriate font type and size, the sentences are easy to understand, the design is very interesting because it is printed in full colored so it motivates students to read and learn it. During the Main Product Revision stage, supplement book is validated by materials experts, media and users not only resulted in percentage scores, but also in the form of suggestions for improving this supplementary book. Some suggestions are

from material experts and users (teachers) such as: the title in the cover does not highlight the focus of conservation-minded ecosystem materials, the information of research location must be clearly stated, the use of appropriate verbs in the greeting, adding the core from the results of the research on the preface, the order of the presented information in the table of contents, adding more KD, giving more mangrove information generally in the introduction, the clarity of the mangrove grouping correctly. Meanwhile, the advice given by media experts and users (teachers) are: the illustration of the image on the front and back cover is too bright so it looks like broken, the opening image illustration is not appropriate, the arrangement of images in the contents is still not appropriate including the family's information for each species.

After the supplement book was revised, then it was used at the Main Field Testing stage or large scale test. At this stage, it was carried out to analyze the effectiveness of supplementary book on learning outcomes. In addition, there were the results of student and teacher responses to supplement book used in the learning process. Before using the supplementary book as an additional learning resource, the average score of the pretest in the study with sample of 72 students was in the low criteria and had not yet reached the KKM (Minimum Criteria). After using this supplementary book in learning process to complete the textbooks and students worksheet (LKS), posttest scores of 72 students reached more than KKM and 100% achieved classical completeness. Students' learning outcomes are presented in Figure 2.

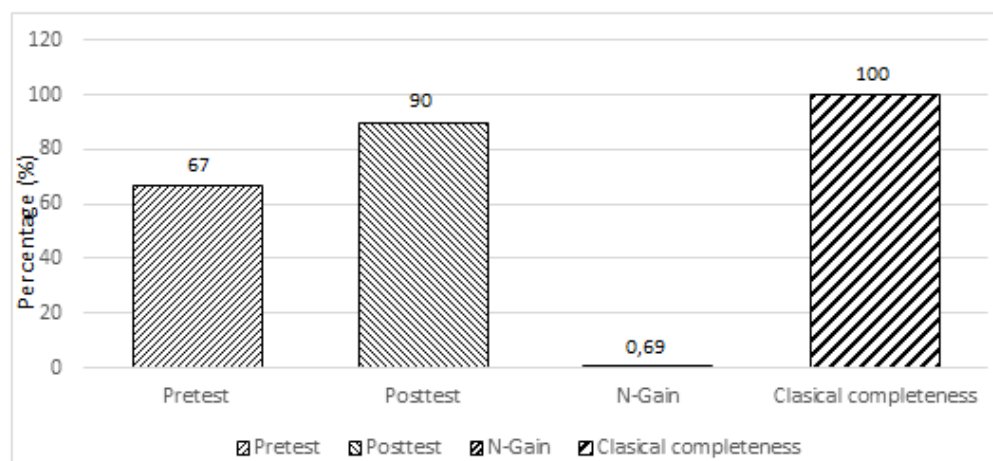


Figure 2. Students' learning outcomes

Based on Figure 2 above, the improvement occurred in learning outcomes from the pretest to the posttest score. In addition, N-Gain reaches the medium criteria, so it can be concluded that supplementary book is developed effectively toward students' cognitive learning outcomes. Students get new information through supplementary books which they can't get from textbooks and student worksheets (LKS). The new information stimulates students' learning motivation and students' curiosity. Students are serious in following learning process using this supplement book as learning resources. The results of the students' seriousness made the posttest score increased. According to Fatimah *et al.* (2012) intellectual ability is also one of success measurement in the cognitive domain.

The presence of student affective and psychomotor scores are used as supporting data on the effectiveness of using supplementary book in learning process. Based on the affective score, shows that students are very enthusiastic in following the lesson of ecosystem materials accompanied by having practicum outside of the classroom, demonstrating good cooperation among group members during discussions and practicums, they are able to interact well among group members and as well as expressing their opinions, responsible in doing the discussion questions and during practicum. Habsari *et al.* (2016) stated that student activities are very

necessary in teaching and learning activities, so students who are supposed to be active because they are the subject to plan and do learning activities by themselves. In accordance with the opinion stated by Salim *et al.* (2017) that learning by giving the surrounding environment can increase the affective score of students. Learning process which is always carried out in the classroom tends to make students feel bored. However, learning process that can attract students to interact directly with the environment will be able to formulate the concepts of problems objectively (Kurniawan *et al.*, 2015).

Students' psychomotor scores are obtained through projects to make posters as an effort to have conservation-minded. Poster is one of the media that is expected to influence and motivate the behavior of people who see it. They are effective communication media to deliver short, solid and impressive messages because of their relatively large size. Making posters is also a form of invitation to keep, protect and respect the mangrove environment. The assessment indicators for posters that are assessed includes the content/text, design, images and delivery of messages. Good posters have simple features, present in one idea and to achieve one main goal, color, slogan, clear writing, varied design motives (Musfiqon, 2012).

After learning the ecosystem materials using the supplement book is complete, the user is given a questionnaire. Based on the advice given by the user on the response questionnaire, the supplementary book was subsequently revised, in this case referred to as the stage of refining the results of the Operational Product Revision trial. Suggestions given by the teacher such as expanding the observation station when doing the research so that it can increase the discovered species, adding more introductory materials that is lead with the mangrove ecosystem. The teacher strongly agrees to the existence of book on conservation-minded ecosystem materials used in learning process. The teachers are motivated to conduct a research-based supplementary book that links the materials concepts to reality. Moreover, supplementary book has attraction through proportional use of colors and the presence of images which are obtained from personal documentation. Using of color can increase retention and motivation to focus students' attention. By the existence of supplementary book which is developed through research and utilization of mangrove areas, it is expected to be useful for learning biology, so that it is not always labelled as boring lessons.

CONCLUSION

Supplementary books in research of mangrove ecosystems are stated to be very valid and effective towards students' learning outcomes.

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