**Development of Biology Learning Modules Based on Character Education on Ecosystem Material in Class X**

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**Abstract**

The purpose of this study was to develop a valid, practical and effective character education-based biology learning module for students. This research method is the development of Research and Development with the 4D approach model (Define, Design, Develop, Disseminate). The instruments used are needs analysis in the form of teacher interviews and questionnaires to students, validation sheets for media experts, material experts, and character education experts, and practicality sheets. Then the effectiveness sheet in the form of a character assessment questionnaire. This study produced a character education-based biology learning module with a very valid category, with a percentage score from media experts 92%, material experts 90%, and character education experts 87%, the practicality results were categorized as very practical with a percentage score of 89% obtained from the biology teacher's response and a percentage score of 90% obtained from student responses. There was an increase in character values in students by 21% with initial data of 54% to 75%, it was stated that the character education-based biology module proved effective in influencing students' character values. Based on this learning module, it can be concluded that student learning outcomes using the developed module are valid, practical and effective for use in student learning activities on ecosystem material.

***Keywords:*** *biology learning module, character education, ecosystem material*

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**INTRODUCTION**

In Indonesia, education does not escape some of the problems that are so complex and difficult to handle, be it in terms of learning, human resources, until the main problem that must be considered and become the focus of educational problems during the 21st century is the crisis of character education in students (yati, 2015). The cultivation of character education values is related to the moral crisis which includes various negative phenomena such as promiscuity, child and youth violence, human trafficking, crimes against friends, drugs, pornography, rape, and deprivation. Efforts to overcome this problem have not been fully successful, and these conditions can be considered as indicators of failure in character building (Afriadi et al., 2013).

Character education is a system of instilling character values in students, involving components of awareness, understanding, concern, and high commitment to the implementation of these values. These values are directed towards God Almighty, self, fellow human beings, the environment, as well as society and the nation (Citra, 2012). Another impact of character education is the development of students' abilities to become independent, creative, and have a national spirit. Character education also creates a school environment that supports learning by fostering honesty, creativity, and high nationalism (Erwenta et al., 2018). The main goal is to develop students' ability to make decisions, maintain goodness, and wholeheartedly realize goodness in everyday life (Suardin et al., 2023)

There are 18 character values formulated by the Ministry of National Education, (2010) in the grand designe of character education, namely: "(1) Religious, (2) Honest, (3) Tolerance, (4) Discipline, (5) Hard Work, (6) Creative, (7) Independent, (8) Curiosity, (9) Democratic, (10) National Spirit, (11) Love the Country, (12) Respect for Achievement, (13) Friendship/communication, (14) Love Peace, (15) Love Reading, (16) Environmental Care, (17) Social Care, and (18) Responsibility" (Siregar & Ulfa, 2023). Based on the strengthening of character education (PPK), issued by the Ministry of Education and Culture of the Republic of Indonesia, there are five main characters that are the priority of PPK, namely: Religious, Nationalist, Integrity, Gotong Royong, and Independent (Kemendikbud, 2018).

According to (Anggriana et al., 2022). the learning process in character education is a transfer of knowledge and transfer of values, namely the process of instilling character education values into students through subjects. One of the subjects that can instill the value of character education is Biology.

Modules are independent learning media that are systematically designed to help students achieve learning objectives. The use of learning modules can improve student competence and condition learning activities that are more planned, actively involving students. Modules also allow students to measure mastery of the material in each module unit (Ulfa et al., 2023). Learning modules that contain elements of character education are developed with the aim of improving the quality of education in Indonesia. Learning modules, as one of the teaching resources, have the potential to contain character education values. This module acts as a learning tool that is systematically and interestingly arranged, including material, methods, limitations, and ways of evaluation (Noperi et al., 2021).

Based on observations at MAS Al-Washliyah 22 Tembung, it is known that Biology teachers more often use media in the form of LKS. Based on the opinion (M. P. Rahmadina, 2019) the presence of images and explanations of material that is easily understood by students is still quite low. The media tends to contain long explanations, few pictures, and has no color, so students are less interested in learning and reading it. The results of observations of class X students show that there are difficulties in understanding ecosystem material. This is due to the complexity and difficulty of the material.

Based on interviews with biology teachers, it is known that student learning outcomes are low, 30% data were obtained. It is known that some students have poor behavior, such as often coming to school late, not doing assignments, littering, and leaving during class hours. Therefore, the application of character education values needs to be done. Character education is still minimal in biology learning. Integration of character education values is needed to improve student behavior. Therefore, a solution that can be implemented to overcome problems in the learning process is to develop a character education-based biology learning module (Solekhah, 2020). This module is expected to be able to bring positive changes in student behavior and attitudes, as well as support the formation of better attitudes and skills. This study aims to develop a character education-based biology learning module, in accordance with the background and problems identified.

Previous research conducted by (Raqzitya & Agung, 2022) proved to be able to develop character education-based E-modules as a science learning resource. (Wicaksana et al., 2020) developed a reproductive health poster based on character education. (Marcelina & Amelia, 2023), (Husni et al., 2023) and (Y. Farid, et al., 2022) produced thematic learning modules based on character education. Furthermore, (Suwanda et al., 2023) developing digital comic media based on character education has proven to be valid, practical and effective in increasing character values.

From previous research, there has been no specific research on character education-based biology learning modules in ecosystems. This opportunity opens up research opportunities to focus on the development of these modules. Observation shows the selection of ecosystem material because in the opinion of biology teachers at MAS Al-Washliyah Tembung, ecosystem material is very suitable for inclusion in character education because students have a close relationship with the surrounding environment. Ecosystem material is one of the materials that is suitable for use as an object of developing biology learning modules because ecosystem material is directly related to the surrounding environment, making it easier for students to analyze further (Solikha et al., 2022).

Based on the explanation above, the researcher aims to produce a biology learning module on class X ecosystem material based on character education at Mas Al-Washliyah 22 Tembung, and to find out how the level of validity, practicality, effectiveness of the biology learning module on class X ecosystem material at Mas Al-Washliyah 22 Tembung.

**METHOD**

**Research Design and Procedures**

This study uses the research and development method (Research and Development) with the 4D approach (Define, Design, Develop, Disseminate) developed by Thiagarajan. (1974).

This research was conducted at MAS Al-Washliyah 22 Tembung with the research subject in the form of students of class X MIA MAS Al-Washliyah 22 Tembung, which involved 36 students as respondents. The research instrument used consists of a needs analysis, which includes an interview sheet for teachers and a student needs analysis questionnaire. In addition, validation sheets involving media experts and material experts were used to test the validity of the media, while student response questionnaires were used as instruments to test the practicality of the media.

This character education-based biology learning module was developed in four stages, namely:

*Disseminate*

*Develop*

*Design*

*Define*

**1). Define:** the initial analysis is carried out to find out and look for basic problems to develop the desired product, learner analysis, task analysis, concept analysis, and analysis of learning objectives. **2). Design:** at this stage the learning module is designed using two applications, namely Word and Canva. While this learning module material is obtained from class X biology modules and textbooks based on the 2013 curriculum, the biology learning module is designed through several aspects, namely the preface, table of contents, list of images, concept map, introduction, KI &KD, learning indicators, learning objectives, module usability instructions, material content, summary, exercise questions. **3). Develop:** this stage consists of 1. Expert validation: consisting of media validation, material validation, and character education validation, and 2. Product trial: limited distribution of product trials to X MIA class students at MAS Al-Washliyah 22 Tembung. **4). Disseminate:** at this stage, the learning module that has been validated, then tested and distributed at MAS Al-Washliyah 22 Tembung, namely in class X MIA.

**Data Collection Instruments**

Data collection methods and instruments in the development of character education-based biology learning modules use four types of techniques, namely: 1) interview sheets for teachers and used to collect information related to the learning process in the classroom, which is the basis of research at the define stage; 2) expert validation sheets are used to assess the validity and practicality of the biology learning module products being developed. The validation sheet consists of media expert validation sheets, material validation; 3) response questionnaire sheets are used to evaluate the responses of students and biology teachers to the use of the module; 4) character value questionnaire sheets, aiming to measure students' religious, honest, responsible attitudes in biology learning.

**Data Analysis Technique**

The data analysis technique aims to obtain a valid, practical, and effective learning module by using quantitative data (validity, practicality, and effectiveness), as well as qualitative data (comments, criticisms, and suggestions). The validity analysis uses the results of validators from media experts, material experts, and character education experts. The validation sheet will be checked by the instrument validator before further validation is carried out by each validator. The results of this validation process will then be analyzed using the Likert scale calculation in Table 1.

**Tabel 1.** Likert Scale Rating Guidelines

|  |  |
| --- | --- |
| **Score** | **Assessment Criteria** |
| 4 | Very Good |
| 3 | Good |
| 2 | Less Good |
| 1 | Not Very Good |

(Source: (R. Rahmadina & Tambunan, 2019)

Based on research (Ikhwani & Kuntjoro, 2021) explains the formula used in the following percentage of product success.

The validation results are then calculated based on the criteria that can be seen in Table 2.

**Tabel 2.** Validation Assessment Results Criteria

|  |  |
| --- | --- |
| **Percentage (%)** | **Assessment Criteria** |
| 86-100 | Very Valid |
| 71-85 | Valid |
| 50-70 | Less Valid |
| 0-49 | Invalid |

(Source: (Putri & Saino, 2020)

Analysis of the practicality of the character education-based learning module developed can be seen based on the results of teacher and student responses. The goal is to find out the responses of teachers and students during the learning process. The learning module assessment can be seen in table 3.

**Tabel 3.** Practicality Assessment Results Criteria

|  |  |
| --- | --- |
| **Percentage (%)** | **Assessment Criteria** |
| 81% - 100% | Very Practical |
| 61% - 80% | Practical |
| 41% - 60% | Less Practical |
| 21% - 40% | Not Practical |

(Source: (Lestari et al., 2020)

The purpose of this character value is to determine the high, medium, or low character in students. which can be seen in Table 4.

**Tabel 4.** Character Value Assessment Criteria Students

|  |  |
| --- | --- |
| **Percentage (%)** | **Response Category** |
| 80,1% - 100% | Very High |
| 60,1% - 80% | High |
| 40,1% - 60% | Medium |
| 20,1% - 40% | Low |
| 0,0% - 20% | Very Low |

(Source: (Hidayati et al., 2020)

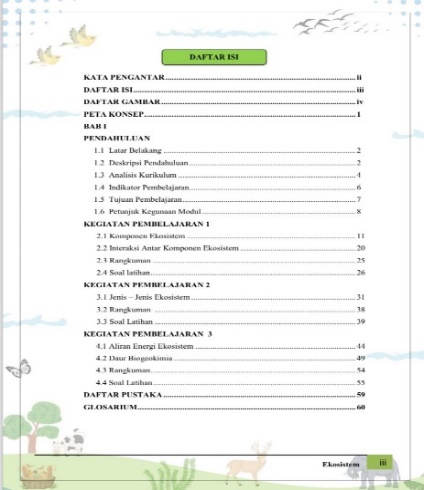
**RESULTS AND DISCUSSION**

**Define**

In the defining stage, researchers conducted interviews with biology teachers and field observations related to the implementation of learning in class X MIA. From this activity, several problems in biology learning were obtained, namely: first, the use of teaching materials in the school is still limited to LKS; second, there is poor student behavior, such as not doing assignments, skipping class during class hours, and sleeping during lessons. Based on the results of these interviews, researchers developed a character education-based biology learning module on ecosystem material with the aim of increasing religious character values, curiosity, responsibility, environmental care, and tolerance.

**Design**

At this stage, the initial design of the character education-based learning module is carried out. This stage aims to prepare teaching materials consisting of several components including a cover made with the canva application, preface, table of contents, concept map, KI and KD, instructions for use, learning objectives, material containing character values such as (religion, responsibility, curiosity, environmental care and tolerance), exercise questions, reflection, feedback, bibliography, glossary, answer key and author biography.



**Figure 1:** Cover view and table of contents view of character education-based biology module

**Develop**

This stage aims to make module products in accordance with the revised results from the validator. The module is designed to be developed into a valid, practical, and effective module based on revisions from validators. Product validators consist of three validators, namely media experts, material experts, and character education experts as shown in tables 6, 7, and 8.

**Tabel 6.** Media Expert Validation Result

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Aspect** | **Score Obtained** | **Maximum Score** | **Percentage (%)** | **Category** |
| Graphics | 29 | 32 | 91% | Very Valid |
| Presentation | 26 | 28 | 93% | Very Valid |
| **Score Obtained** |  | **55** |  |  |
| **Maximum Score** |  | **60** |  |  |
| **Percentage** |  | **92%** |  |  |
| **Category** |  | **Very Valid** |  |  |

**Tabel 7.** Material Expert Validation Result

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Aspect** | **Score Obtained** | **Maximum score** | **Percentage (%)** | **Category** |
| Content Of Material | 48 | 52 | 92 | Very Valid |
| Presentation | 6 | 8 | 75 | Valid |
| **Score Obtained** |  | **54** |  |  |
| **Maximum Score** |  | **60** |  |  |
| **Percentage** |  | **90%** |  |  |
| **Category** |  | **Very Valid** |  |  |

**Tabel 7.** Character Education Expert Validation Result

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Aspect** | **Score Obtained** | **Maximum Score** | **Percentage (%)** | **Category** |
| Verse Suitability With The Material | 19 | 20 | 95% | Very Valid |
| Suitability Of Character Education With The Material | 16 | 20 | 80% | Valid |
| **Score Obtained** |  | **35** |  |  |
| **Maximum Score** |  | **40** |  |  |
| **Percentage** |  | **87%** |  |  |
| **Category** |  | **Very Valid** |  |  |

Based on the results of the table above, media validation conducted by Mrs. Dr. Nirwana Anas, M.Pd, obtained a percentage of 92% with the category "very valid" after revision. Material expert validation conducted by Mrs. Rasyidah, M.Pd, reached a percentage of 90% with the category "very valid" after revision. Character education expert validation conducted by Mrs. Dr. Zulfiana Herni, MA, obtained a percentage of 87% with the category "very valid" after revision.

Research conducted by (Giawa et al., 2022) also showed that media experts gave a score of 94% with a very feasible category. Material experts gave a score of 91% with a very feasible category, and linguists gave a score of 94% with a very feasible category. The results of this study indicate that the module has been well validated by all expert validators. Similar research by (Erita, 2022)(Erita, 2022) showed that the development of this e-module was declared valid based on the assessment of media experts with a percentage of 75% and was declared very valid based on the assessment of material experts with a percentage of 92%. Researchers show that the learning modules developed on average meet the validation requirements so that the modules can be used in various teaching materials and learning resources.

**Tabel 8.** Results Of Teacher Response Questionnaire

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Aspect** | **Score Obtained** | **Maximum Score** | **Percentage (%)** | **Category** |
| Fill | 18 | 20 | 90 | Very Practical |
| Character Value | 11 | 12 | 92 | Very Practical |
| Graphics | 28 | 32 | 87 | Very Practical |
| Presentation | 25 | 28 | 89 | Very Practical |
| **Score Obtained** |  | **82** |  |  |
| **Maximum Score** |  | **92** |  |  |
| **Percentage** |  | **89%** |  |  |
| **Category** |  | **Very Practical** |  |  |

**Tabel 9.** Results Of Student Response Questionnaire

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number Of Respondents** | **Score Obtained** | **Maximum Score** | **Percentage (%)** | **Category** |
| 36 Siswa | 1694 | 1872 | 90% | Very Practical |

The practicality of using the module is obtained from the results of the response questionnaire of biology teachers and grade X students along with statements and responses to the developed biology learning module. This practicality test was conducted after the expert validator validated the learning module. Data obtained from biology teachers at Mas Al-Washliyah Tembung in Table 8, shows that the results of the biology teacher response questionnaire stated that this module was very practical with a percentage score of 89%. Character education-based modules are categorized as very practical because they can be used in the learning process.

Students were given a questionnaire on the practicality of the module developed with 36 students as respondents. The results of the student response questionnaire based on table 9, based on the results of the practicability questionnaire obtained a total score of 1694 and a maximum score of 1872, a percentage value of 90% with a very practical category. Therefore, the character education-based module is said to meet the criteria of practicality. Based on the opinion of (Farihah et al., 2022), it was found that modules can support teachers and students in the learning process, because students can use modules to learn independently and control the intensity of their learning.

**Tabel 10.** Results of Analysis of Character Education Values in Students

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Character Type** | **Initial Score** | **Final Score** | **Maximum Score** | **Initial Percentage** | **Final Percentage** |
| Religious | 248 | 329 | 432 | 57% | 76% |
| Curiosity | 148 | 208 | 288 | 51% | 72% |
| Environmental Care | 146 | 221 | 288 | 51% | 77% |
| Responsibility | 153 | 213 | 288 | 53% | 74% |
| Tolerance | 80 | 107 | 144 | 55% | 74% |
| **Intial Score** |  |  | **775** |  |  |
| **Final Score** |  |  | **1.075** |  |  |
| **Maximum Score** |  |  | **1.440** |  |  |
| **Initial Percentage** |  |  | **54%** |  |  |
| **Final Percentage** |  |  | **75%** |  |  |

Based on the results of the analysis of students' initial and final character values above, it can be seen more clearly, the results are presented in Figure 2.

Figure 2. Tabulation of Students' Initial and Final Character Values

The effectiveness of the learning module was assessed from the results of the character value questionnaire to see the effectiveness of the learning process using the character education-based biology learning module on students. The character value questionnaire consists of 10 questions covering aspects of religion, curiosity, environmental care, responsibility, and tolerance. The number of respondents in this study were 36 students.

Based on Table 10, the assessment results show that the value of students' religious character in the initial questionnaire distribution obtained a percentage of 57% which is classified as moderate. After students read the character education-based ecosystem module, there was an increase obtained from the results of the second questionnaire distribution after the product trial of 76% which is classified as high. The value of students' curiosity character in the initial questionnaire distribution obtained a percentage of 51% which is classified as moderate. After students read the character education-based ecosystem module, there was an increase obtained from the results of the second questionnaire distribution after the product trial of 72% which is classified as high. The value of students' environmental care character in the initial questionnaire distribution obtained a percentage of 51% which is classified as moderate. After students read the character education-based ecosystem module, there was an increase obtained from the results of the second questionnaire distribution after the product trial of 77% which is classified as high. The value of student responsibility character in the initial questionnaire distribution obtained a percentage of 53% which is classified as moderate. After students read the character education-based ecosystem module, there was an increase obtained from the results of the second questionnaire distribution after the product trial of 74% which is classified as high. The value of student tolerance character in the initial questionnaire distribution obtained a percentage of 55% which is classified as moderate. After students read the character education-based ecosystem module, there was an increase obtained from the results of the second questionnaire distribution after the product trial of 74% which was classified as high.

The results of research conducted by distributing the second questionnaire on the value of student character obtained 75% which is classified as high. This shows that the character education-based biology learning module on ecosystem material can affect student character with a percentage increase of 21% with initial data on student character values of 54% In line with research conducted by (Suwanda et al., 2023), namely the development of character education-based digital comic learning media on excretory system material. Researchers also suggested that the results of the value of student character education obtained 66% which is classified as high. So this study shows that character education-based modules on ecosteem material can affect the character value of students. The character education-based learning module developed by researchers is said to be valid, practical, and effective, although there are still some limitations.

**Disseminate**

The disseminate stage is the stage carried out after the product development stage. At this stage, researchers conducted socialization for the distribution of limited character education-based learning modules to X MIA 1 class students at MAS Al-Washliyah Tembung.

**CONCLUSION**

Based on the results of the research that has been done, the character education-based biology learning module has been tested for validity, practicality, and effectiveness. Based on the results of the validity test conducted by three experts, namely media experts, material experts, and character education experts. The media expert was declared very valid with a percentage score of 92%, the material expert was declared very valid with a percentage score of 90%, the character education expert was declared very valid with a percentage score of 87%. Based on the results of the practical test, the biology module was declared very practical with a percentage score of 89% and the percentage of student response scores of 90% was declared very practical. There was an increase in character values in students by 21% with initial data of 54% to 75%, it was stated that the character education-based biology module was proven effective for increasing student character values.

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