



## Development of Biological Science Learning Modules for Class VII SMPN 21 Palu

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**ABSTRACT:** The instructional resources employed in the educational process at SMP Negeri 21 Palu consisted of teacher's handbooks and students' books. Nevertheless, the efficacy of the learning process has been lacking. The students' learning outcomes were found to be low, particularly in the field of Science, as indicated by the researchers' observations. The results revealed that the Minimum Completeness Criteria (MCC) for Science was 65. Approximately 55% of the pupils in the class attained standard scores. The utilization of students' textbooks necessitated the provision of explanations and a teacher's guide. However, due to time constraints, the students' learning process was hindered, resulting in instructors being unable to offer optimal explanations and guidance to the students. Therefore, it encompasses the development of novel instructional resources that learners may effectively utilize. One of the available options for students to utilize is the renewal of modules. Science modules have the potential to foster home-based learning among students due to the inclusion of supplementary resources, such as student guides, that facilitate the study of the module content.

**KEY WORDS:** Biology, Learning, Module, Science.

### INTRODUCTION

Over the last two years, the execution of education in Indonesia has not adhered to the ideal model, wherein instructors and students engage in collaborative learning inside a shared physical space. The issue of education has emerged as a consequence of the Covid-19 pandemic, as stated by the World Health Organization (Sohrabi et al., 2020). The pandemic originated in Wuhan, China, and has had a significant impact on several nations, including Indonesia and other countries globally. The Indonesian government responded to the emergence of this issue by mandating teaching staff to transition from in-person instruction to offline learning, subsequently implementing a shift from face-to-face instruction to a distant learning system, commonly referred to as online learning (Bryson et al., 2020). In addition to online education, there are educational institutions that employ a small group instructional model, either through in-home arrangements or by organizing student study groups inside the school setting through the implementation of rotating schedules.

SMP Negeri 21 Palu is an educational institution that employs the pedagogical approach of small group learning. This educational institution implements a pedagogical approach that emphasizes small group learning and imposes limitations on the amount of time students may spend studying inside the classroom setting. The school employs a method of organizing pupils into smaller groups for studying purposes by introducing shifts or modifications in student study time at each grade level. The preliminary findings of researchers at educational institutions indicated that, in response to the pandemic, measures were taken to divide students into study groups. Furthermore, the teaching and learning activities between students and teachers involved the utilization of teacher handbooks and student books as instructional resources throughout the continuous learning process. The current instructional approach appears to result in suboptimal academic performance among students, particularly in the field of science. Empirical evidence gathered by academics indicates that the implementation of the Modified Curriculum Content (MCC) for scientific topics yields a mean score of 65. Approximately 55% of pupils in the class attained the standard score.

Based on empirical evidence, it is evident that the efficacy of student books as instructional resources in the context of the ongoing epidemic remains limited. The reason for this is that student learning books, or student books, need clarification and assistance from an instructor throughout their use. However, the student learning process is constrained by time, so impeding teachers from offering comprehensive explanations and counseling to students. Hence, in the midst of this ongoing epidemic, there is a pressing need for media innovations that offer novel educational resources to students, enabling them to effectively utilize these materials. One of the pedagogical tools that students may utilize amidst the epidemic is instructional resources presented in the form



of modules (Selviani, 2019). According to Ariana et al. (2020), a module refers to a form of printed instructional material specifically created to facilitate independent study among students. In addition to this, the module possesses the capability to facilitate autonomous learning since it is furnished with comprehensive instructions, enabling learners to engage in educational activities without the direct supervision of an instructor (Sari et al., 2019). The utilization of modules in the educational process serves as a viable solution for schools to address the challenges posed by the pandemic. This approach enables students to engage in remote learning by providing them with comprehensive study materials accompanied by instructional guidelines. In order to provide optimum learning experiences for students, it is important to consider their ability to learn effectively in both teacher-guided and independent learning settings (Mardianti et al., 2020). Utilizing modules as instructional resources in student education offers numerous benefits that enhance the teaching and learning experience. These advantages include facilitating students' ability to adapt their learning approach, identifying areas of weakness through the independent assessment embedded within the module, and fostering self-improvement through the provision of answer keys and discussion of evaluation questions. The information shown within the module. According to Najuah et al. (2020), the utilization of modules in the learning process typically necessitates students to actively engage with the material, seek out additional sources of information, and independently solve problems. Additionally, students are encouraged to take greater initiative in their learning activities. However, it is important to note that autonomous learning in this context does not imply that students are solely permitted to engage in self-directed study. Individuals are encouraged to engage in academic pursuits by studying and engaging in discussions with peers, with the aim of identifying valuable educational materials that can aid in resolving the challenges they encounter.

The primary aim of this project was to develop science learning modules that align with student learning outcomes. The anticipated outcomes of this study are poised to contribute to the enhancement of scientific education by offering insights into the efficacy of learning modules as viable instructional resources. In addition, it offers novel educational opportunities for students through the utilization of modules as supplementary instructional resources, therefore diversifying the learning materials beyond conventional textbooks. This approach facilitates optimal learning outcomes, fostering student engagement and enabling independent learning in both teacher-guided and self-directed contexts.

## RESEARCH METHODS

The research used a 4D paradigm for development, consisting of four sequential stages: define, design, develop, and disseminate (Amini & Saniyah, 2021). The application of the 4 D model is frequently observed in the development of educational goods, such as printed books (Apriliyanti et al., 2017). The primary phase of the project is focused on identifying the necessary product needs and requirements in order to facilitate its development. Subsequently, the second phase entails the design of the product and the preparation of assessment instruments (Agung et al., 2022). This involves the establishment of a module validity instrument, which assesses the content, media, and design aspects of the module. Furthermore, the draft modules are subject to review by teachers, and students are involved in the assessment of these draft modules.

According to Arikunto (2014), the category of feasibility is comprised of five distinct components. This scale considers a range of percentage values, with the highest anticipated value being 100% and the lowest value being 0%. The formula employed is:

$$P = \frac{\sum x}{\sum x_i} \times 100\%$$

Information:

P : Percentage (%)

$\sum x$  : Number of research answers

$\sum x_i$  : The highest number of answers

After the percentage value is obtained, it is interpreted in sentences with the criteria as presented in Table 1:

Table 1. Criteria for the Percentage of Eligibility of Media

Percentage of	Validation Criteria
81% - 100%	Very Worth It
61% - 80%	Decent

41% - 60%      Decent Enough  
0% - 20%      Very Unworthy  
(Modification of Novianti, 2015 in Utami et al., 2018)

## RESULTS

The research in question employs the Four-D (4D) paradigm for development. The development model under consideration encompasses a series of distinct stages, specifically denoted as Define, Design, Develop, and Disseminate (Nugraheni & Sunarno, 2015). The findings of this research are presented in the format of Class VII IPA modules accompanied with International Standard Book Numbers (ISBNs). The utilization of the model we have constructed is anticipated to facilitate students in achieving optimal study outcomes, whether they engage in solo or collaborative learning. The initial phase of the process involves defining key parameters. This stage include the analysis of several aspects of the educational environment, including the curriculum in use, examination of teacher attributes and instructional approaches, and evaluation of the accessibility and use of instructional modules. The examination of instructional materials/modules' accessibility, with the assessment of student characteristics, is also a crucial aspect of analysis. The subsequent examination pertains to the study of the instructional material comprising complex content that poses challenges for students in terms of comprehension, as well as the intended educational outcomes to be attained. The subsequent phase involves ascertaining the specific product that will be manufactured. The assessment of student requirements in the context of seventh-grade social studies education involved the utilization of observation and interview techniques. The findings revealed that pupils had a very limited inclination towards engaging in autonomous study. There are various reasons that are believed to contribute to students' diminished inclination towards autonomous study. One such issue is the utilization of learning media that lacks appeal and fails to adequately address the required subject matter (National, 2008).

The subsequent phase, referred to as the planning stage, encompasses the incorporation of the following elements derived from the design of the preliminary module: (1) outer cover, (2) interior cover, and (3) publisher's page. The document begins with a foreword, followed by a table of contents (National, 2008). In addition to this, it is imperative to create module content components that encompass learning objectives, essential prerequisites for learning, instructional materials or resources, various types of learning activities, and supplementary components. The visual representations depicted in figures 1 to 5 illustrate the phenomenon.



**Figure 1.** Outside Cover  
*Source: P 4I Editors*



**Figure 2.** Inside Cover  
*Source: P 4I Editors*



**Figure 3. Publisher Page**  
Source: P 41 Editor



**Figure 4. Foreword**  
Source: P 41 Editors

In this discourse, the objective is to elaborate upon the concept of development. During this phase, the feasibility of the draft module is assessed through various tests. These tests include evaluating the content's validity, such as verifying the accuracy of the module title, assessing the appropriateness of the module title in relation to its content, evaluating the clarity of images and descriptions, verifying the accuracy of supporting sources that can be used as references for reading source material, and ensuring the inclusion of current issues in the module. The findings pertaining to the validity assessment of the preliminary module, specifically in relation to its content, are shown in Table 1.

**Table 1. Validity Test Results of Draft Module From Content Aspect**

Assessment Aspects	Score
Module Title Accuracy	4
Correspondence between the module title and the content of the material	4
Image Clarity	3
Correspondence Between the Image and the Explanation	3
Accuracy of Supporting Sources That Can Be Used as Reference for Reading Source Material	4
Factual Module Contents with Current Issues	5
<b>Number of Scores Obtained</b>	<b>23</b>
<b>Total Score</b>	<b>30</b>
<b>percentage</b>	<b>76.7</b>

The data shown in Table 1 indicates that the draft module achieved a content aspect score of 76.7%, which was considered to be acceptable for implementation. Subsequently, it is important to assess the soundness of the preliminary module in terms of its media-related attributes. The evaluated components of the medium include the cover design and the material used. Table 2 presents the outcomes of the validity assessment conducted on the preliminary module, specifically focusing on the media component.

**Table 2. Results of the Module Draft Validity Test from the Media Aspect**

Assessment Aspects	Score
<b>A. Cover</b>	
Accuracy of the Cover Image on the Module	3
Quality Cover Image Accuracy	3
Cover Image Size Accuracy	3
Quality Cover Image Placement	3



Module Title Text	4
Suitability of font size in journals	4
Appropriate Placement of Titles in Modules	4
Letter Color Suitability	4
Correspondence between title letters and images	4
<b>B. Material</b>	
Conformity Between Meteri And Media Used	4
Image Quality Used	5
Image Size Accuracy	5
Text Quality In Modules	5
Font Size Consistency Within Modules	5
<b>Number of Scores Obtained</b>	56
<b>Total Score</b>	70
<b>percentage</b>	84

Table 2 illustrates that the draft module pertaining to the media element achieved a score of 84%, indicating its suitability for implementation. Table 3 displays the outcomes of the validity assessment conducted on the preliminary module, specifically focusing on its design element.

**Table 3.** Validity Test Results of the Draft Module from the Design Aspect

Assessment Aspects	Score
<b>A. Cover</b>	
Accuracy of Title Location	4
Accurate Font Size	4
Image Accuracy	3
Ministry of Appearance	4
<b>B. Material Description</b>	
Accurate Font Size	4
Sentence Clarity	4
Writing system	5
Attractiveness of the Material Description Display	4
<b>C. Picture</b>	
Image Suitability to Material	4
Image Clarity For Understanding	3
Attractiveness of Image Display	4
<b>D. Image Description Text</b>	
Location Accuracy	4
Writing Color Accuracy	4
Accurate Font Size	4
Appearance	4
<b>Total Score Obtained</b>	59
<b>Total Score</b>	75
<b>percentage</b>	79



According to the data shown in Table 3, the design element of the module draft achieved a score of 79%, indicating its suitability for usage. The outcomes of the validity assessment conducted by educators on the module draft are presented in Table 4.

**Table 4.** Results of Review of Module Draft by Teachers

Assessment Aspects	Score
<b>A. Content Eligibility</b>	
Completeness Of The Material In Terms Of Kd (Basical competencies)	4
The Depth Of The Material In Terms Of Kd (Basical competencies)	3
Concept Accuracy	4
Interesting Appearance	4
Accuracy Issues With Example	3
Accuracy Of Images, Diagrams And Illustrations	4
Accuracy Of Questions/Tests Used	4
Use Of Illustrations Of Problems Related To Everyday Life	3
Use Of Pictures And Illustrations Related To Everyday Life	3
Encourage Curiosity	4
<b>B. Feasibility Of Presentation Format</b>	
Clarity Of Material Distribution	4
Use Of Space/Layout	3
Availability Of Conclusions/Summary	4
Availability Of Practice Tasks/Assignments In Each Learning Activity	4
Availability Of Answer Keys	4
Availability Of Bibliography	3
<b>C. Language Feasibility</b>	
Accuracy Of Sentence Structure	3
Sentence Effectiveness	4
Standard Terms	4
Grammatical Accuracy	3
Grammatical Accuracy	3
Use Of Symbols/Icons	4
Ease Of Presenting Material For Students To Understand	4
<b>D. Module Evaluation</b>	
Conformity Of Evaluation Tools With Kd	4
Conformity Of Evaluation Tools With Indicators/Objectives	4
Clear And Easy To Understand Questions/Test Instructions	4
<b>The Total Score Obtained</b>	<b>95</b>
<b>Total Score</b>	<b>104</b>
<b>Percentage</b>	<b>91.3</b>

Table 4 shows the results of the teacher's review of the draft module, which obtained a percentage of 91.3 % which was deemed very suitable for use. The results of the validity test of the draft module by 15 students are in Table 5.

**Table 5.** Results of Student Assessment of the Draft Module

Rating Aspect	AVERAGE	%
Do You Think The Content Of This Module Is Interesting?	4.5	90.7
Do You Think The Contents Of This Module Are Easy To Understand	4.6	92.0
What Is The Clarity Of The Images In Module	4.1	82.7
What Is The Clarity Of The Writing (Text) In Module	4.3	85.3
Do You Think The Image Display On The Module Is Attractive?	4.6	92.0
Did You Find This Module Overall Interesting?	4.3	86.7
Can This Module Help Make It Easier To Understand The Lesson Material?	4.3	86.7
<b>Total</b>	30.8	616.0
<b>AVERAGE</b>	4.4	88.0

The findings of the evaluation conducted by the researchers on the draft module prepared for class VII students are presented in Table 5. The collected findings indicate a high level of suitability for the usage of the module, with a score of 88%. The module's distribution is conducted in a restricted manner following the acquisition of the ISBN from the Indonesian Education and Research Development Center (P4I), a member of IKAPI with the registration number 009/Extraordinary Members/NTB/2021. The ISBN for the module is 978-623-5490-59-5.

## DISCUSSION

The present study may be classified as development research. The findings of this study have been presented in the format of a Biology Science module for class VII. The module package encompasses a comprehensive examination of several topics, including the classification of living organisms, cellular energy transformation and metabolism, as well as the processes of respiration and photosynthesis. The module under consideration in this study utilizes a four-D framework, which is an acronym for Define, Design, Development, and Dissemination (Haristah et al., 2019). Moreover, Kalsum et al. (2018) elucidate that in the realm of development research, the use of the 4D technique is prevalent, including four distinct phases. The product development process consists of several stages, beginning with the definition stage, followed by the product design stage, the development stage, and concluding with the distribution stage. In this particular case, the generated product is intended for implementation at SMP Negeri 21 Palu, serving as an example school.

The Define phase serves as the preliminary stage of development, wherein an analysis is conducted to assess the requirements of representative schools involved in the research. This analysis encompasses a review of relevant literature and interviews with teachers of seventh-grade classes. The primary objectives of this analysis include examining the conditions prevalent in schools (such as curriculum, teacher attributes, availability of teaching materials/modules, and analysis of student characteristics) and scrutinizing the materials involved (specifically, the classification of living organisms, energy transformations within cells and cell metabolism, as well as respiration and photosynthesis). Additionally, this phase involves determining the specific products that need to be developed. According to Neno et al. (2022), the process of defining involves the analysis of students, examination of conceptual content within instructional materials, and consideration of learning objectives as a basis for module development. Furthermore, according to Fitriani et al. (2019), the inclusion of concept analysis is a crucial element in the development of educational modules.

The Design Phase include the process of developing the external cover, internal cover, publisher page, preface, table of contents, and concluding with the module's glossary. The module has been developed utilizing a module format design as proposed by Fitriani et al. (2019). It is important to adhere to the principles outlined in the 2017 Research and Technology Higher Education while developing teaching materials. These rules specify that the module should consist of an introduction, a description of the resources, and a conclusion. It is crucial to follow these recommendations without deviation. In addition to this, the authors Nesri and Kristanto (2020) emphasize the importance of developing module assessment instruments for media and material specialists.

The development phase is initiated once the design has been submitted to the validator for the purpose of assessing its level of validity (Neno et al., 2022). The current stage of the feasibility test for the module draft indicates that, based on the evaluation of its content, medium, and validator design, it has been deemed practicable. In contrast, the findings of the evaluations conducted by



both teachers and students indicated that the module was very practical and user-friendly. The evaluation findings encompass the contents' suitability for use, as indicated in Table 1. This pertains to the recommendations put forward about the clarity of visuals and the appropriateness of their alignment with corresponding explanations. Subsequently, it is necessary to assess the veracity of the module draft with regards to its media component. The evaluated components of the media include its cover design and content. When considering media elements within the relevant category, it is important to take into account the following recommendations: (1) Ensure the module cover picture is accurate, (2) Assess the quality of the cover image, (3) Verify the correctness of the cover size, and (4) Confirm the accuracy of the positioning of the cover image. The last step involves doing a validity test on the module draft, specifically focusing on its design aspect. Evaluation of the design elements within the table. The third component encompasses many elements such as coverage, descriptions of materials, photographs, and captions for the photos. The feasibility of the design component was confirmed by the incorporation of ideas pertaining to the image correctness on the cover and the image clarity within the module text in the module draft. The findings shown in Table 4 illustrate the outcomes of the teacher's evaluation of the draft module. The evaluation indicated that the module is highly appropriate for implementation, since it incorporates several ideas that were carefully considered. (1) Certain pictures within the module possess diminutive dimensions, hence potentially impeding reader comprehension. (2) Notably significant sub-chapters or sections have not been duly emphasized. (3) Instances persist whereby examples have not been incorporated. (4) Attention should be given to space in order to enhance the overall visual organization of the module. According to Setyawan and Wahyuni (2019), the findings from the student study indicate that the results obtained from table 5 are very appropriate for practical application. This suggests that the module device developed by the researcher is overall suitable for usage. The last phase entails the Disseminate Phase, namely the distribution of the module bearing the ISBN 978-623-5490-59-5 within the local context of SMP Negeri 21 Palu, with the purpose of utilizing it as an instructional resource. The process of deploying a module.

## CONCLUSION

The Biology Science learning module, designated as Class VII, has been designed with a validation level that is appropriate for its utilization in the field of Biology Science education. Despite undergoing the validation stage, it is important to realize that the development of this module still possesses some limits.

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