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Development Of E-Booklet On The Richness Of Cormus Plant Species In The Salatiga City Forest As A Suplement To Biodiversity Teaching Materials

Fatria Choirun Nisa, Margareta Rahayuningsih[1]✉

[1]Biology Department, FMIPA, Universitas Negeri Semarang, Indonesia

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Abstract

The limited availability of books and the lack of utilization of biology learning material sources by teachers are serious obstacles in learning activities. This study aims to analyze the effectiveness of the e-booklet of cormus plants in Salatiga City Forest as a supplement to teaching materials in learning activities on the material of the diversity of living things based on the results of the development. The e-booklet was developed by combining various multimedia objects, namely text, images, animations, videos, and interactive buttons. This research was conducted at SMA Negeri 2 Salatiga. This type of research is Research and Development. The object of research is the e-booklet media of Cormus Plant Species Wealth in Salatiga City Forest. The research stages include (1) Potential and Problems, (2) Data Collection with exploration and identification of plants, (3) Product creation, (4) Design Validation, (5) Design revision, (6) Trial usage, (7) Product revision, (8) Product. The instrument used was to distribute an assessment questionnaire with a Likert scale and evaluation questions to determine students' cognitive learning outcomes. The results of the study showed that the assessment results by media experts were 96.8% with a very good category, material experts were 84.28% with a good category, and assessments by biology teachers were 86.66% with a good category. The results of the N-Gain score pretest-posttest test were 0.77 (high scale increase) in improving students' cognitive learning outcomes. In conclusion, the E-booklet on the Wealth of Cormus Plant Species in the Salatiga City Forest is suitable for use in the learning process, and there is an increase in students' learning outcomes in biodiversity lessons at SMA Negeri 2 Salatiga.

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✉**Correspondence Address:**
D6 Building, Faculty of Mathematics and Natural Sciences (FMIPA), Sekaran, Gunungpati, Semarang, 50229

E-mail: etak_sigid@mail.unnes.ac.id

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INTRODUCTION

Indonesia is one of the countries rich in biodiversity or the diversity of living organisms. The diversity of living organisms, commonly known as biodiversity, is an essential part of biology education that needs to be studied. Through learning about biodiversity, students can be encouraged to protect and preserve the biological wealth in their surroundings. One of the topics in biodiversity studies is the diversity of plant species. Indonesia's high biodiversity, particularly in plant species, has great potential to be utilized as a learning resource in biology education.

Every region has its potential that can be used as a learning resource. Regional potential or local potential as a learning resource can foster a sense of love for the surrounding environment. One example of local biodiversity potential in Salatiga that can be used as a learning resource is the Salatiga Urban Forest. This forest area contains various types of plants that students can use to expand their knowledge of plant biodiversity. According to Jati (2020), there are 58 species of Spermatophyta in the Salatiga Urban Forest, divided into 36 families.

Utilizing the environment or local potential as a learning resource can be optimized in various ways, one of which is by integrating learning resources into learning materials. The integration of local potential into learning enables students to understand the subject matter in daily life, increases their interest in learning, and facilitates the achievement of learning objectives. It is crucial for teachers to utilize local potential in learning because it helps students comprehend concepts with contextual examples and enhances their knowledge, skills, and attitudes (Nisa, 2022). Incorporating local potential into learning materials can serve as an effective learning resource for students, making the learning process more meaningful and easier to understand. By including local potential in learning activities, the learning process can also become more active (Haryanto & Wulandari, 2019).

The effective and efficient selection and use of various learning resources aim to facilitate educators in delivering the intended messages. Additionally, students can more easily grasp and understand the information conveyed by educators. Therefore, the use of learning materials in the teaching and learning process must consider various aspects with structured planning. The selection and use of teaching materials should align with the teaching methods and the characteristics of the selected subject matter. The supplementary teaching material to be developed by researchers is an electronic medium in the form of an E-booklet.

An E-booklet serves as a supplementary teaching material or a complement to existing textbooks (Hapsari et al., 2018). It can be used as a tool to understand biology topics as it presents diverse information and materials concisely, supported by attractive visuals. The use of E-booklets can also enhance students' interest in learning biology (Hanifah et al., 2020). Learning biology with an e-booklet can be done anywhere, both inside and outside the classroom, making it flexible and easily accessible for students (Kandela, 2021).

Through the use of an e-booklet as a supplementary learning resource, students are expected to observe the diversity of cormus plants in the Salatiga Urban Forest and bring the atmosphere of the Salatiga Urban Forest into the classroom without having to visit the site directly, thus providing a new learning experience. The development of this e-booklet is also expected to serve as a contextual learning resource for students. The knowledge presented in the e-booklet has the additional goal of fostering students' interest in loving the environment and using it as a learning resource, thereby increasing their curiosity about biology topics related to the environment and living organisms.

RESEARCH METHOD

This research was conducted through exploration and data collection of Cormus Plants in the Salatiga Urban Forest, while data collection on effectiveness and product testing of the cormus plant e-booklet was carried out at SMA N 2 Salatiga. The population in this study consisted of Grade X students SMA N 2 Salatiga for the 2024/2025 academic year who were studying biology, specifically the topic of biodiversity.

The sample in this study included Grade X students at SMA Negeri 2 Salatiga, with a small-scale trial involving 15 students from class X-E. Meanwhile, a large-scale trial to assess learning outcomes was conducted with 36 students from class X-B as the experimental group and 36 students from class X-C as the control group.

RESULTS AND DISCUSSION

The purpose of this study is to (1)Analyze the species richness of Cormus Plants found in Salatiga City Forest. (2)Analyzing the feasibility of e-booklets from the research of Cormus Plants in Salatiga City Forest as a supplement to teaching materials based on the development results. (3)Analyzing the readability of the e-booklet of cormus plants in Salatiga City Forest as a teaching material supplement based on the development results. (4)Analyzing the effectiveness of the e-booklet of cormus plants in Salatiga City Forest as a teaching material supplement in learning activities on the diversity of living things based on the development results.

Cormus Plant Richness in Salatiga City Forest

Based on the results of the exploration and identification of cormus plants in Salatiga City Forest, the diversity of living things was found in the form of gene-level diversity, species-level diversity and ecosystem-level diversity. The results recorded a total of 77 species of cormus plants found in Salatiga City Forest, namely 65 species of Spermatophyta plants divided into 42 families and 12 species of Pteridophyta plants divided into 5 families.

Among the 65 species found, there is one plant that has become the identity flora of Salatiga City, the Rejasa Tree with the Latin name Elaeocarpus grandiflorus, which is not known by many people. Rejasa has become a rare identity plant of Salatiga City. This plant has the characteristics of taproot, stalked leaves, crowded at the end of twigs, lanceolate in shape. The flower cluster hangs, the petals are bright red, hairy, the corolla is white. The bulge of the flower base is finely haired (like a chick's feather) tight, the fruit is ovoid, has hair, hard texture, and pale green in color. The rejasa tree is known to have many benefits as a medicinal plant, namely its bark can be used to treat kidney inflammation and as an external medicine to heal ulcers, and its leaves to reduce fever, overcome nausea, lethargy, and jaundice.

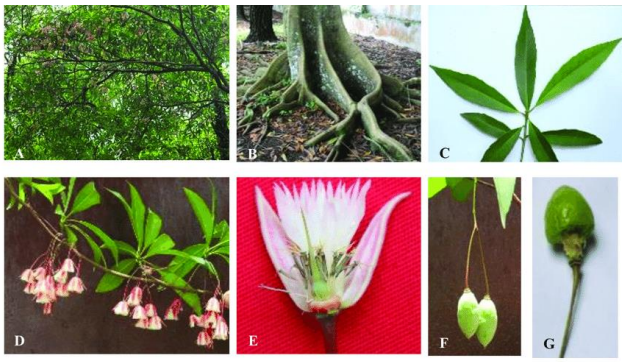

Figure 1 Rejasa tree (*Elecarpus grandiflorus*) - Source: Doc. Rahayu & Boedijantoro, (2018)

The ecosystem diversity found in Salatiga City Forest includes forests, gardens, and rivers. The forest ecosystem is dominated by woody plants such as pine trees, awar-awar trees, resin trees, and so on. The

garden ecosystem found around Salatiga City Forest is the garden directly adjacent to Salatiga City Forest, which is dominated and planted with edible plants such as banana trees (*Musa paradisiaca*) and cassava trees (*Manihot esculenta*). There are also sengon trees (*Albizia chinensis*) that are used as raw materials for furniture production. The river ecosystem found around Salatiga City Forest is dominated by grasses such as alang-alang (*Imperata cylindrica*), umbrella grass (*Cyperus alternatifolius*), Putri malu (*Mimosa pudica*), Sirih cina (*Peperomia pellucida*), and others.

Validation in E-booklet On Cormus Plants In Salatiga City Forest

In the feasibility of e-booklets by media experts, researchers used a questionnaire with a Likert scale type assessment. Media expert validation was conducted by Mr. Dr. Sigit Saptono, M.Pd. The media expert validation questionnaire consists of 27 indicators which are divided into 2 aspects, namely aspects of graphical feasibility and aspects of language feasibility. The data from the media expert assessment results are presented in the following table

Table 1 Media Expert Validity Result

No	Assesment aspect	Percentage	Criteria
1.	Grammatical feasibility	97,03%	Very feasible
2.	Language feasibility	96,38%	Very feasible

Based on Table 1, the feasibility of e-booklets through calculations shows that the aspect of assessing the feasibility of graphics obtained a percentage of 97.03%, which means that the feasibility aspect of the display can be said to be very feasible. In the aspect of language feasibility assessment, it reaches a percentage of 96.38%, which means it can be said to be very feasible. According to Sa'dun Akbar (2013), this percentage is said to be feasible to be used as a learning resource.

Table 2 Material Expert Validity Result

No	Assesment indicator	Percentage	Criteria
1.	Content eligibility aspect	85,45%	Very good
2.	Presentation feasibility aspect	82,22%	Very good
3.	Contextual assessment aspect	80%	Good
	Total	84,28%	Very good

Based on Table 2, the results of validation by material experts, the content feasibility aspect of the e-booklet of cormus plants in Salatiga City Forest received a percentage value of 85.45%. This result is in the very good category because it is in the assessment range above 81% and proves that the information presented in the developed e-booklet has been adjusted to the learning outcomes in the independent curriculum. This is in accordance with the standards for the feasibility of the content of books or teaching materials set by BSNP which explains that the material in a good book or teaching material must be able to help achieve the learning outcomes of the material being taught. The booklet is said to be feasible because it presents complete material and is adjusted to the learning objectives of phase E biodiversity material in the Merdeka

Curriculum, so that it can assist students in meeting existing learning outcomes.

Readibility of E-Booklet On Cormus Plants in Salatiga City Forest`

The small-scale pilot test was conducted at SMA N 2 Salatiga with the subjects of grade X students and Biology teachers to determine the response and readability of the product. Product response was measured through a response questionnaire with a Likert scale of 1-4. The teacher's response was conducted by the Xth grade biology teacher, Mr. Drs.Heri Saptomo. The results of material validation by biology teachers can be described that the presentation of material in the e-booklet has been arranged systematically. The e-booklet of cormus plant species richness in Salatiga City Forest has an attractive appearance and has a good color composition. The results of teacher responses obtained a total percentage of 86.66%.

According to the teacher's assessment, the cover design and content design of the e-booklet are very good in terms of color elements, typography, and the use of illustrations. The color elements used in the e-booklet show contrast with each other both in layout and font color. In addition, the teacher assesses that this e-booklet has a fairly consistent systematic presentation in each part of the content so that it makes it easier for readers to understand the reading points. Various difficult terms in the content of the e-booklet have also been given their understanding in the glossary section at the end of the e-booklet with the aim of making it easier for students to understand a difficult term. The development of e-booklets on the richness of cormus plant species in Salatiga City Forest as a supplement to biodiversity teaching materials has met the standards of textbook eligibility according to BSNP 2014 so that e-booklets are suitable for use as material supplements in schools. The use of e-booklets can minimize costs because they can be downloaded for free in pdf format.

Meanwhile, the results of the students' response questionnaire at SMA N 2 Salatiga obtained an average percentage of 93.33% with very good criteria. In the readability questionnaire, a comment and suggestion column is provided to accommodate students' responses to the e-booklet. The students' responses to the developed booklet include the appearance of the e-booklet is neat and attractive, the language in the e-booklet is easy to understand, the text in the e-booklet explains the content of the booklet.

Learners experience convenience in learning biodiversity material with the e-booklet developed by researchers. E-booklets present material that is in accordance with the reality of the students' environment so that students are more aware of the biodiversity around them and encourage students to develop their curiosity about biodiversity material. This is in accordance with the research of Anggramayeni et.al (2015), that the use of teaching materials based on local potential makes students have the ability to learn directly from the surrounding natural environment and makes meaningful learning.

The readability of text content can be seen by various methods, one of which is using the cloze test. The cloze test is one of the readability measurement tools carried out by assigning students to fill in the words that have been summarized or left blank in a sentence. The removal of words from the reading has no effect on the level of difficulty of the reading. Teaching materials can be said to be successful if readers, in this case learners, can understand the contents of the reading. The overlap test is good for knowing students' mastery of the reading text and can be used to test mastery of the material.

Table 3 Result of Cloze Test

No.	Learners	Students	Percentage	Criteria
1.	High Ability	4	100%	Very good
2.	High-medium Ability	10	88%-96%	Very good
3.	Medium-low Ability	1	76%	Good
	Total		93,33%	Very Good

Based on the results of cloze test on 15 students of SMA Negeri 2 Salatiga class, it shows a different level of cognitive ability, namely 4 students with high ability, 10 participants with high to medium ability, 1 student with medium to low ability so as to obtain an average of 93.33% which falls into very good criteria. This data shows that most students can understand the material contained in the e-booklet very well. It can be concluded that this e-booklet of cormus plant diversity in Salatiga City Forest is easily understood and digested by students well. However, it still needs some improvements, especially in biology terms and foreign terms that are less understood by students, so it still needs to be optimized better so that the readability level becomes higher.

Cognitive Learning Outcomes of E-Booklet on Cormus Plants in Salatiga City Forest

The large-scale trial was conducted at SMA N 2 Salatiga with 36 students in class X-B as the experimental class and 36 students in class X-C as the control class. This usage trial was conducted to measure the improvement of students' learning outcomes in achieving the learning outcomes of the E phase of the Merdeka Curriculum, especially in biodiversity. The trial of use was carried out by applying the use of e-booklets of cormus plant diversity in Salatiga City Forest as a supplement to teaching materials in learning activities in the experimental class.

The N-Gain average test is needed to determine the increase in students' knowledge after receiving treatment, in this case the use of e-booklets. The average N-Gain test was calculated using SPSS 25..

Table 4 N-Gain Mean Test Calculation Results

Class	Average Value of N-Gain	Category
Experiment	0,77	High
Control	0,29	Low

Based on the results of the N-Gain average test in the experimental class, the N-Gain average of 0.77 was obtained which was classified as a high category while the control class N-Gain average was 0.29 which was classified as a low category. The acquisition of a higher N-Gain average test in the experimental class compared to the control class is because when the learning process uses teaching material sources in the form of e-booklets whose material content coverage explains more in-depth or comprehensive. Classes that utilize e-booklets in the learning process also encourage students to study the material more deeply so that students' interest in learning will increase and there is also an increase in learning outcomes and students' abilities. This is in line with Pangestu's research (2019) which mentions that illustrated learning resources can increase students' reading interest and encourage them to explore the contents of the book, the incorporation of interesting and relevant images in electronic books can effectively support teachers and students in the learning process.

The average N-Gain score in the experimental class in the high category proved to be effective due to the use of the biodiversity e-booklet in Salatiga City Forest which also contains a case study and also LKPD with a problem-based learning model or PBL. PBL has the advantage of helping students connect information and develop the ability to think flexibly and wisely in solving real-life problems.

The developed e-booklet provides benefits and objectives in the process of delivering material. In line with Haji et al (2023), books with electronic formats presented with the help of flipbooks are useful for displaying interactive simulations by combining animation, text, video, images, audio that make students more interactive, so that the atmosphere in the classroom becomes more interesting, communicative and can support students' understanding of the material presented by the teacher.

The acquisition of a higher N-Gain average test in the experimental class compared to the control class is because when the learning process uses teaching material sources in the form of e-booklets whose material content coverage explains more in-depth or comprehensive. Classes that utilize e-booklets in the learning process also encourage students to like reading the material in them. When students' interest in reading increases, their learning outcomes and abilities also increase. The learning process is always closely related to the involvement of teachers, students, teaching materials used fiber learning techniques used. In line with the research study from Destiara (2020) who developed teaching materials based on local potential, obtained an average N-Gain with a high category, this shows an increase in students' understanding or mastery of concepts that is very good after learning using the developed product.

In addition to the acquisition of student learning outcomes that mostly increased, there were still students with learning outcomes in the low category. Based on the analysis of the acquisition of the N-Gain score, 5.55% of students get a low score. Differences in cognitive learning outcomes are caused by individual differences in each student. According to Fitria and Indra (2020), individual differences affect the way and learning outcomes of students because each student has a view of how to learn. Based on the research that has been done, some students feel very suitable when the problem-based learning model is applied, namely students find the concept of biodiversity material independently through exploration activities.

CONCLUSION

Based on the results of the analysis and discussion, it is concluded that in Salatiga City Forest, 65 species of Spermatophyta plants were found, divided into 42 families, and 12 species of pteridophyta plants, divided into 5 families, and the use of E-booklet teaching material supplements for Cormus Plant Diversity in Salatiga City Forest was effective in helping to improve students' learning outcomes.

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