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DEVELOPMENT OF AN E-BOOKLET ON NGUYAHAN BEACH GASTROPODA TO IMPROVE STUDENTS' SCIENTIFIC EXPLANATION SKILLS

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Abstract. This study aims to: (1) Determine the gastropod diversity index at Nguyahan Beach; (2) Determine the results of the booklet's feasibility test as a learning resource in improving students' Scientific Skill Explanation; (3) Determine students' responses to the use of the Nguyahan Beach gastropod e-booklet. This study is an exploratory research and development (R&D) project using the 4D model (define, design, develop, disseminate). The resulting product is the Nguyahan Beach gastropod e-booklet. A feasibility collection was carried out by having material expert validators and media expert validators complete a validation questionnaire. Data collection on increasing learning interest and mastery was observed from both test and non-test results. The test results were derived from the pre-test and post-test scores, while the non-test results were obtained by having students and teachers complete a response questionnaire, serving as supporting variables. Data analysis for both tests and non-tests used standard gain. The results of this study indicate that: (1) Gastropods found at Nguyahan Beach, Gunungkidul have a high diversity index of 3.046. Consisting of 2 orders of gastropods with 10 families, 15 genera and 29 species; (2) The results of the N-Gain test in the development research were 63.67, which is classified as moderate. (3) Student responses through the readability test obtained an average percentage of 95.5% which means the product is very suitable for use in learning. Teachers can use the results of this study as an alternative teaching material in the classroom that is contextual.
Keywords: Classification, E-booklet, Gastropods, Nguyahan beach, Scientific explanation skills

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INTRODUCTION

The 21st century demands that students possess a range of skills to face future challenges effectively. One skill necessary for problem-solving is the ability to reason logically (Suwarno & Suratsih, 2018). Based on Minister of Education and Culture Regulation Number 21 of 2016 concerning the Content Standards for Elementary and Secondary Education, the basic competencies that must be mastered include the skills of reasoning, processing, and communicating in both abstract and concrete contexts, in accordance with what is learned during the learning process. One of the reasoning skills developed is scientific explanation skills (SES).

SES is crucial in biological learning, particularly in the context of classifying living things. In the classification of living things, concepts are taught that link the structure and classification of organisms, making it difficult for students to visualise and clearly describe these concepts (Anggraini et al., 2019). The percentage of students experiencing learning difficulties reached 68.31%, including understanding scientific nomenclature, concepts, and terms (Anggraini et al., 2019). Biology material can cause students to experience misconceptions. Student misconceptions arise from students' difficulties in understanding the material, leading to an incomplete understanding (Alawiyah et al., 2016).

Learning difficulties that are not promptly addressed will continue to interfere with

students' ability to acquire new knowledge. If educators fail to address these learning difficulties, students will increasingly encounter material that they cannot fully understand. The sheer volume of incomplete material also leads to an increase in misconceptions (Alawiyah et al., 2016).

One way to address student difficulties in learning biology is by implementing a process to improve students' SES (Student Explanation Skills). However, the reality on the ground shows that students still lack SES skills. Students rarely use their knowledge to explain natural phenomena, resulting in only basic and less meaningful learning (Suwarno & Suratsih, 2018).

Student explanation skills need to be developed because students still rely on instinct rather than data and evidence when compiling evidence. Consequently, students' reasoning skills are still weak (Hernita et al., 2021). One way to improve SES is through the development of adequate learning resources. Adequate learning resources will create effective learning. Susilawati et al. (2015) stated that learning resources play a crucial role in the learning process, ensuring effective and efficient learning activities.

The effectiveness of the learning process, or effective learning, refers to the extent to which students achieve learning outcomes after completing the teaching and learning process. This learning effectiveness can be enhanced through the use of learning resources in the learning process. Learning resources contain new materials that can enhance students' knowledge and insight (Susilawati et al., 2015).

One learning resource that can capture students' interest and attention is a booklet. Booklets are simple in design, with attractive colours and illustrations. Furthermore, booklets can be read anywhere and at any time, which can help improve students' understanding of material they find challenging (Azizah et al., 2022).

Based on observations during the implementation of Educational Practice, the material on the classification of living things proved difficult for students to understand, as it covered a broad range of topics and utilised many Latin terms. This result aligns with Anggraini et al. (2017), who noted that students also struggled to describe the characteristics of each phylum, classify, provide examples, and explain the roles of members of the phylum Invertebrata, thereby hindering their learning.

Gastropods, a member of the Mollusca group, are one of Indonesia's marine resources, playing an important role in the ecosystem as bioindicators, food sources, and research objects (Wulansari & Kuntjoro, 2018). One area with high gastropod diversity is Nguyahan Beach in Gunungkidul, Yogyakarta. Nguyahan Beach is located in Kanigoro Village, Saptosari District. Nguyahan Beach features white sand and waters with calm currents and moderate waves (Huda and Matondang, 2020). This beach is home to a diverse array of marine flora and fauna that can be used as valuable research subjects.

Booklets, or printed books, have drawbacks such as time-consuming printing processes, high costs, and the need for special maintenance (Munawaroh, 2021). As an alternative, digital e-booklets offer a more practical and efficient solution (Listiyani & Budiwati, 2022). E-booklets provide easier access, are more affordable, and require less physical maintenance (Suwarno & Suratsih, 2018). The goal of developing an e-booklet on gastropod diversity at Nguyahan Beach is to serve as an effective learning tool to enhance student engagement in biology learning for 10th-grade high school students, particularly in the classification of living things. This material requires students to develop strong analytical skills in classifying living things based on their morphological and physiological characteristics (Anggraini et al., 2019). Therefore, learning resources that can showcase the diversity of invertebrates in Indonesia, including gastropods, are

needed through this e-booklet. The purpose of this study was to determine the gastropod diversity index at Nguyahan Beach, to assess the feasibility of the booklet as a learning resource for improving students' scientific explanation skills, and to evaluate students' responses to the use of the Nguyahan Beach gastropod e-booklet.

METHOD

The research used was exploratory and research and development (R&D). Exploratory research was conducted using direct observation, combining two methods: line transects and quadrat transects. The research and development (R&D) was conducted using the 4D model (Define, Design, Develop, Disseminate) proposed by Thiagarajan et al. (1974). The resulting product was an e-booklet to improve SES.

The tools used to support this research included a 1 x 1m2 quadrat frame (bamboo and raffia), a global positioning system (GPS), a 100m tape measure, a camera, plastic clips, permanent markers, ballpoint pens, gastropod identification sheets, a thermometer, a refractometer, a pH meter, and a DO meter. The materials used in the study were distilled water, tissue, 70% alcohol, raffia rope, and label paper.

Sampling was conducted using a simple random sampling method, which involved the use of a random number generator or a lottery. This technique has the advantage of reducing bias and immediately identifying any standard errors in the research. Sampling of gastropod diversity in the Nguyahan Beach area, Gunungkidul, Yogyakarta, was conducted at low tide, beginning with the determination of the research station. The research station was divided into two stations on each side of the beach. The gastropod observation plot size used was 1 x 1 m^2. The gastropod species collected were then placed in plastic clips and treated with 70% alcohol to preserve them.

Water quality parameters measured in this study included temperature, dissolved oxygen, pH, salinity, and TDS. Water quality parameters were measured twice at each station. An analysis of the Gastropod Biodiversity Index in the Nguyahan Beach area, Gunungkidul, Yogyakarta, was conducted quantitatively using the Shannon-Wiener formula (H′). The purpose of this theory is to measure the level of order and disorder in a system. The Shannon-Wienner formula is as follows:

$$\mathbf{H' = -\Sigma\ (Pi)(LnPi)}$$

Description:
H′= Diversity Index
Pi= ni/N, Comparison between the Number of Individuals of Species i and the Total Number of Individuals
Ni= Number of Individuals of Species i
N = Total Number of Individuals

Biodiversity index categories are listed in Table 1.

Table 1. Biodiversity Index Categories (H′)

Biodiversity Categories	Diversity Index
Low Biodiversity	$H' < 1$
Medium Biodiversity	$1 < H' < 3$
High Biodiversity	$H' > 3$

The uniformity index analysis is calculated using the formula (Krebs, 1989):

$$\mathbf{E' = H'/lnS}$$

Description:
E′ = uniformity index
H′ = diversity index
S = number of all species

Brower et al.'s (1990) uniformity index categories are shown in Table 2.

Table 2. Uniformity Index Category (E')

Uniformity Category	Uniformity Index
Low Uniformity	E < 0,4
Medium Uniformity	0,4 < E < 0,6
High Uniformity	E > 0,6

Analysis of the gastropod dominance index was calculated using the equation (Odum, 1994):

$$C = \sum \left(ni\ N \right) 2$$

Description:
C = dominance index
ni = number of i-th individuals
N = total number of individuals

The dominance index categories, as defined by Odum (1994), are presented in Table 3.

Table 3. Dominance Index Category (D′)

Dominance Category	Dominance Index
Low Dominance	0 < C < 0,3
Medium Dominance	0,3 < C < 0,6
High Dominance	0,6 < C < 1

The population in this study was all gastropod species found in the Nguyahan Beach Area, Gunungkidul, Yogyakarta. In contrast, the samples in this study consisted of all gastropod species found within the quadrat plots on each predetermined transect line at Nguyahan Beach, Gunungkidul, Yogyakarta.

RESULTS AND DISCUSSION

Results

Diversity of gastropods at Nguyahan Beach

Nguyahan Beach is a tourist attraction in Gunungkidul Regency, located next to Ngobaran Beach. The local community widely uses its strategic location for livelihoods and as a tourist attraction. Based on the results of gastropod identification at Nguyahan Beach, Gunungkidul, two orders, 10 families, 15 genera, and 29 species of gastropods were found. The types of gastropods at Nguyahan Beach, Gunungkidul, are presented in Figure 1. The diversity of gastropods found is shown in Table 4.

Figure 1. Types of Gastropods on Nguyahan Beach, Gunungkidul

Description: 1. Famili Columbellidae (a. *Anachis trepsichore,* b. *Anachis fauroti,* c. *Anachis lyrata,* d. *Pyrene testudinaria*); 2. Famili Pisaniidae (e. *Caducifer truncatus,* f. *Engina lineata*); 3. Famili Prototiidae (g. *Civipollia pulchra,* h. *Civipollia incarnata,* i. *Civipollia fragaria*); 4. Famili Conidae (j. *Conus coronatus,* k. *Conus magus,* l. *Conus (Floraconus) balatensis pigmentatus (var),* m. *Conus* sp.); 5. Famili Costellaridae (n. *Vexillum plicarium*); 6. Famili Muricidae (o. *Morula marginalba,* p. *Morula granulata,* q. *Oppomorus purpureocinctus,* r. *Oppomorus funiculatus,* s. *Oppomorus* sp., t. *Claremontiella nodulosa,* u. *Thais (Thaisella) luteostoma*); 7. Famili Mitriidae (v. *Gemmulimitra avenacea*); 8. Famili Trochidae (w. *Trochus stellatus,* x. *Trochus maculatus,* y. *Trochus radiatus,* z. *Trochus* sp.); 9. Famili Tegullidae (aa. *Rochia nilotica,* bb. *Rochia sp.*) 10. Famili Collonidae (cc. *Collonista arsinoensis*).

E-Booklet on Gastropod Diversity at Nguyahan Beach

The results of developing the E-Booklet on Gastropod Diversity at Nguyahan Beach were carried out based on the 4D development steps proposed by Thiagarajan et al. (1974).

Define

Front-end Analysis

The results of the initial analysis conducted on teachers at SMA N 1 Kasihan confirmed that more innovative and interactive learning resources, such as e-booklets, are needed to help students understand biology concepts better through the claim, evidence, and reasoning approach.

Learner analysis

The results of data analysis of grade X students at SMA N 1 Kasihan, conducted through Google Forms, indicate that many students are unfamiliar with gastropods, and

some students have not utilised SES to understand the material on the classification of living things. In addition, students find it difficult and boring to study with thick books, because they prefer and easily understand material that is concise, practical, and equipped with videos, interactive quizzes, and colourful images.

Table 4. Gastropod Diversity Index on Nguyahan Beach

No.	Species	Total	Pi	lnPi	PilnPI	Ni/n^2
1.	*Anachis trepsichore*	3	0,0422	-3,1640	-0,1336	0,0017
2.	*Anachis fauroti*	2	0,0281	-3,5695	-0,1005	0,0007
3.	*Anachis lyrata*	2	0,0281	-3,5695	-0,1005	0,0007
4.	*Pyrene testudinaria*	1	0,0140	-4,2626	-0,0600	0,0001
5.	*Caducifer truncatus*	1	0,0140	-4,2626	-0,0600	0,0001
6.	*Engina lineata*	6	0,0845	-2,4709	-0,2088	0,0071
7.	*Civipollia pulchra*	4	0,0563	-2,8763	-0,1620	0,0031
8.	*Civipollia incarnata*	5	0,0704	-2,6532	-0,1868	0,0049
9.	*Civipollia fragaria*	3	0,0422	-3,1640	-0,1336	0,0017
10.	*Conus coronatus*	1	0,0140	-4,2626	-0,0600	0,0001
11.	*Conus magus*	1	0,0140	-4,2626	-0,0600	0,0001
12.	*Conus (Floraconus) balatensis pigmentatus (var)*	1	0,0140	-4,2626	-0,0600	0,0001
13.	*Conus sp.*	1	0,0140	-4,2626	-0,0600	0,0001
14.	*Vexillum plicarium*	6	0,0845	-2,4709	-0,2088	0,0071
15.	*Morula marginalba*	3	0,0422	-3,1640	-0,1336	0,0017
16.	*Morula granulata*	2	0,0281	-3,5695	-0,1005	0,0007
17.	*Oppomorus purpureocinctus*	2	0,0281	-3,5695	-0,1005	0,0007
18.	*Oppomorus funiculatus*	2	0,0281	-3,5695	-0,1005	0,0007
19.	*Oppomorus sp.*	7	0,0985	-2,3167	-0,2284	0,0097
20.	*Claremontiella nodulosa*	1	0,0140	-4,2626	-0,0600	0,0001
21.	*Thais (Thaisella) luteostoma*	10	0,1408	-1,9600	-0,2760	0,0198
22.	*Gemmulimitra avenacea*	1	0,0140	-4,2626	-0,0600	0,0001
23.	*Trochus stellatus*	1	0,0140	-4,2626	-0,0600	0,0001
24.	*Trochus maculatus*	1	0,0140	-4,2626	-0,0600	0,0001
25.	*Trochus radiatus*	1	0,0140	-4,2626	-0,0600	0,0001
26.	*Trochus sp.*	1	0,0140	-4,2626	-0,0600	0,0001
27.	*Rochia nilotica*	1	0,0140	-4,2626	-0,0600	0,0001
28.	*Rochia sp.*	1	0,0140	-4,2626	-0,0600	0,0001
29.	*Collonista arsinoensis*	1	0,0140	-4,2626	-0,0600	0,0001
	Diversity Index (H')					3,0466
	Uniformity Index (E')					0,9047
	Dominance Index (D')					0,0625

Suitability of learning resources with learning objectives

The development of this e-booklet aligns with the learning objectives of the current curriculum, particularly the classification of living things in grade 10 of high school. This e-booklet is designed to enhance SES skills, which include the ability to link claims, evidence, and reasoning in order to understand scientific phenomena. Thus, students can more easily identify, classify, and explain gastropod diversity based on their scientific characteristics.

Concept Analysis

The concept analysis is shown in Table 5.

Table 5. Concept Analysis Results

No.	Facts	The Concept of
1.	There are differences (in shape and size) in each type of gastropod discovered.	Biodiversity and Classification of Living Things.
2.	There are 29 species from 10 different phyla.	Species Classification.
3.	There are similarities among several types of gastropods.	Uniformity.

Target Material and Purpose

The primary target material in this e-booklet is the diversity of gastropods on Nguyahan Beach, structured to be relevant to the classification of living things. This e-booklet is intended for 10th-grade high school students as a supplementary learning resource to support their understanding of connecting classification concepts with real-world evidence. Furthermore, this material can also be used by teachers as an innovative learning tool based on exploration and research.

Information to be Disclosed

The information to be disclosed in the e-booklet includes the types of gastropods found on Nguyahan Beach, their morphological and ecological characteristics, and the classification of gastropods based on taxonomic principles. Furthermore, this e-booklet will integrate examples of scientific explanation analysis by presenting the relationship between claims (classification categories), evidence (morphological characteristics), and reasoning (scientific concepts supporting the classification).

Exploration Guidelines

This e-booklet is designed with an exploratory approach, enabling students to understand the material through observation and analysis activities. The exploration guidelines include guidance on directly observing gastropod species, recording their characteristics, and classifying them according to scientific concepts. Students are also encouraged to engage in evidence-based discussions, develop hypotheses, and draw conclusions from the data obtained, thereby further enhancing their SES.

Achievements to be Achieved

The development of this e-booklet is expected to benefit students in improving their understanding of the concept of classifying living things through the SES approach. With the inclusion of materials based on gastropod diversity at Nguyahan Beach, students can learn in a more contextual and applicable way. Furthermore, this e-booklet is also expected to serve as an additional reference for teachers in developing more interactive and research-based learning methods.

Design

Criterion-test-contruction

At this stage, pre-test and post-test questions are developed.

Format Selection

The Nguyahan Beach Gastropods e-booklet measures 21 x 29.7 cm. The font format and size used in the writing are shown in Table 6.

Table 6. E-Booklet Preparation Format

Format	*Font*	*Size*
Front Cover	• *TAN Headline*	• 53,4
	• *Bukhari Script*	• 56,8
	• *Poppins*	• 20
Foreword	• *Abril Fatface*	• 30
	• *Poppins*	• 14
	• *Open Sans Bold*	• 15
Table of Contents	• *Abril Fatface*	• 30
	• *Poppins*	• 16
	• *Open Sans Bold*	• 15
Learning Achievements and Objectives	• *Abril Fatface*	• 30
	• *Poppins*	• 15
	• *Open Sans Bold*	• 15
Chapter Titles	• *Abril Fatface*	• 38,3
Material Content Description	• *Poppins*	• 13-15
Image Sources	• *Poppins*	• 12
Back Cover	• *Poppins*	• 15

Initial design

A summary of the initial design is shown in Table 8..

Table 8. Initial Design Format

Section	Design Format
Beginning	Cover, Foreword, Table of Contents, Learning Outcomes, Learning Objectives.
Contents	Chapter titles, description of the material on the classification of living things, images of gastropods, exploratory video, quiz, determination key, practice questions, glossary.
Closing	Author bio, cover.

Pre-writing

The material presented in the e-booklet consists of text, videos, and images. Reference sources include books, scientific articles/journals, YouTube, websites, and personal photos.

Drafting

This process is carried out using Microsoft Word and Canva. The material prepared in Word is then designed using Canva.

Develop

At this stage, product development and validation were carried out. The validation results, as evaluated by material and media experts, are presented in Table 9.

Table 9. Validation Results

No.	Assessor	Percentage	Category
1.	Materials Expert	100%	Assessor
2.	Media expert	100%	Assessor

After the product was deemed valid, a trial was conducted on students. Following the trial, teachers and students were asked to provide their responses. The results of the student and teacher responses are shown in Table 10.

Table 10. Student and Teacher Response Results

No.	Assessor	Percentage	Category
1.	Student	100%	Assessor
2.	Teacher	100%	Assessor

To determine the effectiveness of the product, a pre-test and a post-test were conducted. The results of the pre-test and post-test are shown in Table 11.

Table 11. Student Learning Outcomes

Data	X-8 Class	
	Pre-test	***Post-test***
Number of students	34	34
Lowest score	20	60
Highest score	100	100
Average score	73,23	91,17
N-gain		63,67
Criteria		Moderate

Disseminate

At this stage of distribution, the e-booklet was made available through the Heyzine.com website and flipHTML5, and shared with biology teachers and grade 10 students of SMA N 1 Kasihan. The following is the link to the Gastropoda e-booklet that has been distributed.

Discussion

Gastropod Diversity on Nguyahan Beach

Based on research results, Nguyahan Beach in Gunungkidul Regency is a strategic tourist destination that serves as a source of livelihood for the local community. Identification of gastropods on this beach revealed the presence of 29 species belonging to 10 families and 15 genera. The gastropod diversity index at this location was 3.046, which is classified as high. Furthermore, the evenness index (E) of 0.904 indicates a relatively high category, while the dominance index (D) of 0.062 indicates relatively low dominance. The most abundant gastropod species was Thais (*Thaisella luteostoma*).

The results of measurements of physical and chemical parameters of the water at Nguyahan Beach indicate that the water conditions meet seawater quality standards. The temperature of 28°C is within the standard (28-32°C) and supports gastropod life. The dissolved oxygen (DO) value of 5.84 ppm indicates good water quality, meeting the standard of greater than 5 ppm. The pH value of 7.0 is within the normal range (7.0-8.5), the salinity of 31.5‰ meets the quality standard (28-34‰), and the TDS of 51.5, which meets the quality standard (500 ppm) (Rukmana & Purnomo, 2019). These parameters suggest that the gastropod habitat at Nguyahan Beach is relatively stable and supports a diverse biodiversity.

Gastropods play a crucial ecological role, primarily as detritus feeders, contributing to the cycling of organic matter in the water. Various water conditions, including substrate type, temperature, salinity, pH, and the content of organic matter and oxygen, influence the distribution of gastropods. Furthermore, gastropods can also serve as

bioindicators of water quality, where the higher the number of gastropods found, the better the environmental conditions (Ruswahyuni, 2008).

Overall, the results of this study indicate that the diversity of gastropods at Nguyahan Beach is relatively high, with physical and chemical parameters supporting the presence and abundance of species. Environmental factors, substrate, and human activities play a role in determining the distribution and abundance of gastropods in this aquatic ecosystem. Therefore, coastal conservation is crucial for maintaining ecosystem balance and the sustainability of gastropod populations on Nguyahan Beach.

Gastropod Diversity E-Booklet in Rowo Nguyahan

The development of learning resources is closely tied to learning theory and instructional design. In the learning process, learning resources play a crucial role in creating effective learning experiences because they serve as a medium that supports students' understanding of the material (Ikawati, 2022). The development of the Nguyahan Beach gastropod e-booklet was carried out through several stages and developments. The development stages are defined as design and development.

The results of the study indicate that Nguyahan Beach has a diverse gastropod population, with 29 species from 10 families and 15 genera, and a high diversity index of 3.046. Therefore, Nguyahan Beach has great potential as a learning resource in biology, particularly in understanding biodiversity and the classification of living things. Biodiversity is not only crucial for ecosystems but also serves as a valuable source of information that can be utilised in education (Asril et al., 2022). By utilising gastropod diversity, students can learn about the classification, adaptation, and ecological roles of the gastropod species found.

Based on exploratory research on gastropods at Nguyahan Beach, several key concepts can be identified, including biodiversity and the classification of living organisms. These concepts are highly relevant to teaching students, as they can help them understand the relationship between species and ecosystems. Understanding biodiversity and the classification of living organisms is crucial in biology education, as it provides insight into the interactions between species and their roles in ecosystems (Pertiwi, 2022).

The material presented in the e-booklet is structured using the SES approach, with indicators of claim, evidence, and reasoning. The claim indicator in the e-booklet takes the form of interactive questions that stimulate children's thinking. The evidence indicator is presented in the form of materials or images with accurate sources, which will enhance students' knowledge (Mukhlish & Paidi, 2025). The claim indicator is an explanation/reasoning regarding the relationship between the claim and the evidence. The e-booklet also includes images and YouTube videos, which are expected to enhance students' understanding. The use of various reference sources in compiling the e-booklet is essential to providing accurate and up-to-date information (Kumar, 2022).

The feasibility of the Nguyahan Beach gastropod e-booklet is supported by quantitative data, with 100% percentage from both material experts and media experts. This result indicates that the percentage meets the criteria of very suitable and can be used for independent learning activities. This result aligns with research conducted by Kumar (2022), who also reached the same conclusion, with an average percentage of P = 89.79. Editing and revisions were carried out in accordance with suggestions from material experts and media experts. The suggestions and input obtained were used to develop the learning resource, making it better and more suitable for use.

A readability test was conducted after expert validation was completed. The

purpose of the readability test was to determine students' ease of use and understanding of the e-booklet. The readability test was conducted by a biology teacher and 34 students (one class). Before the test, students were given a readability instrument sheet and explained how to complete it. The student readability test was conducted after a limited trial. Based on the biology teacher's readability test results, a 100% readability score was obtained.

After the e-booklet was deemed suitable and met the requirements, a limited trial was conducted with 34 students in grade X-8 of SMA N 1 Kasihan. Based on data analysis, the pre-test results showed an average score of 73.32 for class X-8. This score increased after the use of the Nguyahan Beach gastropods e-booklet learning resource in the learning process. The average post-test score was 91.17.

Limited testing has shown that the use of the Nguyahan Beach gastropod e-booklet as a learning resource has an impact on the classification of living things among 10th-grade students at SMA N 1 Kasihan. A significant difference in scores was observed in the pre- and post-test results. The increase in student understanding was also reflected in the N-Gain test results of 63.67, indicating that the e-booklet was moderately effective in improving students' SES.

Student feedback is crucial because the e-booklet was designed with student preferences in mind to increase their engagement in learning. Feedback significantly determines an individual's relationship with their environment. The more effective the feedback, the better the individual will be able to interact with the environment (Katz et al., 2021). Based on a readability test conducted on 34 students, the average readability percentage was 95.5%, indicating that the Nguyahan Beach gastropod e-booklet is considered highly suitable for use as a learning resource.

COCLUSION

Based on the exploratory research and R&D that have been conducted, the following conclusions were obtained: (1) Gastropods found on Nguyahan Beach, Gunungkidul have a high diversity index of 3.046. Consisting of 2 orders of gastropods with 10 families, 15 genera and 29 species; (2) The results of the N-Gain test in the development research were 63.67, which is classified as moderate. (3) Student responses through the readability test obtained an average percentage of 95.5% which means the product is very suitable for use in learning. Teachers can use the results of this study as an alternative contextual teaching material in the classroom. This teaching material also has the potential to enhance student literacy, making it suitable for use.

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