Unnes.J.Biol.Educ. 15 (3) (2026)

Journal of Biology Education

http://journal.unnes.ac.id/sju/index.php/ujbe

# Development of E-Booklet on Plant Richness in the Coastal Mangrove Ecosystem of Tambakbulusan Village, Demak as a Supplement to Biodiversity Learning for MAN Demak Students

**Nabila Tauhidatusy Syarifah, Saiful Ridlo**✉

[1]Departement of Biology, Faculty of Mathematics and Natural Sciences, Semarang State University, Indonesia

**Article Info**

Article History:

*Received : October 2024*

*Accepted : November 2025*

*Published : November 2026*

Keywords:

*Interactive website, virus, multiple intelligence, learning outcomes, learning interests.*

**Abstract**

The Tambakbulusan Demak Mangrove Forest area has a wealth of plants that can be used as a source of environmental learning. This study aims to identify the wealth of plants and analyze the feasibility and readability of the e-booklet developed based on the research results. The research method is Research and Development (R&D) with the Sugiyono model. The research on plant wealth was conducted in the Tambakbulusan Demak Mangrove Ecosystem using an exploratory data collection method. Product development and product validation were carried out in the Semarang State University campus area. Data collection used a questionnaire. Product trials were conducted on 36 students of class E 3 MAN Demak in the even semester of the 2024/2025 academic year. The results of the study showed genetic diversity with butterfly pea flower species (Clitoria ternatea) and 36 types of mangroves from 21 families. The resulting e-booklet was declared feasible by material experts, meeting the aspects of interest, material, language, and helpfulness. Student and teacher responses to the e-booklet were in the very good category.

© 2026 Semarang State University

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

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

p-ISSN 2252-6579

e-ISSN 2540-833X

## INTRODUCTION

Student learning outcomes are an important indicator in evaluating the effectiveness of education. In an effort to improve the quality of education, many studies have been conducted to identify factors that influence student learning outcomes. Various studies have been conducted to reveal the relationship between internal and external factors with student learning outcomes, including school environmental factors, teaching methods, teacher quality, student motivation, and parental support.

Research by Smith & Jones (2010) shows that school environmental factors, such as adequate physical facilities and a positive learning atmosphere, have a positive effect on student learning outcomes. The study emphasizes the importance of a conducive school environment in creating optimal conditions for students to learn and develop.

In a study by Brown et al. (2012), it was found that innovative and interactive teaching methods, such as project-based and collaborative learning, can improve student learning outcomes. Learning approaches that actively involve students in the learning process encourage their involvement and strengthen conceptual understanding.

In addition, research by Johnson (2015) highlights the important role of teachers in student learning outcomes. High-quality teachers, with in-depth knowledge of the subject and effective teaching skills, can have a positive influence on student learning outcomes. The support and guidance provided by teachers also contribute to students' motivation and learning success

Student motivation is also an important factor in student learning outcomes. Research by Lee (2018) shows that students who have high intrinsic motivation, namely motivation that comes from within themselves, tend to achieve better learning outcomes. Intrinsic motivation can be increased through relevant learning, clear goals, and recognition of student achievement.

Parental support also has a significant influence on student learning outcomes. According to research conducted by Davis (2019), parental participation in children's education, emotional support, and monitoring of student learning activities are positively correlated with higher learning outcomes. Parental involvement in children's education builds an environment that supports and encourages students' academic achievement.

Biodiversity learning is an important part of education that aims to increase students' awareness and understanding of biodiversity and the importance of its conservation. Student learning outcomes in biodiversity material can be measured by seeing the extent to which they understand basic concepts, their ability to identify species, and their awareness of related environmental issues.

Experiential learning approaches, such as nature visits, laboratory experiments, and direct observation, can improve student learning outcomes in plant wealth material. Through real experiences, students can see and experience directly the diversity of species and establish emotional connections with the natural environment, which in turn increases their motivation and understanding (Thompson & Johnson, 2012)

A study by Chen et al. (2015) suggests that the use of educational technology, such as interactive multimedia and computer simulations, can make a significant contribution to student learning outcomes in plant wealth material. Educational technology can provide interactive, visual, and immersive learning experiences, allowing students to better understand abstract concepts.

In addition, it highlights the important role of teachers in student learning outcomes in plant wealth material. Teachers who have in-depth knowledge of biodiversity and effective teaching skills in delivering relevant and interesting information can help students gain better understanding. (Park & Lee et al., 2018)

In a study by Wong & Tan (2020), it was found that student involvement in extracurricular activities related to plant wealth, such as nature lover groups or environmental clubs, was positively related to student learning outcomes. These extracurricular activities can provide opportunities for students to further explore plant wealth material, participate in environmental conservation projects, and interact with fellow students who have the same interests.

Learning to recognize the environment around students is adjusted to the E phase of biology CP. Introduction to the surrounding environment is very important for students as members of the Demak City community to recognize the surrounding coastal environment well and be able to find solutions to problems in the environment, especially MAN Demak which is quite close to the coastal environment. One of the coastal environments in Demak City is the Tambakbulusan area located in Tambakbulusan Village, Wedung District, Demak City. This area has advantages because it has a coastal environment that is maintained by the community in the area, many community leaders are the driving force for mangrove conservation by routinely planting and maintaining mangroves. In addition, because it has well-maintained mangroves, the Tambakbulusan area also has a high wealth of plants that can be seen directly from the large number and types of birds that live in the area.

The surrounding environment has provided various kinds of real information about daily life that can be used as learning resources. The existence of this information must be utilized as much as possible to support the learning process. Examples of the use of the coastal environment in Demak City that can be used as learning resources include the Tambakbulusan area. The area is located quite close to MAN Demak, where in the learning process teachers have not utilized mangroves as a learning resource for biodiversity (biodiversity) material and the learning resources are still limited to LKS, modules, and handbooks. The results of interviews with biology teachers and students indicate that other learning resources are needed that utilize local environmental-based potential for Biodiversity material. Therefore, learning resources that utilize local potential need to be developed as a supplement to Biodiversity material as a solution to outdoor learning problems, namely limited time, costs, and school permits for learning that requires activities outside the classroom. In this case, the local potential is research on plant wealth in the Tambakbulusan Mangrove Ecosystem.

Therefore, the results of research on plant wealth in the Tambakbulusan Mangrove Ecosystem are expected to be used as a supplement to MAN biology learning resources for Biodiversity material in the form of e-booklets. The results of this study can be used to achieve Learning Outcomes (CP), namely "At the end of phase E, students have the ability to create solutions to problems based on local, national or global issues related to understanding biodiversity and its role, viruses and their roles, biological technology innovation, ecosystem components and interactions between components and environmental change". One of the information media that can be used to support the learning process is e-booklet. E-booklet is one of the media to convey messages in the form of a summary equipped with attractive images. Learning by utilizing e-booklet will be more meaningful if developed based on research results.

## RESEARCH METHODS

This research is an RnD (Research and Development) study of plant wealth in the Tambakbulusan Mangrove Ecosystem which is packaged in the form of an e-booklet as a supplement to learning resources. The method used in this study is the research and development (R&D) method. The plant wealth research was conducted in the Tambakbulusan Demak Mangrove Ecosystem using an exploratory data collection method. Product development and product validation were carried out in the Semarang State University campus area. Data collection used a questionnaire. Product trials were conducted on 36 students of class E phase 3 MAN Demak in the even semester of the 2024/2025 academic year. Data collection at school used the gap test method to measure the readability of the e-booklet and pretest-posttest to measure learning outcomes. Data analysis in this study used qualitative descriptive.

## RESULTS AND DISCUSSION

### Characteristics of Plant Richness in Tambakbulusan Mangrove Ecosystem can be Used for E-Booklet Development

The biodiversity found in this study is based on the results of research conducted in Tambak Bulusan Village, Demak. The level of biodiversity in this study includes the level of genes, types, and ecosystems. Results of the The diversity of living things in Tambak Bulusan Village has been found to be used as a source of material in making e-booklets as a supplement to teaching materials.

The diversity of genes found is the color variation in the telang flower (Clitoria ternatea). The diverse and wide distribution of Clitoria ternatea is a reflection of the nature of broad ecological tolerance. This occurs in diverse habitats and in various types of soil. Clitoria ternatea is a herbaceous plant belonging to the Fabaceae family. This plant is widespread in the tropics. In general, it grows best in conditions that require high light intensity (Suarna & Wijaya, 2021). Several types of mangroves were found which were divided into three categories, namely major mangroves, minor mangroves, and association mangroves. According to Tomlinson (1998) in Athalia et al., (2024), Mangrove Major is a mangrove that fully inhabits tidal areas, can form pure stands, adapting to high salinity. This type of mangrove only grows in mangrove forests and is not found on land. Minor mangroves are mangroves that have marginal habitats and are not significant community members. Mangrove association mangroves that grow far from the beach or on the spot.

In species diversity, there are 36 species of plants found in the Tambakbulusan Mangrove Forest Area from 21 families. Mangroves in the major mangrove components include the families Achantaceae, Combretaceae, Lythraceae, Meliaceae, Pasifloraceae, and Rhizoporaceae. Plants that are included in the major mangrove component generally have the characteristics of shallow roots, spreading, sometimes growing upwards to form pneumatophiles (breathing roots), hard, thick, shiny, succulent leaves, have water and salt storage tissues. It is usually found on coasts and mangrove forest areas. Some of the species found are A. alba, S. alba, A. marina, B. cylindrica, B. gymnorrhiza, B. parviflora, R. mucronata and R. apiculata. Plants from the family that belong to the major mangrove can survive in salty conditions because they have a physiological mechanism to remove excess salt. This is in line with Sinyo et al (2022) which states that some mangrove plants have salt glands to regulate osmosis.

The components of minor mangroves found include the Euphorbiaceae and Primulaceae

families. The minor component is mangrove plants that are not able to form a conspicuous type of vegetation, rarely form pure stands and only occupy the edges of the habitat. It is usually found on the outer part of the beach. Some of the species found are E. agallocha, Aegiceras floridum, and Aegiceras corniculatum. E. agallocha has a gray, smooth bark, but has nodules. The roots creep along the soil surface, often tangled and covered by lenticelles. The stems, branches, and leaves have sap. This plant is found on the edge of mangroves or the mainland.

The components of the association mangroves found include several types of plants from the Aizoaceae, Apocynaceae, Asteraceae, Casuarinaceae, Concolculaceae, Fabaceae, Lamiaceae, Loganiaceae, Poaceae, and Pteridaceae families. Plants in the associated mangrove component are plants that are associated with coastal forests and can be disseminated by seawater currents. Usually this plant lives in land areas far from coastal areas with very low salinity levels and can live in various soil conditions. Plants that belong to the association mangroves are usually herbaceous plants, growing vines on the side of the road or on the stems of other plants, and have attractive and striking flowers such as Canavalia virosa (Fabaceae family), Clitoria ternatea (Fabaceae family), Clerodendrum inerme (Lamiaceae family), and Sesuvium portulacum (Aizocaeae family). Then, in the mangrove component of this association, many species of sea spruce (Casuarinaceae family) are found. Rofi'i et al (2022) stated that plants such as Clitoria ternatea and other associated plants are lowland plants with very high adaptability, including adaptation to salinity, so that they are widely found as mangrove association plants in river estuaries or land near the coast.

In terms of ecosystem diversity, the coast and mangrove forest are the places with the highest type wealth. In this area, it is dominated by major mangrove types including the Rhizoporaceae, Acanthaceae, Lythraceae, Meliaceae, Passifloraceae, and Verbenaceae families. The family with the most types can also be found in pond and mangrove areas. The family with the highest number is Rhizoporaceae with a total of 6 types of plants found. Plants belonging to the Rhizoporaceae family are Bruguiera Cylindrica, Bruguiera Gymnorrhiza, Ceriops Tagal, Rhizophora Apiculate, Rhizophora Mucronata, and Rhizophora Stylosa. The second most common family is the Acanthaceae family with a total of 5 types of plants found in pond and mangrove areas. Plants belonging to the Acanthaceae family include Avicennia Ebracteatus, Acivennia alba, Avicennia lanata, Avicennia marina, and Acanthus Ilicifolius.

Based on these findings, the dominant mangrove species are Rhizoporaceae and Acanthaceae. These two types are able to adapt to the environment and the rapid breeding process. This is in line with Suarna & Wijaya (2021) which states that mangroves grouped in the Rhizophoraceae family can grow well on siltant soil substrates. This is also supported by research conducted by Rambu et al. (2019), that mangroves in the Rhizophoraceae family, such as R. apiculata, relatively prefer substrates that are categorized as silt or silt clay clay.

The Rhizophoraceae and Acanthaceae families are widely found in coastal ecosystems and mangrove forests due to soil conditions suitable for mangrove growth. In addition, the mangrove forest ecosystem is an artificial ecosystem so that people deliberately plant mangroves. The most planted mangroves are in the Rhizophoraceae and Acanthaceae families because species from these families are easier to grow and resistant to all environmental conditions. This is in line with Idrus et al (2021) which states that the Rhizophoraceae and Acanthaceae families are able to thrive in environments with relatively varied physical conditions in all locations. Mangroves planted in coastal areas can support the tourism sector through natural beauty and ecotourism activities.

Planting mangroves on the coast can also help reduce abrasion. However, fewer mangroves are found. This is due to the degradation of mangroves for recreational areas, land conversion as

ponds and settlements. This is supported by research conducted by Rindarjono (2021) which stated that there were reclamation activities in swamp areas that were originally natural polders to accommodate flood runoff, because they were piled up so that they became higher. This causes water to look for lower parking spaces and flooding so that it can disturb and damage mangroves around the coast.

In the pond ecosystem, no mangrove plants were found. This is because the salinity value in pond areas is lower than in coastal areas and mangrove forest areas. In line with research Matatula (2019) which states that there are fewer mangroves in areas close to fish ponds which causes the salinity value in the Beringin Beach mangrove forest to show a slowly decreasing value when compared to the salinity value in the Pariti mangrove forest. The pond ecosystem provides several benefits for both humans and the environment. For the community, it is a source of food, because it is able to supply animal protein needs such as fish, shrimp, crabs. For the environment, pond ecosystems can maintain ecological balance and environmental quality b. As a means of conservation of marine flora and fauna/brackish water.

The results of the next research were made in the form of an e-booklet on Biodiversity in the Bulusan Demak Pond Mangrove Forest Area, which contains information on biodiversity in the Bulusan Demak Pond area, especially the diversity of mangrove species along with photos of the research results completed with a description.

**E-Booklet Design**

The e-booklet on plant richness in the Tambakbulusan Demak Mangrove Forest Area is compiled based on the results of observations by researchers that are adapted to the curriculum in schools. The e-booklet was designed and developed from April to June 2024. The information obtained in the form of gene diversity, types, and ecosystems in the Tambakbulusan Demak mangrove forest area was then collected through documentation.

The plant wealth e-booklet product in the Tambakbulusan Demak Mangrove Forest Area is designed as a supplement to the learning resources for class X students in the subject of biology of plant wealth material. The researcher used the results of his exploration in the Tambakbulusan Demak mangrove forest area as material that was developed into an e-booklet. The results of this study are in the form of several images obtained by the researcher while at the research site.

The cover of the e-booklet is given images that represent biodiversity shown with several pictures of species found in the Tambakbulusan Demak Mangrove Forest Area. The image used as the background of the cover was chosen with a diverse and striking color composition so that it could attract the attention of students. The next page is the preface from the author. The preface in this e-booklet contains remarks from researchers and their hope that the e-booklet can be a supplement to student learning resources.

Then, there are instructions for using the e-booklet. Instructions for using the e-booklet are presented in illustrative form. Instructions for use are very helpful for students in using the e-booklet. Furthermore, there are Learning Outcomes (CP) and Learning Objectives (TP) pages. This page outlines what are the learning achievements and objectives in phase E or class X so that students can know and understand the goals after learning plant wealth material.

Before entering the core material about gene diversity, types, and ecosystems, the researcher presents a page explaining the profile of Tambakbulusan Village to provide students with a general

overview of the area. The presentation of the material consists of several components, namely titles, images, classifications, and descriptions. The existence of pictures can help students easily remember the material and can improve students' language skills and creativity (Utami, 2020).

The e-booklet is also equipped with a glossary as a collection of words and their meanings to make it easier for students to understand words that are considered difficult. A good understanding of these terms is very important not only for mastery of biological concepts but also to build a foundation for students' scientific thinking. Glossaries can be an effective tool for improving biology literacy, helping students relate terms to real-world concepts, and increasing interest and active participation in learning (Larasati, 2023).

The use of e-booklets provides an experience for students to learn by utilizing technology. In line with Anggraeni & Sole (2018) which states that media that is suitable for learning in the 21st century requires teachers to utilize technology in it. The material presented in the e-booklet is also based on the results of research in the environment around the students. According to Irwandi & Fajeriadi (2020), the surrounding environment is able to develop the ability to transfer students' understanding to new contexts independently. The use of the surrounding environment as a learning resource facilitates the learning process, is more interesting, and motivates students to be more active, interactive, and critical in solving problem formulations. This can foster interest in learning which is one of the intrinsic factors that affect the achievement of student learning goals.

The e-booklet is equipped with practice questions after the material. This practice question can make students have a learning drive in themselves by doing practice questions repeatedly until they get the best score so that their understanding of the concept of plant wealth material can increase (Rofiah & Bahtiar, 2022).

The advantages of the e-booklet on plant wealth in the Tambakbulusan Demak Mangrove Forest Area are made with a flipboook model that can be accessed via smartphones and laptops. E-booklets can be used by students anywhere and anytime so that they can support students to learn independently. Easy access makes this media one of the factors that supports students to open it repeatedly so that it can improve student learning outcomes (Suryandaru & Setyaningtyas, 2021).

**E-booklet features**

The media presents contextual and factual material. This is shown by the acquisition of a score of 100% on the contextual aspect by material experts and is included in the very good category. The presentation of e-booklets that contain contextual elements including constructivism, inquiry, learning community, learning community, reflection and assessment are manifested in an interesting e-booklet that fosters a sense of desire to learn. This can encourage students to make a connection between the knowledge they have and its application in daily life.

Then, the e-booklet media of plant wealth in the Tambakbulusan Demak Mangrove Forest Area is interesting. This is based on the results of student and teacher responses in the aspect of interest to get a score of 94% from students and 100% from teachers with the very good category. The acquisition of this score is because the e-booklet developed attracts students' attention to learn plant wealth material. The images that are arranged according to their proportions make students comfortable in learning. According to Utami (2020) Images can help students remember the material easily.

Furthermore, the easy-to-read e-booklet of plant wealth in the Tambakbulusan Demak Mangrove Forest Area was shown by the acquisition of a response score of 87% for teachers and 95% for students. In the e-booklet using good sentences and paragraphs, the language used is simple and easy to understand, and the letters used are easy to read. The appropriate choice of words and sentences makes it easier for students to understand the material.

The e-booklet on plant wealth in the Tambakbulusan Demak Mangrove Forest Area can provide learning motivation for students, as shown by the acquisition of response scores from teachers in the aspect of assistance of 100% and students of 93%. Attractive display, integration between material and technology, use of illustrations and images that can provide motivation to learn the material. Azmi & Maksum (2020) stated that the use of digital learning media can get more opportunities to understand the material, not only at school but also at home.

**Feasibility of e-Booklet on Plant Wealth in the Tambakbulusan Mangrove Forest Area Based on the Results of Material and Media Expert Validators, Teacher and Student Response Questionnaires**

Product assessment by material experts aims to assess products based on the content or content in them based on aspects that have been made in the assessment instrument. The lecturer who is an expert in the material to validate is a lecturer from the Department of Biology FMIPA, Semarang State University. Product assessment by material expert lecturers includes aspects of content eligibility, presentation feasibility, and contextual assessment aspects. The results of the assessment by material experts on *the e-booklet* of plant wealth in the Tambakbulusan Mangrove Forest Area can be seen in Table 4.3.

Table 4. 1 Product Assessment Results by Material Experts

| Assessment aspects | Percentage (%) | Category |
|---|---|---|
| Content eligibility aspects | 98% | Excellent |
| Aspects of eligibility | 98% | Excellent |
| Aspects of contextual assessment | 100% | Excellent |
| Average | 99% | Excellent |

The results of validation by material experts received an average score of 99% in the very good category. In terms of feasibility, the content received a score of 98% in the very good category. Overall, the e-booklet on plant wealth in the Tambakbulusan Demak Mangrove Forest Area presents materials that are in accordance with the learning achievements and objectives. The material in the e-booklet is designed in an interesting way to encourage curiosity so as to arouse students' interest in learning.

In terms of presentation eligibility, it received a score of 98%, which is included in the very good category. The presentation of material in the form of images is accompanied by information based on the results of identification, exploration, and researcher documentation. The use of images can attract students' attention in learning. This is in line with the opinion Safitri & Kabiba (2020) That said, images on learning media can function to arouse students' interest and attention, pictures can also clarify important parts of a material, so that it can improve students' ability to relate to real situations.

The contextual assessment aspect received a score of 100% in the very good category. The presentation of e-booklets that contain contextual elements including constructivism, inquiry, learning community, learning community, reflection and assessment are manifested in an interesting e-booklet so as to foster interest, a sense of curiosity, an attitude of independence in learning, and encourage students to make connections between the knowledge they have and its application in daily life. Thus, the plant wealth e-booklet product in the Tambakbulusan Mangrove Forest Area is suitable for use as a supplement to learning resources on plant wealth materials.

Table 4. 2 Results of Product Assessments by Media Experts

| Assessment aspects | Percentage (%) | Category |
|---|---|---|
| Aspects of graphic eligibility | 98% | Excellent |
| Linguistic eligibility aspects | 95% | Excellent |
| Average | 97% | Excellent |

Based on the results of the assessment by media experts, the average score obtained was 97%. This score is included in the very good category. The feasibility aspect of graphics received a score of 98% in the very good category. This shows that the display in the e-booklet has met all the indicators of the feasibility of graphics so that it is feasible to be applied to students. The selection of bright colors of the e-booklet, the use of images, the proportional layout, the right selection of letters and sentences, and the size in accordance with the ISO A5 standard make this e-booklet of plant richness in the Tambakbulusan Mangrove Forest Area worthy of obtaining a high score. Thus, the plant wealth e-booklet product in the Tambakbulusan Mangrove Forest Area is suitable for use as a supplement to learning resources on plant wealth materials.

Table 4. 3 Results of Teacher Response Questionnaire

| Assessment aspects | Percentage (%) | Category |
|---|---|---|
| Aspects of interest | 100% | Excellent |
| Material aspects | 100% | Excellent |
| Language aspects | 87% | Excellent |
| Accessibility aspect | 100% | Excellent |
| Average | 97% | Excellent |

The assessment by biology teachers was carried out by MAN Demak biology teachers including aspects of interest, material aspects, language aspects, and aspects of assistance. Overall, the assessment by the biology teacher got a score of 97%. In terms of interest, getting a score of 100% is included in the very good category. The score was obtained because the e-booklet had met the indicators of the attractiveness aspect. An attractive appearance, the integration of the material with technology, the use of illustrations and images that can provide motivation to learn the material make the e-booklet worthy of a high score. Students' interest in participating in learning can be increased using pictures. Images can help students remember material easily (Utami, 2020).

The material aspect received a score of 100% in the very good category. The high score was obtained because the biodiversity e-booklet in the Tambak Bulusan Demak Mangrove Forest Area presents the material completely, contextually, concisely, systematically, and easily understood. The completeness and systematics of the material presented are shown by complete e-booklet sections including covers, prefaces, table of contents, instructions for use, learning objectives, materials in

accordance with research in the Bulusan Demak Tambak Mangrove Forest Area, glossary, bibliography, cover, and author biodata.

The language aspect received a score of 87% in the very good category. The score was obtained because the e-booklet used good sentences and paragraphs, the language used was simple and easy to understand, and the letters used were easy to read. The linguistic aspect is very important because it affects the level of media readability. The higher the level of media readability, the easier it is for students to understand so that it affects interest and is followed by an increase in student learning outcomes (Sari et al., 2020).

The aspect of assistance received a score of 100% in the very good category. The acquisition of this high score is based on the results of the assessment that the e-booklet has met the assessment indicators, namely it can help students understand the material, is practical, easy to carry around, and flexible. Students are now more interested in things that are unique, interesting, and flexible (Yunus, 2022). Therefore, the biodiversity e-booklet in the Tambak Bulusan Demak Mangrove Forest Area is worthy of being used as a supplement to teaching materials.

Meanwhile, the average score obtained from the student response questionnaire of 94% is in the very good category. The acquisition of these scores is based on the accumulation of interest aspects of 94%, material aspects of 93%, language aspects of 95%, and assistance aspects of 93%. The acquisition of scores with excellent categories shows that the e-booklet developed can be used as a supplement to teaching materials.

Table 4. 4 Results of Student Response Questionnaire

| Assessment aspects | Percentage (%) | Category |
|---|---|---|
| Aspects of interest | 94% | Excellent |
| Material aspects | 93% | Excellent |
| Language aspects | 95% | Excellent |
| Accessibility aspect | 93% | Excellent |
| Average | 94% | Excellent |

The interest aspect got a score of 94% with the category very good. The acquisition of this score is because the e-booklet developed attracts students' attention to learn plant wealth material. The images that are arranged according to their proportions make students comfortable in learning. The material aspect got a score of 93% and the language aspect got a score of 95%. The presentation of material is adjusted to the student's learning achievements and goals. The appropriate choice of words and sentences makes it easier for students to understand the material.

The aspect of assistance received a score of 93%. High grades are obtained because e-booklets can be used easily and practically. Students can access the e-booklet for free at no cost. In addition, e-booklets can help students understand the material and encourage students to learn independently. In line with Azmi & Maksum (2020) which states that the use of electronic learning media can create independent learning for students so that students can have more opportunities to understand the material, not only at school but also at home.

## CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that:.

1. The e-booklet on plant wealth in the Tambakbulusan Demak Mangrove Forest Area has the characteristics of being contextual, factual, interesting, easy to read, and motivating, as shown by the results of assessments by material expert validators, media experts, teacher responses, and student responses which are included in the very good category.
2. The plant wealth e-booklet was declared very feasible to be used as a learning resource supplement with the results of the student response questionnaire in the very good category.
3. The teacher's response stated that the e-booklet on plant wealth in the Tambakbulusan Demak Mangrove Forest area met the aspects of interest, material, language, and assistance by users with the results of the questionnaire responses of students and teachers in the very good category.

## BIBLIOGRAPHY


Anggraeni, F. B. S. & D. M. (2018). LITPAM, West Nusa Tenggara, Indonesia. *Journal of Research and Assessment of Educational Sciences: e-Scientificika*, *2*(1), 10.

Athalia, Q., Rante, D., Sahupala, A., & Komul, Y. D. (2024). *STRUCTURE AND COMPOSITION OF MANGROVE FORESTS IN HATUSUA VILLAGE, KAIRATU DISTRICT, WEST SERAM REGENCY*. *1*(3), 185–204.

Azmi, R. A., & Maksum, H. (2020). *ANALYSIS OF THE NEED FOR THE DEVELOPMENT OF WEB-BASED LEARNING MEDIA FOR NETWORK INFRASTRUCTURE ADMINISTRATION SUBJECTS. 4*, 303–314.

Idrus, A. Al, Syukur, A., & Zulkifli, L. (2021). The Evidence of Rhizophora as a Potential Species to Improve Mangrove Recovery on the Southern Coast of East Lombok, Indonesia. *ASM Science Journal*, *14*(June), 57–64.

Irwandi, I., & Fajeriadi, H. (2020). Utilization of the Environment as a Learning Resource to Increase the Interest and Learning Outcomes of High School Students in the Coastal Area, South Kalimantan. *BIO-INOVED : Journal of Educational Biology-Innovation*, *1*(2), 66. https://doi.org/10.20527/binov.v1i2.7859

Larasati, E. (2023). Development of Universe Card Teaching Media to Enrich the Glossary of High School Students in Biology Subjects. *Mitra Pilar: Journal of Education, Innovation, and Applied Technology*, *2*(1), 37–44. https://doi.org/10.58797/pilar.0201.05

Matatula, J.-. (2019). Diversity of Salinity Conditions in the Environment Where Mangroves Grow in Kupang Bay, NTT. *Journal of Environmental Sciences*, *17*(3), 425. https://doi.org/10.14710/jil.17.3.425-434

Rindarjono, G. (2021). Reclamation, Risk, and Urban Inequality: Inundation, Abrasion, and Social Impacts in Central Java. *Geo Spatial Proceedings*, 383–392.

Rofi'i, I., Poedjirahajoe, E., & Marsono, D. (2022). Diversity and Distribution Patterns of Mangrove Species in Sptn Region I Bekol, Baluran National Park. *Journal of Marine Science: Indonesian Journal of Marine Science and Technology*, *14*(3), 210–222. https://doi.org/10.21107/jk.v14i3.9293

Rofiah, B. N., & Bahtiar, M. D. (2022). Analysis of the Use of E-Learning, Practice Intensity, and Learning Motivation on Student Learning Outcomes. *Educational : Journal of Educational Sciences*, *4*(2), 2143–2155. https://doi.org/10.31004/edukatif.v4i2.2453

Safitri, A., & Kabiba, K. (2020). The Use of Image Media in Increasing the Learning Interest of Grade IV Students at SD Negeri 3 Ranomeeto. *Didactic: Journal of Education and Science*, *20*(1), 334–346. https://doi.org/10.30651/didaktis.v20i1.4139

Sari, N. M., Sabri, T., & Kresnadi, H. (2020). Analysis of Thematic Learning Tools with a Scientific Approach in the Covid-19 Period in Grade IV Elementary School. *Journal of Equatorial Education and Learning*, *9*(11), 1–8.

Sinyo, Y., Tolangara, A., Saibi, N., & Saturday, R. (2022). Analysis of Salt Content in Mangrove Root and Leaf Media Secreter Avicennia Sp. *EDUCATION - Journal of Education*, *20*(2), 197–205.

Suarna, W., & Wijaya, M. S. (2021). Butterfly pea (clitoria ternatea L.: Fabaceae) and its morphological variations in Bali. *Journal of Tropical Biodiversity and Biotechnology*, *6*(2), 1–12. https://doi.org/10.22146/JTBB.63013

Suryandaru, N. A., & Setyaningtyas, E. W. (2021). Development of Website-Based Learning Media in Grade IV Mathematics Learning Content. *Journal of Basicedu*, *5*(6), 6040–6048. https://doi.org/10.31004/basicedu.v5i6.1803

Utami, Y. S. (2020). The use of image media to improve student learning outcomes in science learning. *Journal of Education and Counseling (JPDK),* *2*(1), 104–109. https://doi.org/10.31004/jpdk.v1i2.607

Yunus, G. F. A. A. M. (2022). *THE DEVELOPMENT OF TEACHING MATERIALS IS ASSISTED BY THE ANYFLIP APPLICATION ON THE COORDINATION SYSTEM MATERIAL FOR GRADE XI STUDENTS*. *7*(2), 224–235.