Al-Ishlah: Jurnal Pendidikan
Vol.14, 3 (September, 2022), pp. 3449-3456
ISSN: 2087-9490 EISSN: 2597-940X, DOI: 10.35445/alishlah.v14i3.1347

Development Enrichment Book Based on Laboratory Results for Viruses on Plants Material

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ARTICLE INFO

Keywords:

Enrichment book;
Laboratory result;
Viruses in Plants

Article history:

Received 2022-02-14
Revised 2022-14-12
Accepted 2022-07-17

ABSTRACT

This study aims to development a biological enrichment book based on the results of research on disease incidence (DI), disease severity (DS) and isozyme characterization on virus-infected chili plants; determine the validity of the biological enrichment book based on the results of research; and knowing the profile of students' understanding after using the enrichment book. The research was conducted at SMA Batik 1 Surakarta. The sample used is class X students totaling 170 students. Data collection techniques used are tests and non-tests. The data obtained are in the form of assessment data from several experts. In addition, the data obtained were in the form of student knowledge profiles after using enrichment books. The data from the expert's assessment were analyzed descriptively and quantitatively, while the student knowledge profile data was analyzed using the Rasch Model using the Winstep application. The results of the validity of enrichment books based on research results show that enrichment books are feasible to be applied and used in the learning process as a textbook support book, while the results of the student understanding profile after using the enrichment book are in the good category seen from the student's ability to answer questions.

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1. INTRODUCTION

Students' understanding is influenced by the learning process in the classroom. The learning process is supported by many things, including curriculum, teaching programs, learning approaches, quality of masters, learning materials, learning strategies, learning resources and assessment techniques/forms. These supporting components can be a determinant of the success of a learning and affect learning outcomes (Muslich, 2007). Learning resources also affect the formation of student

understanding. One of the learning resources used in learning is a book. Books are the primary learning resource for students. Books have been arranged in such a way and generally adapted to the applicable curriculum (Suhardi, 2012). The number of student textbooks available in the market is very large, varied and of varying quality. According to Adisendjaja, Hilmi and Romlah (2007), several research results report that there are still inaccurate concepts and misconceptions that require alternative conceptions in textbooks. Therefore, other supporting books are needed that can enrich the mastery of science and can be a complement to textbooks. One of them is an enrichment book.

Enrichment books are books that can be used as learning resources that can support the learning process. This is in accordance with the Regulation of the Minister of National Education of the Republic of Indonesia Number 2 of 2008 concerning Books Article 6 Paragraph 2 which states that in addition to textbooks, educators can use educator guide books, enrichment books, and reference books in the learning process. While paragraph 3 states that educators can encourage students (students) to read enrichment books and reference books to increase students' understanding and insight. Enrichment books are books that contain material that can enrich basic, secondary and tertiary education textbooks (Permendiknas, 2008).

Enrichment books have functions such as enrichment of knowledge to increase knowledge (information) and expand readers' knowledge of science, technology and art. According to Widyaningrum et al., (2015) the characteristics of enrichment books, namely (1) are not the main guidelines for students in learning, (2) are not presented in order according to grade level, (3) are related to part or one of the SK / KD in the content standard, (4) can be used by all readers at all levels or levels of education, (5) can be used as an enrichment book, reference and guide for educators. So it can be concluded that the enrichment book was developed in order to increase students' knowledge, or information that is not explained in the textbook.

Based on the results of observations and interviews conducted at SMA Batik 1 Surakarta, it is known that the use of teaching materials such as enrichment books as complementary books from textbooks has not yet been implemented, let alone enrichment books compiled based on research results. The teaching materials used in the classroom other than textbooks are only in the form of modules or dictation which are arranged based on the subject matter in accordance with the SK and KD in the curriculum. While the results of interviews conducted with biology teachers, it was found that virus material is material that is quite easy to understand by students, as evidenced by satisfactory learning outcomes and achieving KKM scores, but even so, their understanding is only limited to what they learn in class or what they learn. only in textbooks. For example, in discussing viruses that occur in plants, they only know a few of the many viruses that attack plants. Their understanding is only limited to the material taught in textbooks. In addition, the material taught still uses universal examples so that the discussion is limited and less comprehensive.

Based on the problems above, one of the efforts that can be done is by developing a biological enrichment book based on the results of research on viral material in plants, ideally this enrichment book should not only contain basic concepts but also facts presented based on research results. Teaching materials developed based on research results will be more contextual, deeper, and more interesting because they are not only theories or concepts, but are based on scientifically proven facts (Primiani, 2014). In addition, the science of understanding is developing very quickly and rapidly, including the development of educational methodologies and the like. This statement requires students to improve the ability to master the science of understanding. If they do not follow these developments, it is not impossible that they will not enter the system and the vortex of the growth of the understanding science community. This is where the importance of current research results so as to provide insight, understanding and the fulcrum of educational development. In addition, research-based learning will be able to stimulate students to continue to follow the development of science and is carried out contextually because it is based on concrete data from research results (Amin, 2010).

The development of enrichment books is also based on the lack of utilization of research results as teaching materials in schools. Therefore, this enrichment book was developed based on the results of

research conducted, namely Disease Incidence (DI), Disease Severity (DS) and isozyme characterization in infected chili plants. This enrichment book is expected to add insight, knowledge, and curiosity of students and can be used as a learning resource to understand the concept of virus material in plants more deeply. The purpose of this research is to delelopment an enrichment book based on research results, to determine the validity of an enrichment book developed and a profile of student understanding after using an enrichment book.

2. METHODS

This research is a development research (R&D). The product developed in the form of an enrichment book which was developed based on research results, namely Disease Incidence (DI), Disease Severity (DS) and analysis of isozyme banding pattern on virus-infected chili plants. The results of this research are used as the basis for the preparation of the enrichment book. Book development is carried out using 4D models, are define, design, develop, and disseminate. The research was conducted at SMA Batik 1 Surakarta. The sample used is class X students totaling 170 students. Data collection techniques used are tests and non-tests. The data obtained are in the form of assessment data from several experts are material espert, gramar expert, design expert and education practitioners. In addition, the data obtained were in the form of student knowledge profiles after using enrichment books. The data from the expert's assessment were analyzed descriptively and quantitatively, while the student knowledge profile data was analyzed using the Rasch Model using the Winstep application.

3. FINDINGS AND DISCUSSION

Enrichment Book Development Based Research Result

The product developed in this study is a Biological Enrichment Book Based on Disease Incidence (DI), Disease Severity (DS) and Isozyme Characterization in Virus-Infected Chili Plants, which aims as a supporting book to provide new information to students about viruses in plants, especially chili plants. This is in accordance with the statement that enrichment books are books used in schools but are not the main handbooks but only as additional books to increase understanding and broaden readers' knowledge of understanding science, technology and art (Kemendikbud, 2018).

The development of research results-based biology enrichment books is based on a needs analysis that begins with observation activities, namely analyzing supporting books used by teachers in the learning process, interviews with biology teachers and students regarding classroom learning on plant viruses, and conducting studies literature. The results of the needs analysis are used as the basis for the characteristics of the developed enrichment book.

The development of this biology enrichment book can create more meaningful learning activities because the material presented is contextual. This is in line with Amin's (2010) statement that research-based learning will stimulate students to continue to follow the development of science and is carried out contextually because it is based on concrete research data. In addition, teaching materials developed based on research results also make learning more interesting because they are not only theories or concepts, but are based on facts and scientific evidence (Wahyuni et al., 2018)

The research results-based biological enrichment book was developed based on research results that were adapted to learning at school, namely about viruses that infect plants, especially chili plants and detecting virus-infected plants by using isozymes. which trains students to interact so that students are active and encourages students to observe various phenomena that occur, besides that this enrichment book is equipped with various information about material or biology that provides new information related to the material presented. And this enrichment book is also equipped with evaluation questions so that students can study independently and measure their abilities after studying the enrichment book.

The research-based enrichment book was compiled and packaged into 2 parts, consisting of 2 main topics, namely Pepper Yellow Leaf Curl (PYLC), and detection of virus-infected plants using isozymes.

The characteristics of this enrichment book present material developed from the research results of Disease Incidence (DI), Disease Severity (DS) and Isozyme Characterization in Virus-Infected Chili Plants. The results obtained are the symptoms of Pepper Yelow Leaf Curl and Disease Incidence (DI), Disease Severity (DS) obtained from field results by observing 5 chili plants infected with the virus in five sub-districts in Sukoharjo Regency. Likewise, the results of isozyme characterization on virus-infected chili plants obtained from laboratory results in the form of observed band patterns are documented as references which are included in the enrichment book developed. One of the differences between research results-based enrichment books and other enrichment books is that ordinary enrichment books use images obtained from other reference sources (not real/original), while research results-based enrichment books use images obtained directly from the results of research conducted (real). /original). In addition, the activities presented in the enrichment book can be determined or set by the researcher himself.

Enrichment books are books that contain material to enrich textbooks that are able to increase the mastery of science and technology and skills. The enrichment in question leads to the provision of information related to the subject or material contained in the curriculum in depth or broadly. In addition, enrichment books can help students who have difficulty understanding certain material that is not widely explained in the main textbook (Sitepu, 2012). Moreover, enrichment books based on research results such as those developed by researchers. With this enrichment book students can learn something new in a concrete and real way because ideally this enrichment book does not only contain basic concepts but also facts that are put forward based on research results. This is in line with Primiani (2014) opinion which states that teaching materials developed based on research results will be more contextual, deeper, and more interesting because they are not only theories or concepts, but are based on scientifically proven facts.

Enrichment Book Validation by Expert

The biology enrichment book developed was tested for validation by experts and biology teachers. The validation aims to obtain a feasibility assessment of the developed enrichment book and input for improvement of the enrichment book according to suggestions and criticisms. The inputs and suggestions given are used as material for the improvement of the biology enrichment book. The results of each validation test carried out by Biology experts and teachers are presented in Table 1.

Table 1. Validation Results of Enrichment Books by Experts

No	Validator	Maximum Score	Validation Score	Percentage (%)	Eligibility Criteria
1.	Grammar Expert	65	58	89,23	Very Eligible
2.	Design Expert	80	77	96,25	Very Eligible
3.	Material expert	105	74	70,48	Eligible
4.	Biology teacher	145	134	92,41	Very Eligible

The comparison of the value of the module validation results with the maximum validation value is presented in Figure 1.

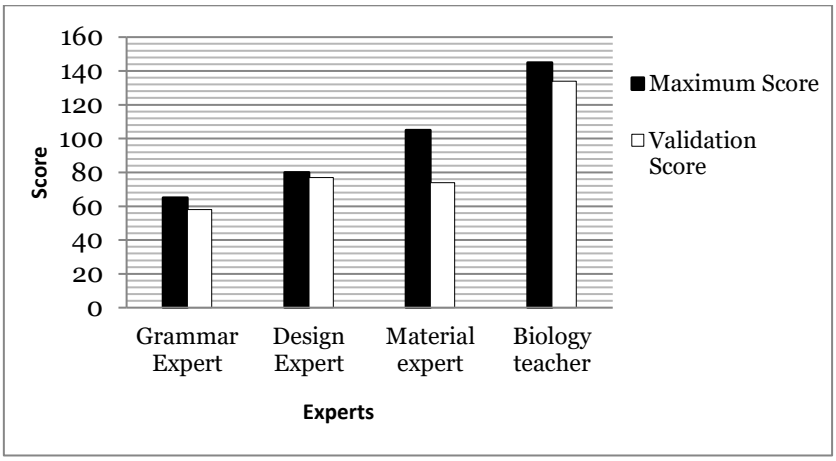

Fig. 1. Histogram Comparison of Enrichment Book

Based on the results of the validation, it was obtained that the validation from grammar experts was 89.23%, development design experts were 96.25% and education practitioners were 92.41% in the very feasible category, while validation from material experts was 70.48% in the category feasible (Table 1). The function of the validation test is to have a high validity value and can be accounted for. Based on the validation that has been done, it can be concluded that the development of a research-based biology enrichment book is feasible to be implemented in biology learning, especially on virus material in plants. Through this enrichment book, students can learn independently to provide new information or additional understanding insights that are not presented in textbooks or are not taught in class. This biological enrichment book based on the results of Disease Incidence (DI), Disease Severity (DS) and isozyme characterization in chili plants infected with the virus was compiled in a complete and systematic way so as to facilitate student understanding.

Student Knowledge Profile

In the analysis of Rasch modeling, the category of students' level of understanding is determined based on the separation person index and the logit value obtained by the respondent. Index separation can be known through the summary statistics menu in the winstep software. The index value of separation person is 0.95. This value determines the number of groups of people in testing the developed instrument. According to Sumintono & Widhiarso (2015), the calculation of the number of groups uses the formula:

Number of groups = (4 X index separation + 1): 3

= (4 X 0.95 + 1): 3

= 1.6 (rounded to 2)

Furthermore, the value limit on the students' understanding criteria is determined based on the logit value on the person measure. The grouping of respondents is presented in Table 2.

Table 2. Respondents Criteria

Logit	Value Criteria	Respondents	Percentage (%)
0 ≤ person	height	124	73,37 %
person < 0	low	45	26,63 %

Categorization of student understanding is done by analyzing the number of groups based on the person separation obtained. Based on the calculation, there are two groups, which means that there are 2 levels of student understanding. The division of levels is obtained from the index of separation of persons and the logit value obtained by the respondents.

Based on the test instrument that has been tested, it can be seen the characteristics of the respondents on the profile of students' understanding after using the enrichment book. The percentage of students' understanding profile has been presented in Table 4.21. Based on the analysis, it was found

that from 169 students, 124 with a percentage of 73.37% of them were included in the high category, and 45 with a percentage of 26.63% were included in the low criteria. This indicates that 73.37% of students understand the material presented in the enrichment book that has been developed. So it can be concluded that the enrichment book developed is suitable for use in the learning process, especially on virus material in plants. This is in line with research conducted by Resterina et al. (2021) which states that the use of enrichment books in the learning process affects students' understanding and learning outcomes. Likewise with the research conducted by Rofiah et al. (2015) that enrichment books affect students' knowledge as evidenced by the results of the pretest and posttest which show students' abilities increase after using enrichment books.

4. CONCLUSION

The development of the Biological Enrichment Book was compiled based on the results of research on Disease Incidence (DI), Disease Severity (DS) and Isozyme Characterization in Virus-Infected Chili Plants. This enrichment book aims to provide new information or new insights that are presented in real and concrete terms based on scientific facts from research results. The analysis of the validity of enrichment books based on the results of Disease Incidence (DI), Disease Severity (DS) and Isozyme Band Pattern Analysis in Virus-Infected Chili Plants through validation tests by experts and practitioners shows that the enrichment book is feasible to apply and used in the learning process as a textbook support book. While the profile of students' understanding of the virus material after studying the research results-based biology enrichment book is in the good category seen from the student's ability to answer questions about virus material. Based of the 170 students, only a small number of students experienced errors in answering questions, while other students were able to complete and correctly answer questions regarding virus material in chili plants.

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