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The Effectiveness of E-booklet Ungaran Mountain Natural Dyeing Plants as A Supplement for Angiosperm Sub Matter to Improve Student's Scientific Literacy Abilities

Muhammad Syarif Hidayat✉, Enni Suwarsi Rahayu, Margareta Rahayuningsih

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Universitas Negeri Semarang, Indonesia

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Abstract

Biology learning media is needed in school learning, so Biology teachers must prepare for the media needs. One material that requires additional learning media is plant material. The learning media is expected to complement the books used in schools. This research aims to: 1) Identify types of natural dye plants on Mount Ungaran, especially Ngesrepbalong Village, Limbangan District, Kendal Regency. 2) Analyzing the effectiveness of E-booklets in increasing students' scientific literacy on Plantae material. 3) Analyze the practicality of E-booklets as a learning medium for Plantae material. The method of data collection techniques use interviews, observation, and questionnaires. The analysis data used N-gain. Based on the results of analysis and research, it shows: 1) There are 19 species of natural dye plants identified on Mount Ungaran, especially in Ngesrepbalong Village, Limbangan District, Kendal Regency. 2) E-booklets are effectively used in biology learning. 3) E-booklets are practically used in biology learning. The results of this research can be used as a reference for developing other media in learning Plantae material.

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✉ Correspondence Author:
E-mail: syarifh14320029@students.unnes.ac.id

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INTRODUCTION

In the 21st century technology is developing very rapidly. Development This technology also has an impact on learning or the field of education. Some of the influences of technology on 21st century learning are its availability of various learning models and media that utilize technology. Technology can present teaching and learning activities through various interesting applications. Learning can be delivered using audio, visual, and audio-visual media (Banarsari et al., 2022). The use of technology is expected to increase the success of the process of teaching and learning (Tekege, 2017).

Students can learn by accessing three-dimensional visualizations of biological concepts so that it is no longer relevant for teachers to lecture them in front of the class. Information technology advice is used as a medium in classroom learning. Many Biology teachers in the learning process still patterned thought for a long time even though the curriculum changed repeatedly. There are various various reasons for maintaining a learning-centered model Teacher. Seeing this fact, researchers were moved to conduct further observations further and in-depth. (Suharno, 2014).

The results of observations and interviews in December 2022 with teachers at Madrasah Aliyah Askhabul Kahfi Mijen, Semarang City in classes X1, X3, and X5, show that in the biology learning process, teachers still use the lecture method. In implementing the lecture method, is equipped with media modules and direct observations around the school. However, direct observation activities require quite a lot of time so learning often does not run completely. This affects student learning outcomes. In 2022, student learning outcomes for Plantae material will not reach classical completion because 20% of students scored below the KKM. The basic competencies for the Plantae material used are KD 3.8 and KD 4.8, where these basic competencies require students to be able to identify seed plants and their roles and make observations based on phenetic and phylogenetic analysis.

Apart from that, students still find it difficult to understand and apply scientific concepts to everyday life. According to Betari (2016), to improve students' scientific literacy skills in applying scientific concepts, there is a need for science learning innovations to provide provisions for everyday life in solving problems scientifically. In the opinion of Nurhidayah (2015), providing direct experience to students with the aim of developing student competence in understanding the natural environment scientifically is the essence of science learning. Students are seen as objects and as subjects. Active learning is an active and dynamic teaching and learning process (Baharun, 2015).

It is thought that the above problem can be overcome by using Android-based learning media. Android-based learning media is an example of the realization of technology in the education sector. It is hoped that this media can improve students' learning and understanding of the material. The digital marketing research institute Emarketer estimates that in 2018 the number of active smartphone users in Indonesia will be more than 100 million people (Rahmayani, 2015). This technology has a big influence on learning in terms of the use of learning media in schools and other educational institutions (Rusdi, 2015). Mobile learning is different learning because students can access learning materials, guidance, and applications related to learning, anytime and anywhere via telecommunications devices such as cell phones, smartphones, and tablets (Handayani, 2015).

Students' learning difficulties for most indicators in Plantae material are still classified as very high. One aspect that influences students' learning difficulties in this research is the aspect of methods, models, and learning media (Zarisma et al, 2015). Learning innovation is needed to improve the quality of learning by using learning media that can make students more active in learning activities so that learning will be more meaningful (Sastrika et al., 2013).

One of the Android-based learning media that can be developed to help students understand the morphology, characteristics, and classification of plants, especially seed plants, is teaching media in the form of e-booklets. According to Darlen (2015), e-booklets are learning media that can be used in the learning process in and outside of class. The e-booklet has a small size. The contents of the e-booklet teaching media include the names of terms and pictures of personal documentation from several journal literature which can broaden students' insight as well as a summary of explanations so that students can easily understand them. This follows the opinion of Rengel (2019) that suitable material to be included in e-booklet media is material with lots of pictures to explain the material concisely.

The coloring process has always played a crucial role in human life and civilization. Various countries have certainly adopted this process in the textile, printing, cosmetics, pharmaceu-

tical, and food industries (Harsito et al., 2021). Dyes are pigments that are dissolved in solvents based on water, oil, or other substances so that they can stain plant raw materials for a certain duration or permanently (Echegaray et al., 2023). Traditional dyes can be obtained naturally from various natural resources. Dyes are obtained by extracting dyes from animals, plants, and mineral sources in nature (Nuraeni et al., 2022) The main sources of plant dyes are many contained in plants, namely in leaves, stems, bark, flowers, fruit, root bark, fruit skin, and other parts (Farida and Nisa, 2015).

In the last few decades, the use of synthetic dyes has been reported to have potential risks to health and environmental aspects. Synthetic dyes have a high level of toxicity (Amchova et al., 2015). Therefore, a critical review of the reuse of natural dyes from natural resources is needed to design approaches that can minimize these health and environmental issues (De Mejia et al., 2020). This includes how to find natural resources that produce natural dyes with quality and economic value (Neves et al., 2019). As a country with abundant biodiversity, Indonesia has the potential to provide natural materials that can be used as a source of natural dyes (Maskun et al., 2021). So this research is important to do with the aims: 1) Identify types of natural dye plants on Mount Ungaran, especially Ngesrepbalong Village, Limbangan District, Kendal Regency. 2) Analyzing the effectiveness of E-booklets in increasing students' scientific literacy on Plantae material. 3) Analyze the practicality of E-booklets as a learning medium for Plantae material.

METHOD

This research design used one shoot case study. The classes taken were two classes in class X at Madrasah Aliyah NU Al-Hikmah Mijen. At beginning of the research, a pretest was conducted on students. Then, the next step is to apply the treatment to the learning process in the experimental class with the teaching materials that have been developed, namely the e-booklet teaching materials for the natural coloring plant spermatophyta. After students operate or use e-booklet teaching materials as additional material supplements, the teacher gives post-test questions as an evaluation of the student's understanding of the material that has been provided. The post-test results are the result of student learning on cognitive competence to determine students' scientific literacy abilities.

Table 1. One Shoot Case Study Research Design

Class	Pre-Test	Treatment	Post-Test
Treatment	0_1	x	0_2

Information :
0_1: Pre-test (before treatment)
X: Treatment by giving e-booklets of natural dye plant types
0_2: Post-test (after treatment)

RESULT AND DISCUSSION

Natural Dye Plants on Mount Ungaran

The results of the observations show the total types of natural dye plants found and identified on Mount Ungaran, especially Ngesrepbalong Village shown in Table 2.

Table 2. Image of Natural Coloring Plants

Plant	Habitus	Part
Medinilla speciosa Blume.	Shrub	Parijoto is usually used as a natural coloring on the stem of the fruit which produces a reddish color
Terminalia Catappa Linn.	Shrub	Ketapang is used as a natural dye on the leaves which produces a purplish color
Graptophylum pictum Griff.	Shrub	Daun wungu is used as a natural dye on the leaves which produces a purplish color
Anredera cordifolia Linn.	Bush	Binahong is used as a natural dye on the leaves which produces a brownish-yellow color
Bischofia javanica Blume.	Tree	Gintungan is used as a natural dye on the bark of the stem which produces a reddish color
Tectona grandis Linn.	Tree	Jati is used as a natural dye on the leaves which produces a brownish-yellow color
Schima wallichii (DC.) Korth.	Shrub	Puspa is used as a natural dye on the bark of the stem which produces a brownish-red color

Indigofera sp.	Shrub	Indigofera is used as a natural dye on the leaves which produces an indigo-blue color
Samanea saman (Jacq.) Merr.	Tree	Trembesi is used as a natural dye on the leaves which produces a yellow and greenish color
Falcataria moluccana (Miq.) Barneby & Grimes.	Tree	Sengon is used as a natural dye on the bark of the stem which produces a brownish color
Adenanthera pavonina Linn.	Tree	Saga is used as a natural dye on the bark of the stem which produces a brownish-yellow color
Clitoria ternatea Linn.	Bush	Telang is used as a natural dye for flowers which produces a purplish color
Pithecellobium lobatum Benth.	Tree	Jengkol is used as a natural dye on the skin of the seeds which produces a purplish color
Chinchona sp.	Tree	Kina is used as a natural dye on the leaves and bark of the stem which produces a brownish-yellow color
Pandanus amaryllifolius Roxb.	Shrub	Pandan is used as a natural dye on the leaves which produces a greenish color
	Bush	Bawang Dayak is used as a natural dye in the roots which produces a brownish-red color
Syzygium polyanthum Wight.	Shrub	Salam is used as a natural dye on the leaves which produces a yellow color
	Shrub	Jambu is used as a natural dye on the leaves which produces a yellow color
Bixa orellana Linn.	Bush	Kesumba is used as a natural dye because seed produce red color

The results of identifying the diversity of natural coloring plants are used as the basis for making e-booklets. E-booklets are a type of book that contains interesting text and images so that learning media using e-booklets are more effective because they can contain more text and images than other promotional media. Electronic media has interesting and straightforward material properties, equipped with images, recordings and / or sound chronicles (Setiawan et al., 2018). This makes the e-booklet of natural coloring plants a learning media on Plantae system material that can improve students' science literacy skills.

The Effectiveness of E-booklets in Increasing Students' Scientific Literacy on Plantae Material

In Table 3 class is compared to the average pre-test score of 85.2. Table 3 for class compared to the average pre-test score of 87.5. Based on the cognitive learning results tested on students, the e-booklet has fulfilled one of the indicators of learning effectiveness as a learning medium for plant material.

Table 3. Pre-Test and Post-Test Score

Information	X IPS 1		X IPS 2	
	Mark Pre-test	Mark Post-test	Mark Pre-test	Mark Post-test
Highest Score	75	95	75	90
Lowest Value	10	75	15	75
Average Value	35.6	85.2	46.4	82.2
A complete number of students	2	22	2	21
The number of students is incomplete	23	3	22	3
Classical completeness (%)	8	88	8.3	87.5

In the table of N-Gain test results for classes X1 and Learning by applying the e-booklet learning media of natural coloring plants to improve students' scientific literacy skills. When students use the e-booklet learning media for natural plant dyes, and plant material in the learning process, students are directly confronted with real examples that occur in humans or contextually, so that students are immediately faced with factual problems and questions.

Latip (2015) stated that the scientific lit-

eracy-based multimedia that was developed was able to improve students' scientific literacy skills because scientific literacy-based learning multimedia contained a scientific knowledge domain that displayed images and animations regarding technological material. The use of a combination of text, images, and animation in learning multimedia makes it easier for students to understand the content being studied.

Table 4. Pre-Test and Post-Test Score

N	Gain Category Percentage		
	High	Currently	low
25	17	8	0
24	8	14	2
N-Gain (100%)			

In the table of N-Gain test results for classes X1 and Learning by applying the e-booklet learning media of natural coloring plants to improve students' scientific literacy skills. According to Morris (2003), several factors influence students' low scientific literacy. These factors include (1) low students' scientific literacy skills which can be caused by conventional science learning habits and ignoring the importance of the ability to read and write science as a competency that students must have. When students use the e-booklet learning media for natural plant dyes, and plant material in the learning process, students are directly confronted with real examples that occur in humans or contextually, so that students are immediately faced with factual problems and questions.

Learning outcomes based on assignments in this research are based on the final results of preparing assignments in groups to compile student discussion sheets Table 5.

Table 5. Student Learning Outcomes

Category	Criteria	Students	Mark (%)
81.25% < P ≤ 100%	Very Good	10	20.4
62.5% < P ≤ 81.25%	Good	25	51
43.75% < P ≤ 62.5%	Poorly	14	28.6
25% < P ≤ 43.75%	Not Good	0	0

This can be seen from the report results in Table 5 that as many as 20.4% of students got assignment scores in the outstanding category, 51% got scores in the good category and 28.6% are not good scores. According to students' learning outcomes in working on their final assignments, students have a high willingness to carry out real actions, discover new things, and learn concepts by looking for sources whose credibility can be trusted.

The Practicality of E-booklets as A Learning Medium for Plantae Material

The practicality of natural coloring plant e-booklet learning media for learning plant material in improving students' scientific literacy skills through teacher responses with a percentage of 87.85% and student responses with a percentage of 89.71%. A product can be said to be practical or easy to use and easy to understand if respondents rate it as quite practical by more than 75% (Purwanto, 2017).

Table 6. Results of Teacher Responses

Indicator	Score	Maximum Score
Letter Display	11	12
Sentence Effectiveness	14	16
The E-Booklet Sentences Are Easy To Understand	14	16
Cover View	14	15
Ease Of E-Booklet Media	13	16
The Composition Of The Materials For The E-Booklet Media	14	16
The Practicality Of E-Booklet Media	6	8
Total score	86	99
Percentage	86.87 %	
Criteria	Very practical	

From the results of Table 6, the teacher gives a high assessment of each assessment indicator, because the e-booklet is easy to use, the sentences are easy to understand, and the arrangement of the contents is to the needs of the material being studied.

Indikator	Score X IPS 1	Max score	Score X IPS 2	Max score
Letter Display	270	300	245	288
Sentence Effectiveness	365	400	358	384
The E-Booklet Material Is Easy To Understand	368	400	348	384

Cover View	355	375	325	360
Ease Of E-Booklet Media	368	400	325	384
The Composition Of The Materials For The E-Booklet Media	362	400	345	384
The Practicality Of E-Booklet Media	172	200	165	192
Total Score	2260	2475	2111	2376
Percentage	91.3 %		88.84 %	
Criteria	Very practical		Very practical	

Student responses to the application of e-booklets were obtained through questionnaires given after the learning activities were carried out. Based on the results of the questionnaire analysis provided, students responded very well to the application of e-booklets in learning Plantae material. The identification results presented help students understand the concept of plantae material, apart from that it also improves students' scientific literacy skills. The material presented in the e-booklet is also material that is always experienced by students as part of the use of plants in everyday life and applies to problems that exist in society.

Plantae material is considered difficult by most students, especially since there is a lack of learning media that helps them understand the material. The learning media used so far by teachers only use student handbooks and modules so they have not been able to improve students' scientific literacy skills.

The learning carried out by teachers mostly gives assignments, resulting in students' understanding of the material being only conceptual. The e-booklet learning media of natural dye plants can help class students. the research shows that the scientific literacy abilities of students in the high group in the science attitude aspect are still quite good, while students in the medium and low groups are still relatively poor. This is in line with research conducted by Diana, et al (2015) which states that students who are included in the science specialization should have high interest and motivation as well as other affective aspects towards science.

CONCLUSION

Based on the results of the analysis from the discussion, it can be concluded that there are 19 species of natural dye plants identified on Mount Ungaran, especially in Ngesrepbalong Village, Limbangan District, Kendal Regency. Effective e-booklets can improve students' scientific literacy skills at MA NU Al-Hikmah Polaman Mijen. E-booklets are practical and easy to use in biology learning, especially plant material.

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