Journal of Biological Science and Education
~JBSE~
Website: http://usnsj.com/index.php/biology
Email: biologi_jbse@usn.ac.id

Development of Popular Scientific Book on ZPT of Shallot Skin Extract on Green Mustard Growth

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ARTICLE INFO

E-ISSN: 2721-0804
P-ISSN: 2723-6838
Vol. , 6 No. 2, December 2024
URL: http://usnsj.com/index.php/biology

Suggestion for the Citation and Bibliography
Citation in Text:
Istiqamah & Shalehah (2024)
Bibliography:
Istiqamah & Shalehah, A. (2024). Development of Popular Scientific Book on ZPT of Shallot Skin Extract on Green Mustard Growth. *Journal of Biological Science and Education, 6*(2), 47-55

Abstract

As much as 60% of waste in Indonesia is organic waste, one of which is onion skin waste. Onion skin is often thrown away and not reused. Based on references, shallot skin contains the hormones auxin and gibberellin, which are growth hormones that can be utilised as growth regulators. Popular scientific books on growth regulators from shallot skin extract are still minimal so it is necessary to develop this book. The purpose of this study was to describe the validity and readability of the Popular Science Book digital ZPT of shallot skin extract on the growth of green mustard. The type of research used is Educational Design Research (EDR) development research which includes preliminary research, product prototype design phase (prototyping phase), and product assessment phase by experts (assessment phase) but in this study only up to the product prototype design phase (prototyping phase). This research uses Tessmer's formative evaluation which includes self-evaluation, expert review and one to one evaluation. Validity data was taken from expert validation data as many as three experts using questionnaire instruments. one to one evaluation data to obtain book readability data was obtained from 6 people including 3 students and 3 people from the community. Data on the validity and readability of the book were analysed using Akbar's category. The results showed that the results of the validity test of popular scientific books were 79.85% with a fairly valid category and the readability test data was obtained at 88.88%, showing very good quality.

Keywords: Educational Design Research, Popular Scientific Books, Validity, Shallot Skin Extract, Green Mustard Growth ,

A. Introduction

With the increase in population in Indonesia, the amount of waste generated also increases, including domestic waste, factory waste, industrial waste and others (Yikwa & Banu, 2020). In Indonesia, according to data collected from the Ministry of Environment, the largest composition of waste is household waste and the largest composition of household waste is

organic waste or waste (60%) (DITJEN PSLB3, 2020). This waste if not reused becomes a new problem for the environment. the impact caused such as the cause of environmental pollution that has the potential to harm humans and the environment (Zulkifli, 2017). One of the wastes that is often ignored is domestic waste and market waste. Every day markets and homes produce waste, such as plastic waste, food, vegetable scraps, fruit peels, and others, one of which is shallot skin. Onion is one of the main ingredients of food in the world, especially Indonesia.

Generally, shallot bulbs are used as kitchen spices, but the skin is often ignored and discarded (Hanum et al, 2020). Even though shallot skin has great potential when used as a Growth Regulator (ZPT) because shallot skin naturally contains growth hormones such as auxin and giberalin (Banu, 2020). ZPT is an organic material that does not include nutrients that have an important function in regulating growth because they contain natural hormones. Shallot skin also contains other important compounds such as steroids, alkaloids, flavanoids, monoterpenoids, and others, besides that shallot skin also contains other nutritional elements such as protein, carbohydrates, sulfur and other minerals that are useful for growth and soil fertility (Hanum et al., 2020).

Green mustard is an agricultural commodity that is widely grown in Indonesia, especially South Kalimantan. In addition, green mustard also has fast growth with relatively cheap maintenance. Green mustard is also a vegetable ingredient that is often found in Indonesian dishes, such as fried rice and chicken noodles. This is the attraction of mustard greens into agricultural commodities. By this research, utilization of shallot skin waste into ZPT is expected to increase the growth of mustard greens not only as waste utilization but also reduce pollution and can increase mustard greens agricultural commodities.

Popular scientific books are one of the books that are often in demand by the public, because it is practical, informative, and interesting (Shalehah, 2024). Books as a form of documentation and source of information are not only for education but can also be read by the public. The making of this popular scientific book is expected to be a source of teaching material both for the department concerned, but also a source of information that is utilized by the general public. Based on the results of literature observation, popular scientific books on the effect of shallot skin extract on green mustard growth are very limited. this is what underlies the desire of researchers to develop popular scientific books.

The novelty technology of this popular scientific book is that the book produced will then be formed in digital form so that it is easy to carry and access wherever it is. this digital book also makes it easier for all groups not only students to read.

B. Literature Review

1. *Garing, M. F.D, dkk (2021) Effect of Concentration and soaking time of shallot skin solution on kulo chrysanthemum plant cuttings (Chryshanthemum* sp.*) in Tomohon City*

In the research of Garing, et al, it was found that the best was at 75% and 100% concentration of shallot skin solution. What is different is that this research has not been made in the form of a book and only a shallot skin bath. In this study, researchers used shallot extract on green mustard growth and the final product was the Popular Scientific Book developed.

2. *Sari, N, dkk (2022) Utilization of Onion Skin Waste and Chicken Eggshells to Increase Mustard Production.*

The difference in Sari et al's research is using shallot skin extract and chicken eggshell extract, and there is no book produced from this research. While in this study researchers used shallot skin extract alone without other additions, the experimental results were then developed resulting in the final product in the form of a popular scientific book.

3. *Ndruru, dkk (2022 Effect of Shallot Skin Waste on the Growth of String Beans (Vigna sinensis* L*)*

The research of Ndruru, et al. resulted in shallot skin extract having an effect on stem height, stem diameter and number of leaves of long bean plants. The difference in this study is in the plants tested, in this study researchers used green mustard as a test plant. In addition, the research of Ndruru, et al has not produced a product in the form of popular scientific book.

Based on the results of a review of several previous studies, there are several studies that are almost similar to this study, but the results of the effect of shallot skin extract on plants have not been made into Popular Scientific Books. Therefore, researchers are interested in popular scientific book about the effect of shallot skin extract on the growth of mustard greens.

C. Methodology

1. Research Design

This research includes development research using Educational Design Research (EDR) design. In EDR there are three stages, namely Preliminary research, Prototyping stage, and assessment phase. This research only reached the prototyping stage. According to Zaini (2018), the research development stage must focus on the preliminary stage and the formative evaluation stage, especially in book development. The evaluation stage used Tessmer's evaluation stages including self-evaluation and expert review. Self-evaluation is carried out by the research team (include two members research team) itself in compiling popular scientific books including evaluation in the preparation of the cover and preparation of the contents of the book until the initial prototype book or prototype book 1 is produced. Meanwhile, the expert test was carried out after the prototype 1 book was completed. At the expert test stage, the research team will ask 3 expert experts in media, material, and language to validate the book. This validation stage can be done repeatedly until the final prototype book is formed. One to one evaluation data test was obtained to test the readability of popular scientific books. this data was obtained from interview data of 6 participants, including 3 students who had taken the plant physiology course and 3 people from the community.

2. Instruments

The expert validation instrument uses an expert validation questionnaire instrument adapted from Latifah, et al (2020) which has 9 assessment components and uses a questionnaire that adopts a Likert scale with answer options 1-4 in the form of a checklist. The one to one evaluation data test uses a questionnaire instrument developed by the researcher with a Likert scale and various assessment indicators relevant to this research.

3. Technique of Data Analysis

The data in this study were obtained from the results of the Expert Validation Test using validation by three expert validators from the Biology Tadris Study Programme of UIN Antasari Banjarmasin. The validation questionnaire covers the scope of material, language and media validation such as three aspects such as readability, vocabulary, format, and writing style of digital scientific books. After converting the scores of three expert validators, it can be seen the level of validity and feasibility of the digital popular science book product 'Growth Regulators of Red Onion Peel Extract on Green Mustard Growth' which will be categorised using Akbar's categories (2022). Validation and readability analysis using Akbar's (2022) at formula 1 calculation.

$$\text{Validation (V)} = \frac{\text{Total Skor Validation}}{\text{Total Skor}} \text{ X } 100\% \quad \text{.....Formula 1}$$

The validity data was then analysed using the grand categories in table 1.

Table 1. Popular Science Book Validation Criteria based on percentage

Percentage	Validity Category
85.01% - 100.00%	Very valid, can be used without revision
70.01% - 85.00%	Moderately Valid, can be used but needs minor revisions
50.01% - 70.00%	Less valid, recommended not to be used, need major revision
01.00% - 50.00%	Invalid, should not be used

(Source: Adapted from Akbar, 2022)

One to one evaluation data to test readability was analysed using the grand categories in table 2.

Table 2. Popular Science Book Readability Criteria based on percentage

Percentage	Readability Category
81.00% - 100.00%	Very Good
61.00% - 80.00%	Good
41.00% - 60.00%	Good enough
21.00% - 40.00%	Less good
00.00% - 20.00%	Not good

(Source: Akbar, 2022)

D. Findings and Discussion

1. Findings

a. Preliminary research

At this stage the researcher analyzes the needs, reviews the literature, develops a concept and research framework. At this stage it was found that:

1) Based on the results of observations, Indonesian people, especially the people of Banjarmasin city, only use shallot bulbs as a seasoning for cooking. While the shallot skin is thrown away. So that a lot of shallot skin waste is not reused.
2) based on the results of the literature study There is no research that tests shallot skin extract on green mustard growth.
3) based on the results of observations, there is no popular scientific book on the benefits and effects of shallot skin extract on the growth of green mustard. literature regarding this popular scientific book is still minimal and limited so the development of this popular scientific book is very necessary.
4) At this stage, the process of preparing for experimental data collection begins.
5) Experimental data collection on the effect of shallot skin extract on the growth of mustard greens with various concentrations and its effect on height, number of leaves and fresh weight of mustard greens for 2 months.

b. Prototyping Stage

At this stage, the popular science book began to be compiled based on the results of the previous experimental data. The preparation stage includes the preparation of covers, contents, content, materials, and others that always pay attention to the criteria of popular scientific books. This preparation stage goes through the Tessmer formative evaluation test which includes self-evaluation by all team research to get an initial prototype popular science book. Then the initial prototype popular scientific book was tested through expert review of 3 (three) media, language and material experts.

The following table 3 of popular science book validity results.

Table 3. Expert Review or validity Results

No	Component	Assessment Validation Results	Category*
1	Coherence Aspect	81,25%	Valid enough
2	Readability	75%	Valid enough
3	Vocabulary: expressions, verbs, choices, exaggerations	75%	Valid enough
4	Active and passive sentences	83,33%	Valid enough
5	Format	91,66%	Highly valid
6	Writing Metode	75%	Valid enough
7	Applications and Implications	83,33%	Valid enough
8	Definition and Explanation	75%	Valid enough
9	Other style devices: narrative, humor, and analogy	79,16%	Valid enough
Average		**79,85%**	**Valid enough**

*source: data

The one to one evaluation test was carried out to obtain data on the readability of popular scientific books. this data was obtained from 6 participants. the data on the results of this readability can be seen in table 4.

Table 4. One To One Evaluation Review or Readability Results

No	**Komponen Penilaian**	**(%)**	**Kategori**
1	Every part learnt is easy to understand	91,66%	Very good
2	The overall content of the popular science book is complete	91,66%	Very good
3	The words used are easy to understand	87,5%	Very good
4	Good image quality and understandable meaning	87,5%	Very good
5	No typographical or grammatical errors found	91,66%	Very good
6	The photo on the cover is clear and understandable	83.33%	Very good
Average		**88.88%**	**Very good**

*source: data

After the popular scientific book was validated by expert review and one to one evaluation review, it was revised again through self-evaluation, then the final prototype popular scientific book was obtained. The cover of the final prototype of the popular science book that has been made can be seen in Figure 1.

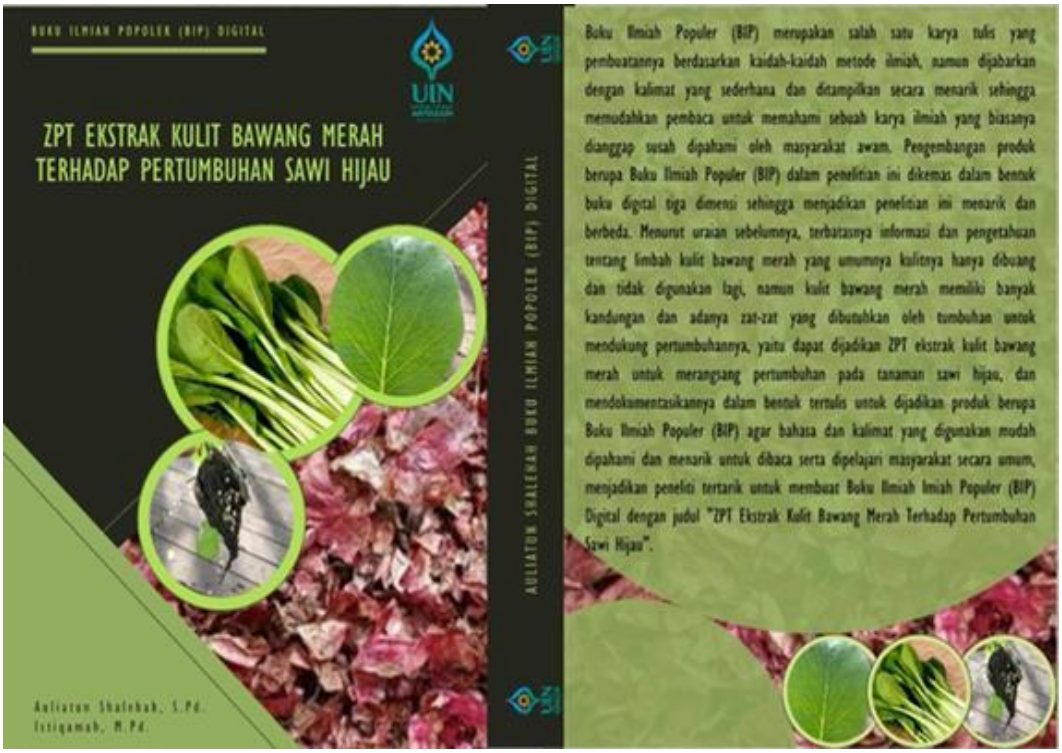

Figure 1. Final Design of Popular Scientific Book

For popular science books in digital form, the barcode in Figure 2 can be accessed.

Figure 2. Barcode Popular Science Books In Digital Form

Based on the results of the data listed in the table, the results of the validity test by 3 experts on 9 assessment components show an average percentage of 79.85% with this percentage, popular scientific books can be categorized as quite valid, can be used but need minor improvements.

2. Discussion

Based on the results of the recapitulation of the validity test from the expert, the popular scientific book developed obtained a final score of 79.85%, with a category that is quite valid. In accordance with Akbar's view (2022), the percentage is included in the range of 70.01% - 85.00% which shows the validity of popular scientific books, but still requires some improvement. Researchers then made revisions based on the suggestions and input provided previously by the validators. The validity test by this expert involved 9 aspects of product assessment, including coherence, readability, vocabulary, sentence structure, format, writing method, application and implication, definition and explanation, and other language styles.

The results of the recapitulation of the coherence aspect test in popular scientific books obtained a percentage of 81.25%, which is included in the moderately valid category. It can be

concluded that each paragraph in a popular scientific book has one clear main idea, is arranged with the right conjunctions, organizes ideas sequentially, and conveys the contents of the book in a way that is easily understood by readers. This is also in accordance with Suwarni's (2015) view on the use of simple language and in accordance with the rules of correct Indonesian spelling in book texts. Nonetheless, minor revisions are still needed to improve the coherence aspect in popular scientific books.

The recapitulation of the validity test of the readability aspect in popular scientific books obtained a percentage of 75%, which is included in the moderately valid category. It can be concluded that the text content of popular scientific books is in accordance with the age level and education level addressed, and the sentences and words used can measure the level of readability for readers. This is able to motivate readers to learn the material presented, in accordance with Mulyadi's (2015) view of the importance of the suitability of books to their readers in influencing readers' interest and motivation to read and understand the contents of the book. Nevertheless, minor revisions are still needed to improve the readability aspect of popular scientific books.

The recapitulation of the validity test results of the vocabulary aspect in popular scientific books obtained a percentage of 75%, which is included in the moderately valid category. From this explanation, it can be concluded that the use of vocabulary in popular scientific books is limited, and the words used do not use a lot of vocabulary. This is in accordance with the view of Khairoh et al. (2014) that a book is considered appropriate if the vocabulary used is simple, light, and brief so that the content of the material or story is more easily understood by the reader. However, minor revisions are still needed to improve the vocabulary aspect in popular science books.

The results of the recapitulation of the validity test of the vocabulary aspect in the Learning Information Material (popular scientific books), the percentage of validity reached 75%, which is in the moderately valid category. It can be seen that the use of vocabulary in popular scientific books is limited, and the words used tend to be simple and concise, in accordance with the opinion of Khairoh et al. (2014) that a book is considered good if the vocabulary used is simple, light, and brief so that the content of the material or story is more easily understood by the reader. Even so, minor revisions are still needed to improve the vocabulary aspect in popular scientific books.

The results of the recapitulation of the format aspect validity test in popular science books received a score of 91.66% or in the very valid category. This shows that the popular science book has met the standard format of scientific writing which is expressed in a systematic and consistent manner without experiencing significant changes in the storyline presented. The results of the calculation of the recapitulation of the validity test of the writing method aspect in popular scientific books received a score of 75%, and was categorized as quite valid. The writing in popular scientific books has followed the principle of simplicity and has an appeal that is in accordance with applicable standards, so that the content of the material presented is able to motivate readers and has practical value. However, minor revisions are still needed to improve the writing method aspect of the popular science book.

The results of the calculation of the recapitulation of the validity test of the application and implication aspects in popular scientific books received a value of 83.33%, which is included in the moderately valid category. popular scientific books have linked the material with real-world problems to attract readers' interest. This is in accordance with Suparman's research (2012) which emphasizes the importance of the relevance of the content of learning books with implications in everyday life. However, minor revisions are still needed to improve aspects of the application as well as the implications of the popular science book.

The results of the calculation of the validity test recapitulation show that the definition and explanation aspects in the Learning Information Material (popular scientific books) obtained a percentage of 75%, which falls into the moderately valid category. popular scientific books have successfully applied various techniques, such as descriptions, examples, analogies, or metaphors, to facilitate reader understanding. This is in line with the opinion in another study (Wibowo, 2008) that emphasizes the importance of objectively composed descriptions to detail events or landscapes in learning books. This helps readers feel as if they have seen it firsthand through the reading presented in the book. Nonetheless, minor revisions still need to be made to improve the definition and explanation aspects in the popular science book.

The last aspect of assessment in popular science books includes styles that include narrative, humor, and analogy. The results of the calculation of the validity test recapitulation show that other aspects of the style obtained a percentage of 79.16%, which is included in the moderately

valid category. popular science books have used analogies to explain complex ideas in popular science books are appropriate. In addition, the use of narrative to present ideas in popular science books is also relevant. This is in line with the view presented in another study (Wibowo, 2008), which emphasizes the importance of objective or imaginative narratives to present events or occurrences in the hope that readers can understand and appreciate any material presented. However, minor revisions are still needed to improve other aspects of style in the popular science book. This agrees with Afrahmiryano & Ariani (2017) that every teaching material or learning product must go through a validation process by educational experts to ensure its validity. When learning products are only made by researchers or lecturers as a reference in the lecture process, it is rare for lecturers to validate the product before it is used by students. The purpose of this validation is to evaluate the content of the learning product material in accordance with the current needs of the world of education factually. Thus, we can assess the extent to which the teaching materials are appropriate and relevant in the educational process. Validation also helps in assessing the substance of the learning materials and the extent to which the content is in accordance with the expected learning objectives and outcomes.

After a readability test of the digital popular science book content from 6 people, including 3 students and 3 community members, a final percentage of 88.88% was found, indicating very good quality. Based on the evaluation of the previously described aspects, it can be concluded that the popular science book that has been prepared by the researcher contains relevant and adequate material. The validity of the popular science book developed has also been proven, although it requires minor revisions to improve its effectiveness in accordance with the input provided by the validator. This opinion is in line with the views of Haviz (2013) who states that learning products can be considered valid if they are based on adequate, relevant theories, and developed with a strong foundation.

After making improvements based on the inputs and suggestions provided by the validators in the expert assessment stage or validity test, the Learning Information Material (LIN) has entered the third evaluation stage, namely the content readability test. At this stage, respondents were asked to give their views on the popular scientific book design that had been prepared by the researcher. In accordance with Rusdi's (2018) explanation, the purpose of the popular scientific book content readability test is to evaluate the intrinsic aspects and impact of product use by users. After evaluating all aspects of the assessment previously described, the Learning Information Material (LIN) product prepared by the researcher can be considered very good and suitable for various groups, including students, especially those taking Plant Physiology Theory and Practicum courses, as well as the general public. This popular science book is designed in a way that facilitates understanding, successfully communicating scientific language with language that is easier to understand. In addition, the writing of this popular scientific book adopts a simple and interesting style of language, delivered in a relaxed style without being stiff. This helps readers better understand the material. Popular science books also incorporate photos and innovative creative elements, so that the text does not dominate the page, providing a more engaging reading experience.

This opinion is in line with the findings in a study by Irwandi, Winarti, and Zain (2019), who stated that in developing Learning Information Materials, it is important to use simple, concise, and concise language that is appropriate for the target education level. The orderly organisation of ideas and sentences that provide clear and convincing directions are also important factors. Muhammad, Muhiddin and Adnan (2018) added that the use of learning products with attractive designs, appealing images or photos, and easy-to-understand presentation of materials can play a role in motivating and increasing participants' interest in the learning process.

E. Conclusion

The results of the validity test of the digital popular science book by experts showed a final percentage of 79.85%, which indicates that the popular science book is quite valid and can be used, although it requires minor revisions. The validity test by the expert involved 9 aspects of product assessment, including coherence, readability, vocabulary, sentence structure, format, writing method, application and implication, definition and explanation, and other language styles. After a readability test of the digital popular science book content from 6 people, including 3 students and 3 community members, a final percentage of 88.88% was found, indicating very good quality.

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