



Development of Biology Learning Resource: E-Booklet to Make and Apply Biosilica Fertilizer from Rice Husk

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Abstract

Learning resources for plant growth and development material in Phase F of the Merdeka Curriculum in Indonesia need to be developed with contextual and meaningful content in accordance with biology learning outcomes and support sustainable lifestyles. This research aims to 1) prove validity, 2) analyze practicality, 3) analyze readability, and 4) analyze characteristics of e-booklet from research results with innovations to make and apply biosilica fertilizer. This research is a research and development project. The results of e-booklet development obtained a very valid category based on the assessment results from the validators of content expert and learning media expert. The e-booklet obtained a very practical category based on the results of teacher and student responses. The readability level of the e-booklet was high based on the results of the cloze procedure test. In addition to the innovation of making and applying biosilica fertilizer from rice husk, this learning resource invites students to think creatively to find solutions to environmental problems around them. This e-booklet has some innovations, such as being interactive and equipped with materials in various forms, for instance, text, image, audio, and practicum video. In addition, the e-booklet is integrated with evaluation activities.

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INTRODUCTION

The biology learning process at school must adapt to curriculum developments. In the 2022/2023 academic year, the Merdeka Curriculum in Indonesia has been implemented, which is a development of the 2013 Curriculum as a form of learning recovery due to the COVID-19 pandemic (Usman et al., 2023). The new curriculum has a more flexible framework according to student needs, focusing on teaching materials, character and skill development, and project to strengthen the Pancasila student profile (Hakim et al., 2022). The Merdeka Curriculum emphasizes skill development such as creativity, collaboration, critical thinking, and communication (Puskur Dikbud Ristek, 2022). The Merdeka Curriculum refers to the nature of science as a process and product. Therefore, the biology subject includes two elements: biology understanding and science process skills (Puskur Dikbud Ristek, 2022). The learning outcomes of Phase F on growth and development material are 1) students can apply the concepts of growth and development in everyday life, 2) students can perform process skills independently to solve daily life problems, and 3) students can create ideas or products to overcome these problems in the form of projects.

Learning resources on plant material have yet to be developed much, especially on plant growth and development in the context of understanding biology material and practicing science process skills. Aprilanti et al. (2022) developed learning resources with plant material, but the topic was about the taxonomy of Pteridophytes. Sanchez et al. (2021) examined roadside trees' implications for environmental education. Pratiwi & Rachmadiarti (2021) developed learning resources on plant growth and development, but the learning sources were aimed to train science literacy skills. Febriarti & Rahayu (2022) also developed learning resources on plant growth and development. However, the learning resources were aimed to train critical thinking skills.

With this curriculum transition, it is necessary to upgrade learning resources to support the learning process according to the new curriculum. Learning resources are devices, materials, equipment, settings, and people that aim to facilitate student learning (Mulyono & Ampo, 2021). Based on the interview results with biology teachers at SMA Negeri 8 Semarang Indonesia in February 2023, learning resources in implementing the Merdeka Curriculum at school are still limited and inadequate. The learning resources rely on government textbooks, which are currently being revised. Due to these limitations, teachers also use learning resources from training activities or workshops of the Biology Teacher Community.

Practicum activities are one of the learning methods teachers use in plant growth and development material at SMA Negeri 8 Semarang. Practicum activities allow students to be more active, and many students get scores above minimum completion criteria (only 5% below minimum completion criteria) or have achieved classical completion. However, there are areas for improvement in the practicum activities, such as innovation. Students only use commercial chemical fertilizers and do not utilize waste in their surrounding environment. Therefore, there is a need for innovation to do a practicum that benefits for the environment, and it can be used as an idea for project to strengthen the Pancasila student profile activities on sustainable lifestyles. The theme of sustainable lifestyles is related to innovation to overcome environmental problems, so students are invited to make their own fertilizer from waste materials rather than use a ready-made fertilizer on the market.

Based on the results of questionnaire analyzing the needs of student learning resources at SMA Negeri 8 Semarang, 13.8% of 65 students felt that the learning resources used were less understandable. Students wanted learning resources that could facilitate various learning types with audio, visual, and audio-visual to help them understand the abstract concepts. These problems can be overcome by developing an e-booklet that contains brief material on the concept of plant growth and development (aims to deepen understanding of biology) and the implementation of the theory in an experiment (aims to train science process skills) with the innovation of making rice husks into biosilica fertilizer and its application to corn plants. The e-booklet is developed with a flipbook because it creates a more exciting learning atmosphere, giving the impression that the student opens a physical book, but it is in electronic media. A flipbook can combine animation, images, text, audio, and video. Therefore, a flipbook can facilitate all learning types and is more interactive (Amanullah, 2020).

RESEARCH METHODS

This research is a research and development (R&D) with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) approach (Branch, 2009). The analysis consists of two stages: 1) analysis of learning resource needs obtained from the interview results with biology teacher, student observation questionnaires, and based on learning outcomes, and 2) analysis of material needs carried out by doing an experiment of making biosilica fertilizer from rice husks and its application to corn plants. Making biosilica fertilizer using an extraction method was adapted from the research by Todkar et al. (2016). The fertilizer produced in the white powder form was then used as a treatment to observe the growth and development of corn plants with parameters of stem height, leaf length, leaf width, root length, and wet weight. The fertilizer used in this experiment was white powder biosilica fertilizer weighing 25 grams. Biosilica fertilizer was used as a treatment for corn plants with five concentration levels: P0 (control), P1 (2.5 g/L), P2 (5 g/L), P3 (7.5 g/L), and P4 (10 g/L). Observation data were analyzed using normality test, homogeneity test, oneway Anova test, and followed with LSD test. The research results on biosilica fertilizer production and application were used as material for compiling e-booklet.

The e-booklet was designed on Canva application and the flipbook display was made with the help of Heyzine Flipbook software. The development stage was carried out with validity, practicality, and e-booklet readability tests. The e-booklet could not be implemented because Phase F of the Merdeka Curriculum for class XII had not been implemented in schools during this research period. The evaluation stage was carried out by interpreting the validity, practicality, and readability test results. The assessment results were used as a reference in improving the product. This research was conducted from February to December 2023 at the Biology Laboratory of Universitas Negeri Semarang and SMA Negeri 8 Semarang. More concise research flow can be seen in Figure 1.

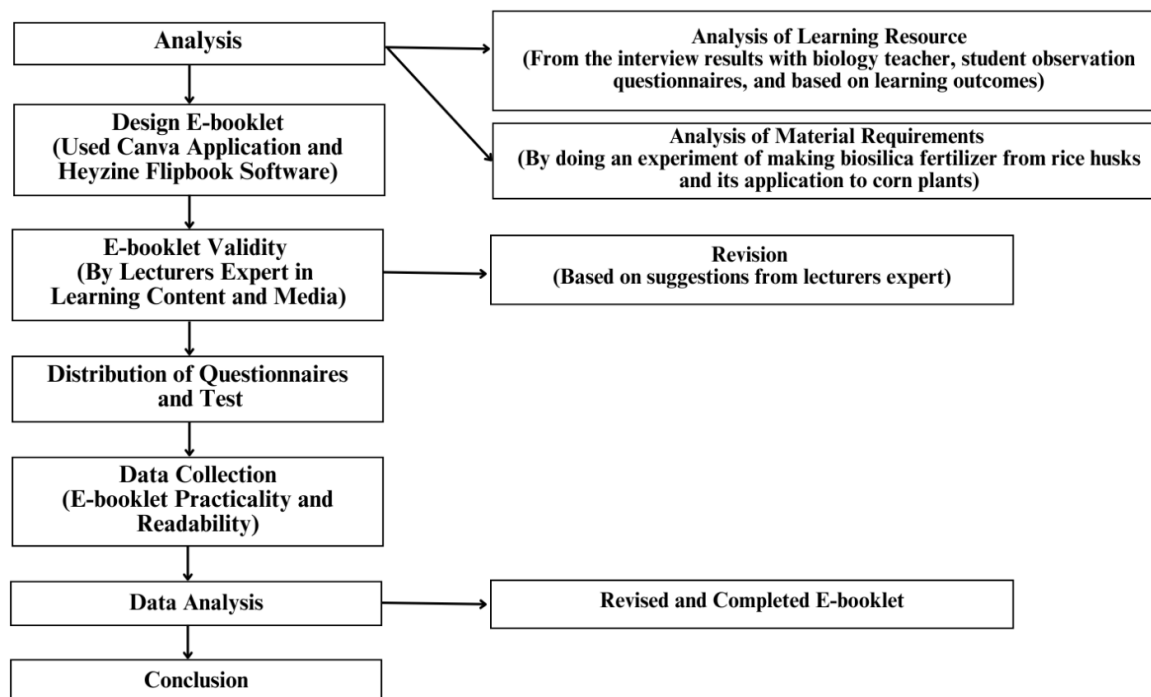


Figure 1 Research Flowchart

This research employed a purposive sampling technique. The samples used were students who had studied the material on plant growth and development. The subjects in this research were 106 students from XII MIPA 1, XII MIPA 2, and XII MIPA 3 classes in 2023/2024 academic year at SMA Negeri 8 Semarang. Data were collected using questionnaires and tests. The questionnaire method was used to determine the

validation and practicality responses to the use of e-booklet. The test method used to determine the readability of the e-booklet uses a blank test question sheet (cloze test). The validity results data and practicality results data were then analyzed and interpreted in Table 1. The readability results data by students were then analyzed and interpreted in Table 2.

Table 1 E-booklet Validity and Practicality Criteria (Arikunto, 2013)

Scoring Scale (%)	Validity Criteria	Practicality Criteria
$80 < V \leq 100$	Very valid	Very practical
$60 < V \leq 80$	Valid	Practical
$40 < V \leq 60$	Quite valid	Quite practical
$20 < V \leq 40$	Less valid	Less practical
$0 < V \leq 20$	Not valid	Very Impractical

Table 2 E-booklet Readability Criteria (Fadillah, 2018)

Scoring Scale (%)	Criteria
$R > 70$	High
$30 \leq R \leq 70$	Medium
$R < 30$	Low

RESULT AND DISCUSSION

The results of this research include 1) e-booklet validity obtained from the assessment of content expert and learning media expert, 2) e-booklet practicality obtained from the biology teacher's responses and student responses, 3) e-booklet readability obtained from the cloze procedure test done by students, and 4) e-booklet characteristics described based on the characteristics of the e-booklet, namely the innovation of making and applying biosilica fertilizer.

E-booklet Validity

The total validation score from the content expert was 77 out of 80, with an average of 96.25% (Table 3).

Table 3 Recapitulation of Content Expert Validation of E-booklet Content

Eligibility Components	Score from Validator	Percentage
Content eligibility aspect	31/32	96.88%
Presentation feasibility aspect	16/16	100.00%
Linguistic appropriateness aspect	23/24	96.88%
Contextualized assessment	7/8	87.50%
Total score	77/80	
Average		96.25%
Category		Very valid

Note. There are 20 question items and the maximum score of each item is 4. Therefore, the total maximum score is 80.

Validation of the e-booklet was carried out by validators of content expert and learning media expert from Biology Education study program, FMIPA, Universitas Negeri Semarang. The results of the content expert validation consist of four eligibility components, namely content eligibility aspect, presentation feasibility aspect, linguistic appropriateness aspect, and contextualized assessment. The presentation aspect had the highest percentage, which was 100.00%. This means that the e-booklet has a consistent presentation system, conceptual sequence, supports complete presentation, and has coherence and a coherent flow of thought. Content eligibility aspect has a percentage of 96.88%, this means that the e-booklet already has complete, deep, accurate, and up-to-date material. The material can also stimulate students' curiosity and

interest very well. The e-booklet can train science process skills to get good.

Linguistic appropriateness has a percentage of 96.88%, this means that the e-booklet already uses communicative, dialogic, and interactive language. This is appropriate in accordance with student development and in accordance with language rules. The e-booklet has consistency in using terms, symbols/emblems, and scientific names. The e-booklet also has straightforward language. The contextual assessment had the lowest percentage, which was 87.50%. The material presented is up-to-date in accordance with scientific developments, the examples presented come from the students' immediate environment, and can broaden students' horizons to better understand plant growth and development. The material in the e-booklet has met the criteria of constructivism, inquiry, questioning, learning community, reflection, and authentic assessment. The average percentage was 96.25% with a very valid category (Table 3).

There are several previous researches that have developed e-booklets for biology materials and have been tested for validity by content experts. On mushroom material by Damayanti et al. (2022) obtained a score of 88.09%; on biotechnology material by Azizah & Iswari (2021) obtained a score of 92.77%; on biodiversity material by Pujiasih et al. (2021) obtained a score of 92.14%, by Sarip et al. (2022) 85.34%, by Sinaga et al. (2023) 95.53%, by Fa'izah et al. (2023) 95.00%, on reproductive system material by Eliana et al. (2022) obtained a score of 91.00%; on immune system material by Gultom et al. (2022) obtained a score of 83.20%; on environmental pollution materials by Erawati & Susanti (2022) obtained a score of 80.66%; on plant material by Hanifah et al. (2020) 93.00% and by Zulfaningrum & Eko (2023) 78.11%; and on animalia material by Winda et al. (2022) obtained a score of 91.48% and by Alfarid (2023) 95.80%.

The previous researches received several suggestions for improvement, including the need to improve the language used in the e-booklet because there were still some inconsistencies in the language displayed. There were typos, scientific names had not been italicized, and some explanations had not been displayed clearly (Azizah & Iswari, 2021; Alfarid, 2023). The previous researches also necessary to improve the structure of sentence presentation, adjust word choice, improve definitions in the material, and add some content to deepen the material (Pujiasih et al., 2021; Erawati & Susanti 2022). Another suggestion for previous researches is the need for improvements in presenting descriptions based literature studies to strengthen the truth of the material (Damayanti et al., 2022; Sarip et al., 2022; Zulfaningrum & Eko, 2023).

To avoid similar mistakes from previous researches, this research developed an e-booklet for plant growth and development material pays close attention to the appropriateness of the content of the material, presentation of the material, choice of language, and contextual material. Therefore, the score obtained from the validation of content expert in this research was 96.25%, which is higher than previous researches.

The total validation score from the media expert was 83 out of 84, with an average of 98.81% (Table 4).

Table 4 Recapitulation of Media Expert Validation of E-booklet Media

Eligibility Components	Score from Validator	Percentage
Graphical feasibility aspect	59/60	98.33%
Linguistic appropriateness aspect	24/24	100.00%
Total score	83/84	
Average		98.81% (Very valid)

Note. There are 21 question items, and the maximum score of each item is 4. Therefore, the total maximum score is 84.

The validation results from the learning media expert on the e-booklet media consist of two feasibility components, namely graphical feasibility aspect and linguistic appropriateness aspect. The highest percentage was 100.00% on the linguistic aspect, and the lowest percentage was 98.33% on the graphics feasibility aspect. The e-booklet already uses communicative, dialogic, and interactive language. This is appropriate in accordance with student development and in accordance with language rules. The e-booklet has consistency in using terms, symbols/emblems, and scientific names. The size of the e-booklet is in accordance with the content of the material, the arrangement of the layout elements on the front and back covers has unity, already displays a good and clear center point on the cover. The composition of the layout of the title, author, logo, is balanced and in tune with the layout of the contents.

The letters used on the cover are attractive and easy to read and the letters used on the cover are simple

(communicative). The colors used are harmonious and clarify the material or contents of the e-booklet. The illustration of the e-booklet cover is appropriate and the layout of the cover design is consistent, harmonious, complete, and accelerates understanding. The placement of the layout of the contents is appropriate and the layout design of the contents can accelerate understanding. The typography of the contents is simple, the typography of the contents is easy to read and facilitates understanding, and the images presented are clear. Overall, the validation results obtained an average of 98.81% with a very valid category (Table 4).

There are several previous reasearches that have developed e-booklets for biology materials and have been tested for validity by learning media expert. In biotechnology material by Azizah & Iswari (2021) obtained a score of 93.40%; in environmental pollution material by Erawati & Susanti (2022) obtained a score of 94.28%; in biodiversity material by Pujiasih et al. (2021) obtained a score of 86.29%; in plantae material by Zulfaningrum & Eko (2023) obtained a score of 85.41%; in animalia material by Alfarid (2023) obtained a score of 93.30%.

These previous reaseraches received several suggestions for improvement, including the need to improve the appearance of the proportions and composition of the colors used. Avoid using bright colors on the background of the title containing the product image so that the focus of the product image is disturbed (Azizah & Iswari, 2021). The cover creation is also expected to add illustrations that match the content, the selection of font types and sizes is also adjusted so that it can be easily read properly, and reduce too much writing (Alfarid, 2023; Zulfaningrum & Eko, 2023).

This e-booklet developed for plant growth and development material pays close attention to aspects of graphic and linguistic feasibility to avoid similar mistakes in previous researches. The development of this e-booklet really paid attention to the combination of colors and layout in the cover design and content design. The use of language is also in accordance with the rules and makes it easier for readers to understand. Therefore, the score obtained from the validation of learning media expert in this research was 98.81%, which is higher than previous researches.

E-booklet Practicality

The practicality test involved responses from a biology teacher and students.

Table 5 Recapitulation of Biology Teacher's Response to E-booklet

Indicator	Total Score	Percentage
Interest	19/20	95.00%
Content	39/40	97.50%
Language	16/16	100.00%
Helpfulness	24/24	100.00%
Total score	98/100	
Average		98.00% (Very practical)

Note. There are 25 question items, and the maximum score of each item is 4. Therefore, the total maximum score is 100.

Based on the biology teacher's response, the language and helpfulness indicators received the highest percentage of 100.00%. The results of the biology teacher assessment show that the language used in the e-booklet is simple and easy to understand, the letters used are simple and easy to read, the sentences and paragraphs used are easy to understand, and in accordance with Indonesian language rules. This e-booklet is practical, easy to use, easy to carry, and does not require expensive costs. E-booklets also help teachers in providing learning resources for students, can represent learning objectives in the Merdeka Curriculum, help in understanding biology and training students' science process skills, help students understand growth and development materials, help in conducting experiments, and can guide students in applying concepts to an experiment.

The content indicator obtained 97.50%, shows that the material presented is complete. The theories, examples, and images presented are appropriate and accurate. The contents of the e-booklet invite students to think in finding solutions to environmental problems. The material is presented in a coherent, systematic and consistent manner. The material presented in the form of text, images or illustrations, and videos is easy to understand. The material is equipped with an introduction, instructions for use, material diagrams, summaries, glossaries, evaluations, and evaluation discussions that further enhance students' understanding.

The existence of experiments can realize the concept of nutrition in plant growth and development so that it can present meaningful learning.

The lowest indicator was on the attractiveness of 95.00%. The score was not optimal because there were no motivational sentences, so the biology teacher suggested adding motivational sentences to raise students' enthusiasm for learning. The overall appearance of this e-booklet is attractive, the design of the e-booklet is presented with a combination of letters, colors, writing, and interesting images or illustrations. This e-booklet makes learning biology, especially the material on plant growth and development, not boring. The presentation of the e-booklet in the form of a flipbook further increases motivation to learn biology. Overall, the average percentage was 98.00% with a very practical category (Table 5).

E-booklets that have been developed in previous researches also received response scores from teachers. Research by Azizah & Iswari (2021) obtained a score of 97.22% with suggestions for improvement in scientific writing. Research by Erawati & Susanti (2022) obtained a score from teachers of 95.29% and by Karmellia & Lufri (2023) of 94.62% with suggestions to pay more attention to language selection and pay attention to the efficiency of learning time.

This e-booklet developed for plant growth and development material pays close attention to aspects of interest, material, language, and helpfulness to avoid similar mistakes in previous researches. Therefore, the score obtained from teacher response was 98.00%, which is higher than previous researches.

The average response from 106 students was 91.11%, which indicates a very practical category (Table 6). Some students also gave suggestions according to the obstacles they experienced and their hopes for future learning.

Table 6 Recapitulation of Student Responses to E-booklet

Indicator	Percentage
Interest	91.27%
Content	90.38%
Language	90.96%
Helpfulness	92.69%
Average	91.11%
Category	Very Practical

Note. There are 15 question items, and the maximum score for each item is 4. Therefore, the total maximum score for each student is 60.

From student responses, the largest percentage was on the helpfulness indicator of 92.69%. Then, it was followed by the interest indicator of 91.27% and the language indicator of 90.96%. The content indicator received the lowest percentage response of 90.38%. Overall, the student responses received an average of 91.11% with a very practical category (Table 6). According to students, The overall appearance of the e-booklet is attractive. The design of the e-booklet is presented with an attractive combination of letters, colors, writing, and images/illustrations. The presentation of the e-booklet in the form of a flipbook further increases motivation to learn biology. E-booklets make learning biology, especially the material on plant growth and development, not boring. E-booklets make students more enthusiastic about learning biology.

The material is presented in a coherent, systematic, and consistent manner. The contents of the e-booklet are related to life (contextual). The material presented in the form of text, images, and videos is easy to understand. The existence of experiments can realize the concept of nutrition in plant growth and development so that it can present meaningful learning. The material is equipped with an introduction, instructions for use, material diagrams, summaries, glossaries, evaluations, and evaluation discussions that further enhance students' understanding. The language used is simple and easy to understand. The letters used are simple and easy to read. The sentences and paragraphs presented are easy to understand. This e-booklet is practical, easy to use, easy to carry, and does not require expensive costs. E-booklets help students understand the material on growth and development and help in conducting experiments.

E-booklets that have been developed in previous researches also received response scores from students. Research by Azizah & Iswari (2021) obtained a student response score of 91.25% with the lowest percentage of responses in the aspect of being helped to understand the material without teacher assistance and interest in using the e-booklet. Research by Sinaga et al. (2023) was 82.9% with the lowest percentage of responses in the material aspect. Research by Erawati & Susanti (2022) obtained a student response score of

86.56%. Research by Karmellia & Lufri (2023) was 95.36% with the lowest percentage of responses in the usefulness aspect. This e-booklet, which was developed for plant growth and development material, pays close attention to the aspects of interest, material, language, and helpfulness to avoid similar mistakes in previous researches.

E-booklet Readability

The results of the cloze test from 106 students showed an average percentage of 94.67%, so that the readability of the e-booklet is in the high category (Table 7).

Table 7 Average Results of Students' Cloze Procedure Test

Class	Percentage	Category
XII MIPA 1	96.32%	High
XII MIPA 2	97.08%	High
XII MIPA 3	90.69%	High
Average	94.67%	High

Note. There are 20 question items, and the maximum score is 100.

A high level of readability indicates that the text is easy to read and understand by the reader. This means the use of simple words, short and clear sentences, and an orderly paragraph structure. Validity testing ensures that the content and format of the e-booklet are of high quality and relevant, practicality testing ensures that the product is easy to use, and readability testing ensures that the information can be understood well. All three support each other to create an e-booklet that is effective and efficient in its use. If the e-booklet is valid in terms of content, but difficult to practice or difficult to read, its effectiveness will decrease. Therefore, good validity must be balanced with practicality and readability so that users get maximum benefits. Readability and practicality testing are also closely related to validity. Valid e-booklets need to be tested for readability and practicality to suit the characteristics and needs of users.

E-booklet Characteristics

The e-booklet was designed using the Canva application and published using Heyzine Flipbook software. Many previous researches have developed e-booklets using Canva (Damayanti et al., 2022; Pratiwi et al., 2022; Alfariid, 2023; Fa'izah et al., 2023; Marcellina et al., 2023; Zulfaningrum & Eko, 2023), but only a few researches publish it with Heyzine Flipbook software. In the e-booklet publication, previous researchers used FlipHTML5, Flip PDF, Flip PDF Professional, Flip PDF Corporate, and Website 2 APK Builder Pro (Hoiroh & Isnawato, 2020; Eliana et al., 2022; Erawati & Susanti, 2022; Gultom et al., 2022; Nursafitri et al., 2022; Pratiwi et al., 2022; Fa'izah et al., 2023; Marcellina et al., 2023). This software is considered less interactive because not all software can integrate YouTube videos and evaluation activities. Another obstacle is that some software requires a premium user account. The software cannot include other multimedia if it is not a premium account. Therefore, the e-booklet in this research uses Heyzine Flipbook because the software can integrate multimedia without having a premium account. As a result, the e-booklet can present a more interactive learning resource.

The components of e-booklets developed by previous researches still need to be improved. In the research by Fitriani et al. (2023) and Yusuf et al. (2023), the e-booklets only come with an introduction, glossary, and bibliography. The e-booklet developed by Pratiwi et al. (2022) has almost complete components: introduction, content, and closing. However, there are no learning objectives and evaluations. These shortcomings became a reference in the development of e-booklets in this study.

This e-booklet has three components: introduction, content, and closing. The introduction contains the front cover, preface, instructions for using the e-booklet, table of contents, learning objectives, and material diagram. The image presented in the middle of the cover has presented the contents of the e-booklet. There is a picture of a corn plant from a seedling aged 3 DST (Days After Planting) to an adult corn plant that is approximately 80 DST old. The image symbolizes that the material discussed in the e-booklet is the material on plant growth and development. Beside the image, there is a photo of biosilica fertilizer that has been made during the experiment. This photo symbolizes that in the e-booklet there is an experiment on making biosilica fertilizer and its application to corn plants.

The preface contains an expression of the author's gratitude for the completion of the e-booklet, a brief information about the contents of the e-booklet, the goals and hopes for making the e-booklet, thanks to all parties who have helped, and an expression of acceptance of criticism and suggestions. The instructions for using the e-booklet contain the targets who can use the e-booklet, an explanation of the component parts of the e-booklet, and how to operate the e-booklet. The table of contents explains the location of sub-material pages, making it easier for readers to find the pages they want to read. The learning objectives explain the objectives of biology learning, namely understanding biology and process skills. The material diagram contains concepts and materials that are arranged and linked systematically. This aims to facilitate students' understanding in assembling the relationship between the concepts and materials.

The content section consists of the concepts of plant growth and development material, which is complemented by the practicum of making biosilica fertilizer from rice husk waste and analyzing the effect of biosilica fertilizer on the growth and development of corn plants. The material describes the understanding of plant growth and development, the process of plant growth and development, and the factors that affect plant growth and development. It is equipped with material in various forms such as text, images, audio, learning videos.

The e-booklet that has been developed is different from other e-booklets because it contains innovations to make and apply biosilica fertilizer. The data obtained from the experiment of making and applying biosilica fertilizer from rice husk waste is used as material in the e-booklet. Making fertilizer from rice husk waste can also contribute ideas for conducting P5 activities (project to strengthen Pancasila student profile) on sustainable lifestyles related to waste processing innovations into valuable products. The biosilica fertilizer produced from this experiment can be used for learning activities on plant growth and development material as an external factor that affects plant growth and development. Students can directly learn and prove the concepts for more contextual and meaningful learning.

This e-booklet explains in detail the tools, materials, and experimental procedures to avoid errors during the practicum. There is a video of a series of practicums from start to finish so that students get guidance that makes it easier to understand the steps. The results and discussions are presented on the next page as an effort to provide students with an overview of the practicum data and its analysis. The effects of silica use on the growth and development of corn plants are explained based on journal articles so that students get reliable information.

Then there is a summary, evaluation, and discussion of the evaluation. The summary contains a summary of the material from beginning to end, presenting important points to make it easier for readers to understand the contents of the e-booklet. Integrated evaluation on google form in e-booklet so that students do not need to go back and forth to change links to access it. When students finish all the questions, their scores appear after clicking the submit button. Students can also see the accumulation of their answers and see which parts are right and wrong. E-booklet integrated with evaluation link is different from other e-booklet. Discussion of evaluation is also provided in this e-booklet so that it can enrich students' understanding.

The closing section contains a glossary, bibliography, author's bio, and back cover. The glossary contains definitions of the terms used in the e-booklet, which serves to help students when they have difficulty understanding the meaning of the terms in the e-booklet or when students feel unfamiliar with the terms. The bibliography contains several sources or references used in creating the e-booklet. The author's biodata contains the author's identity and experiences. The back cover of the e-booklet contains a closing sentence in the form of the author's hopes for readers after reading the contents of the e-booklet.

Students can access the e-booklet on smartphones, tablets, computers, and laptops. The e-booklet file can be easily disseminated by sharing the e-booklet link and QR code. However, students need internet access to open the e-booklet because its features are integrated with YouTube videos and questions for evaluation activities. Students can slide to the right or left to use the e-booklet. The e-booklet display can switch pages just like opening a book. Students can click the play button to play audio or video, and then the display will play automatically. Interactive videos can impact cognitive achievement in students directly (Afify, 2020). Students can also access the evaluation section by filling in the answers to each question. Grades and answer keys will automatically appear after the answers are sent. The e-booklet developed in

this study successfully provides learning resources that 1) can facilitate understanding of biology and develop students' science process skills, 2) can present learning that is more meaningful, more contextual, and not boring for students, and 3) are attractively packaged.

CONCLUSION

The results of the e-booklet development obtained a very valid category for some aspects: content feasibility, presentation feasibility, linguistic feasibility, graphical feasibility, and contextual assessment based on the assessment results from validators on the content expert and learning media expert. The e-booklet obtained a very practical category based on the results of teacher and student responses. The readability level of the e-booklet is high based on the results of the cloze procedure test. In addition to the innovation of making and applying biosilica fertilizer, this learning resource invites students to think creatively to find solutions to environmental problems around them. There are some innovations in this e-booklet: it is interactive; it is equipped with materials in various forms (text, image, audio, practicum video); and it is integrated with evaluation activities. The e-booklet developed in this study successfully provides learning resources that can facilitate understanding of biology and develop students' science process skills; can present learning that is more meaningful, more contextual, and not boring for students; and are attractively packaged.

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