

The Development of Character Based Biology Material Learning Model in Improving Students' Environmental Morality

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ABSTRACT

The problems dealing with environment are getting worse and an alteration is required in order to develop students' morality which is based on character education. Besides, a solution in the area of learning system is also needed. It can be accomplished by designing teaching material based on character education. The main purpose of this action is to improve students' characteristic and environmental morality through teaching and learning process.

The purpose of this research is to develop learning media in the form of learning material based on character education for biology subject matter biodiversity for senior high school students that are categorized as appropriate / suitable. This research is a development research that uses Research and Development (R&D) Method.

This research applies development method model 4D consisting of Define, Design, Develop and Disseminate. The data analysis technique used is descriptive analysis and qualitative and quantitative analyses. The data were obtained from three validators that comprise three experts namely material expert, language expert and learning media expert, and reviewers. 20 senior high school students and one senior high school teacher were also involved. The steps to produce learning media in the form learning material based on character education are as follows: doing need analysis (define), designing learning media (design), developing learning media verified by experts (development), and implementing the learning media in schools and doing evaluations (disseminate).

Based on the analysis it can be concluded that the biology learning material based on character education is effective in shaping attitude / character with an average score of 78 and also effective in shaping students' environmental morality with an average score of 76. Based on the scores from the teacher and the expert team it is claimed that the developed learning material is highly capable to form positive character of the students and also their environmental morality.

Keywords: Biology Teaching Material, Character Education, Environmental Morality

INTRODUCTION

Education is considered to be the best place to prepare nation's agents of change that will bring about welfare for the country. Besides, educational institution is not only as a place knowledge but also to shape attitude, behaviors, characters, and leadership of the youth (Rokhman F., Syaifudin A., Yuliati, 2013).

To educate students in forming character teacher or educator who have the competence in character education. The educational competence of a teacher is crucial in achieving educational goals aside from the competence in his field, his general knowledge and pedagogical knowledge (Mehmet Ulger, Suleyman Yigittir, Orhan Ercan, 2013). The research that applied survey model was intended to identify the teacher competence, that plays an important role in forming students' character together with their parents, in this research through self assessment.

The data was collected with the help of CECBS (Character Education Competency Belief Scale) that was developed by Milson & Eksi (2003). The research team consisted of 231 teachers that were employed in various provinces in Turkey. The result shows that teachers' belief about character education competency is centered on "agree" on CEC (Character Education Competency) dimensions and GEC (General Education Competency) dimensions.

Teachers play determining roles in technical field of education that is learning. In the teaching activities a teacher should prepare and plan teaching and learning process to be carried out. An effective teacher is required to possess four areas of competencies, namely planning, execution, evaluation, development of learning system (Hamzah, 2012).

Module is one of learning material developments starting from planning the learning system that has to be possessed by a teacher. In another definition module is printed learning material that is used by students as a means of learning independently and is also used by a teacher to give the materials to the students in a good order. One of the supporting factors for the success of carrying out the curriculum is the learning material because learning material makes it easy for the teacher and students in the teaching learning process, improving the learning quality and also achieving the learning objectives (Tirtaraharja, 2013).

Living environment morality is often depicted as 'natural evolution of world morality.' What it means is that, world morality is more and more concerned with the universe and ecological problems. In the beginning world morality was concerned more with social relationship among individuals and then later with social interactions between individuals and the whole society (William, 2015).

Following the footsteps of Aldo Leopold, Eugene P Odum from Georgia University, Athens (United States) formulates environmental morality as philosophical and biological considerations about the relationship between human individuals with the place they live in and all other non human living organisms. In civilized society, this morality leads humans to reconsider several ideas which are right or wrong regarding human behaviors towards their living environment. It should be realized that the individual and social life quality depends a lot on environmental condition. The extension of ethics that covers human relation with environment should be an integral part of human philosophy. Human vision and behavior can not be separated from philosophical consideration that color his life (William, 2015).

The result shows that there is a significant positive correlation between the comprehension of ecocentric morality and environmental ethics, although there is no significant relationship statistically between the moral comprehension and environmental ethics that are not anthropocentric. This research finding supports the argument that environmental ethics, that extends moral considerations outside of human to the universe as a whole, needed to overcome the so many environmental problems (Tuncer et al., 2011).

Based on various understanding above, it should be realized that environmental management by human until now is not in accordance with environmental morality. Environmental morality is crucial in balancing the universe, meanwhile human is of the opinion that he is not part of the universe so he manages it freely even to the point of destroying it. Hence, as a solution to improve students' environmental morality, a learning material which is based on character education should be developed. The outcome of this material development can be a breakthrough in carrying out environmental education that is more dynamic and more contextual with the reality of daily life.

METHOD

The research was conducted at SMAN 1 Caringin located on Jl. Mayjen H E Sukma Caringin, Cimande Hilir, Bogor Sub Regency, Bogor Regency. The research was carried out starting in May until August 2018. This research was a development research (Research and Development), utilizing 4D model (Define, Design, Develop, and Disseminate). Research and Development is a research model which is used to create a certain product and evaluate its properness and effectiveness of the product (Sugiyono, 2016). The developed product is a biology learning material module based on character education in the materials of bio diversity.

The steps of Research and Development refers to Thiagarajan (2013) in Sugiyono (2016) with 4D model that has been modified in figure 1 below :

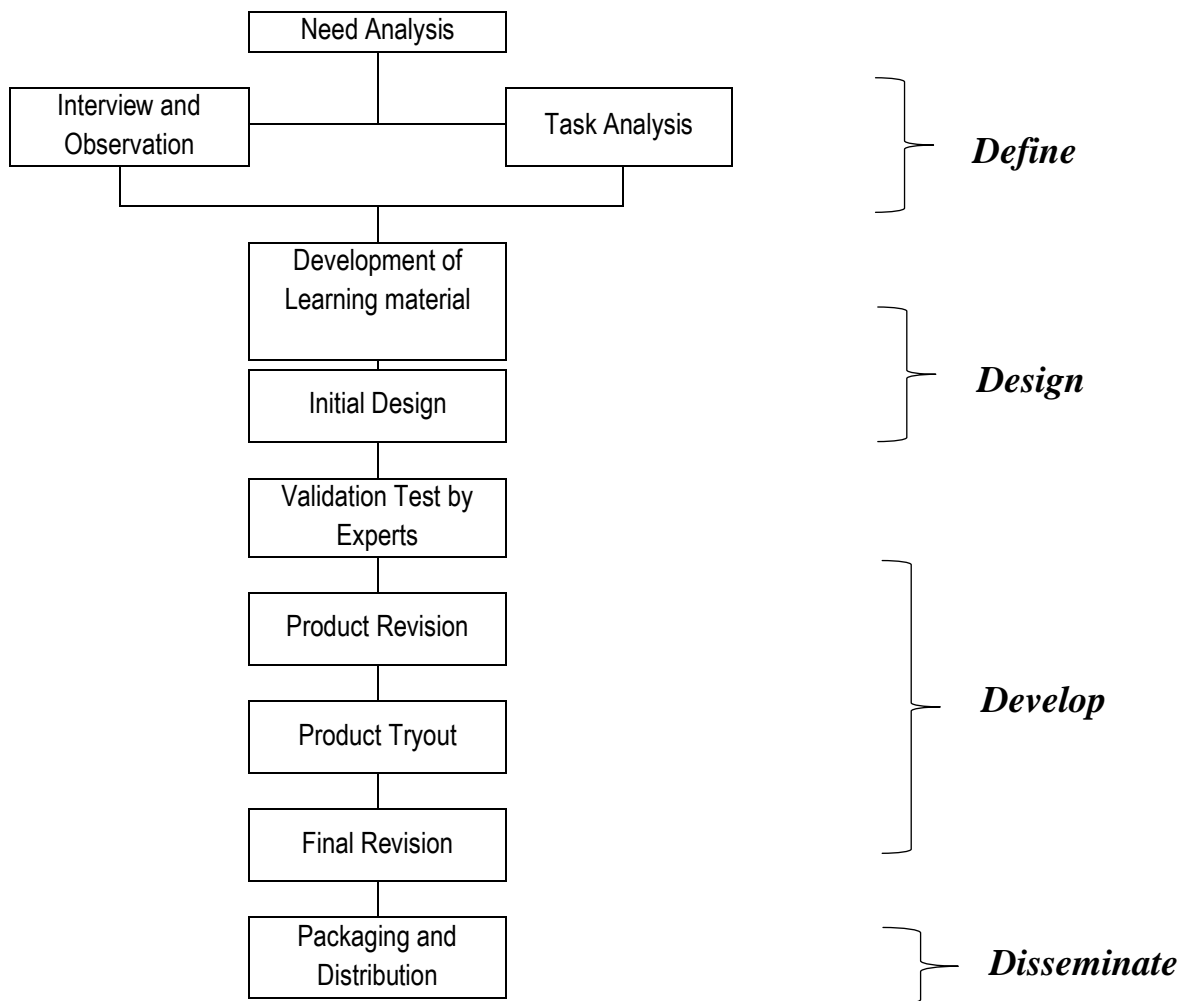


Figure 1. Product Try Out Design

Analysing step is conducted through working on the data gathered by using the instruments. The product in a form of teaching material is validated by three different experts, they are an expert of content material, an expert of design and an expert of character education. To get the data about the quality of teaching material being developed, a formula proposed by Arikunto is used:

1. Expert Validation

$$\text{Score} = \frac{\text{average of validation score}}{\text{Maximum Score}}$$

The result of calculation is interpreted based on scoring criteria. The scoring criteria can be seen in the following table.

Table 1. Expert validation criteria toward Biology material development Based Character Education (Arikunto)

Percentage (%)	Criteria
86 – 100	Sangat Layak
71 – 85	Layak
56 – 70	Cukup Layak
<55	Kurang Layak

2. Product Effectiveness

The effectiveness of the product can be seen based on the influence of the product on students' character value and environmental morality.

$$\text{Skor Penilaian} = \frac{\text{jumlah skor yang diperoleh}}{\text{jumlah total skor}} \times 100\%$$

The result of the calculation, in a form of questionnaire administered to the students after using the product, is interpreted based on scoring criteria. The scoring criteria can be seen in the following table.

Table 2. The criteria of Product Effectiveness toward the Development of Students' Character Value

Average Score	Criteria
86 – 100	Very Effective
71 – 85	Effective
56 – 70	Effective Enough
<55	Less Effective

RESULTS AND DISCUSSION

A. Product Development of Biology Teaching

The research design applied is 4D model from Thiagarajan, which consists of 4 stages namely definition, design, development, dissemination. The data related to every stage of the development that are conducted are as follows:

a. Definition

The first stage done to determine and define the development requirements is by analysing Core Competency, Basic Competency, and Competency Achievement Indicator of the material the bio diversity, and collect information through observation and interview of students and teacher.

This is supported by the theory, Muchlich Mansur, (2010) in Novi Aryu's review, (2014) which states that several criteria of content appropriateness that has to be fulfilled by a learning material is the **accordance** of the learning material with SK () and KD (Basic Competency) that are stated in the curriculum of the respective subject matter.

This definition process is also done through observation and interview with the students and the teacher. In the interview it is stated that the learning material in the form of module to be used in Biology subject matter was still not available. The character education and environment education of the students are still not optimally implemented in Biology learning. Based on those observation and interview, it was agreed on that there should be a development of learning material in the form Biology module based on character education with the hope of shaping attitude (character) school environmental morality of the students.

b. Design

The step in this design stage was begun by preparing and making the development design of Biology learning material. This stage consists of: 1) deciding the material; 2) indicator; 3) Teaching objective; 4) Designing LDS; and 5) evaluation of test materials. The learning material was made for two learning sessions and was designed according to the characteristics of the material to be developed. According to Sugiyono, (2016) creativity is used to decide the right idea in determining the concept that is suitable with the product to be created.

As a whole the delivery of learning material based on character education possess four basic contents, i.e. religious, honest, responsible, and communicative values. The interpretation of the four contents of character value are presented in learning materials based on character education as follows:

1. Religiousness value.

Religious value is an affective competency that reflects students' faith in God the Almighty. The message and the learning content of the learning material development consist of events and phenomena that are often seen and felt by the students in their surroundings. The moral message about the importance of tolerance, grateful for the blessing from God and are able to communicate it and also love towards the surrounding are already presented in the religious content of the Biology learning material development.

2. Honesty value.

Being honest is an attitude and behavior that reflect the unity between knowledge, talk, deed (knowing what is right, saying the right thing, and doing the right thing) so that the person becomes trustworthy. The message and the learning content of the developed learning material is events and phenomena that can be seen and felt by the students in their surrounding. The moral message about commitment, sample figure in social role model, and love for the truth has been presented in the content of being honest of the learning material development.

3. Responsibility Value

Being responsible is a person's attitude and behavior to do his task and obligation, that he has to do, towards both himself and others in his surrounding. The moral message about resilience, hardwork, courage, and awareness towards the environment has been presented in the content of the responsibility in the developed Biology learning material.

4. Communicativeness Value.

Being communicative is attitude that shows fondness of talking, socializing, and cooperating with other people. The message and learning content of this developed learning material derives from events and phenomena that can be seen and felt by the students in their surroundings. The moral message about competency, creativity, innovation, and friendship have been presented in the communicative content at the developed Biology learning material.

Character education is an effort intentionally done to develop good character based on the core policies objectively both for the individual and the society (Sundari, 2016). The indicators of character values that are found in the learning material are presented in table 4.

Table 4. The indicators of Character values in the developed learning material.

Indicator	Location at Learning material		
	Learning activities	Content	Page
Religious	appreciation activities	"Have you known your God?"	Page 3
		"Have you communicated with your God?"	Page 14
Honest	Main activity	Article	Page 17
Responsible	Main activity	Article	Page 10
Communicative	Main activity	Student discussion page	Pages 4 and 21

Being religious means having faith, following the religious teaching based on his/her faith, and respecting differences of religions. This character covers always working in accordance to his/her obligation, and keeping the trust of other people, and also having a courage to admit his weakness while accepting the strengths of other people. In the development of learning material, religious value.

Honesty character is an attitude and behavior that reflect a unity between knowledge, speech, action (knowing what is right, saying the right thing, and doing the right thing) so that the person becomes a figure that can be trusted (Sundari, 2016). When developing the learning material, the honesty character value is put at the core activity that is at the article content in the middle of the material. The honesty value that is developed is by describing a sample figure as a social role model that loves the truth, has moral commitment and believes that honesty will bring virtue.

Being responsible is an attitude and behavior of a person to do his task and responsibility, which he has to fulfill, both towards himself and others in his surroundings (Sulistiyowati, 2016). In the development of learning material, the character value of responsibility is put at the core activity that is in the article content in the middle of the material. The responsibility values that are developed are participating in keeping the environment and finding solutions in an effort to preserve flora and fauna available in his environment.

Being communicative is activity that shows the fondness of talking, socializing, and cooperating with other people. At the development of learning material, the value of communicative character is presented at the core activity that is at the content of LDS (Students' Discussion Sheet). The instructions at the Student Discussion Sheet at the developed learning material emphasizes that the students conduct group discussions. Therefore it is expected that there will be interactions among the students by prioritizing cooperation and respecting one another's opinion and later every group will have to present the result before their friends and teacher.

c. *Development*

Development is validation stage to the initial product by feasibility assessment of the learning material through examination by experts and by a small group. The test to decide its appropriateness and validity is done by learning material experts, design experts and character education experts. The product suitability test is intended to find out whether a product is suitable or not to be used in learning process. A text book is said to be suitable if its validation score is "good" or "very good" (Solahudin, 20110).

1. Material Evaluation

Material component of learning material is considered appropriate if it fulfill these aspects: 1) the suitability of the material with basic competency; 2) the clearness of objective and indicator in the learning material; 3) the depth and width (the scope) of the material; 4) The accuracy of concept, definition, and fact; 5) the accuracy of examples, cases, pictures, and illustration; and 6) Accuracy of literature reference.

Data were obtained from three validators (validating experts) that consist of 2 lecturers and 2 Biology teachers through product validating instruments. The scores and average obtained by the participants of each suitability aspect are shown in the following table:

Table 5. Material Appropriateness Recapitulation by Expert Lecturers.

Aspect	VAL-1	VAL-2	Average
The suitability between material and basic competency.	2	3	83
The clarity of objectives and indicators of the learning material.	3	3	100
Depth and Width of the material (the scope of material).	3	2	83
The accuracy of concepts, definitions, and facts.	3	3	100
The accuracy of examples, cases, and facts.	2	3	83
The accuracy of reference.	3	3	100
Average			92
Criteria			Very Suitable

Tabel 6. Recapitulation of Material Suitability by Biology Teachers

Aspect	VAL-1	VAL-2	Average
The suitability between material and basic competency.	3	3	100
The clarity of objectives and indicators of the learning material.	2	3	83
Depth and Width of the material (the scope of material).	3	3	100
The accuracy of concepts, definitions, and facts.	3	2	83
The accuracy of examples, cases, and facts.	3	2	83
The accuracy of reference.	3	2	83
Average			89
Criteria			Very Suitable

Based on the result analysis of product suitability, the suitability aspect of the material both from the expert lecturers and the biology teachers get the average score of 90 with the criteria of very suitable. Validation result gives notes that the presented contents and the developed learning materials have been in depth and are in line with the Core Competency, Basic Competency and Grade Point Average.

The contents to be presented in the learning materials are "light" so they will help the students to reduce burden related to the material concepts. This is in line with Solahudin's research (2011) with research title "Pengembangan Buku Ajar Kimia Kelas X" (Developing Chemistry Student Book Year X.) which states that students are motivated to learn Chemistry further when the delivery learning content is designed "lightly" to avoid burdensome concepts presentation like what is common in Chemistry text books in general.

2. Design Examination

The design component of the learning material is said to be suitable if it fulfills several criteria: 1) Color composition of the content; 2) layout; and 3) Attractiveness. The data were obtained from 2 Biology lecturers of FKIP (Faculty of Teacher Training and Education) Pakuan University through product validation instrument. The scores earned and their average for every suitability aspect of design component of Biology learning material are given in table 7.

Table 7. Recapitulation of Suitability Design taken from Expert Lecturers

Aspect	VAL-1	VAL-2	Average
Color Content Composition	2	3	83
Layout B	1	3	67
Attractiveness	2	3	83
r	Average		78
d	Criteria		Suitable

Based on analysis result of product suitability, the suitability aspect of the design component given by expert lecturers, the average score is 78 with the criteria "Suitable." The score is proved with the fact that the pictures, illustrations, font, layout, and consistency is already correct, suitable and the appearance is attractive. Some suggestions for improvement or revision of the learning material before before being tried out have been done based on validation from the experts.

3. Character Education Scores Examination

The data for suitability and validity of the product related to character education that are given by 5 validating experts that consist of 3 lecturers and 2 Biology teachers through a product validation instrument. The obtained scores and their average in every komponent suitability of Character Education scores in Biology learning material are shown in Table 8.

Table 8. Rekapitulation Suitability Scores on Character Education Given by Experts.

Aspect	VAL-1	VAL-2	VAL-3	VAL-4	VAL-5	Average
Religious	3	3	3	3	1	87
Honest	3	2	2	2	3	80
Responsible	3	3	3	3	3	100
Communicative	2	2	3	3	3	87
	Average					88
	Criteria					Very Suitable

Based on the analysis of product suitability results, the suitability score on the aspect of character education from expert lecturers and Biology teachers get an average score of 88 with the criteria "very suitable."

Recapitulation of scores from all validating experts on 3 suitability aspects can be seen on table 9.

Table 9. Rekapitulation of Scores by Validating Experts

Suitability Aspect	Average Score
Content	90
Design	78
Score of Character Education	88
Average	85
Criteria	Very Suitable

The evaluation results of the validating experts and their suggestions have been used as a base to conduct a limited product tryout to a small group to get direct input in the forms of responses, reactions, opinions towards the product of Biology learning material that has been developed.

The data were collected from 6 validators (evaluators) that are class XI students using product validation instrument. The scores obtained and their average of every suitability aspect of Biology learning material can be seen in table 10.

Table 10. Limited Product-Tryout Results

Aspect	V1	V2	V3	V4	V5	V6	Average
The concept delivered in learning material is suitable with the learning indicators.	5	5	5	4	4	4	90
The pictures make the students easier to learn the concepts.	4	4	4	4	5	4	83
The pictures in the learning material lead the students in finding the concepts in ecosystem lesson material.	4	4	5	3	3	3	73
The materials that are given through the developed learning material are easier to understand.	3	4	4	5	5	5	87
The learning materials have attractive appearance.	4	5	4	4	4	4	83
The font used and the writing in the learning material are clear.	3	5	4	4	4	4	80
The language in the learning material is easy to understand.	4	5	4	5	5	5	93
The learning material is more practical and can be learned repeatedly.	4	4	3	5	5	5	87
The learning material can be learned either individually or in groups.	5	5	4	3	3	3	77
The illustration, pictures and examples in the learning material are already suitable with the moral message of religious value.	4	4	4	4	4	4	80
The illustration, pictures and examples in the learning material are already suitable with the moral message of honesty value.	4	3	4	4	4	4	77
The illustration, pictures and examples in the learning material are already suitable with the moral message of responsibility value.	4	5	3	3	3	3	70
The illustration, pictures and examples in the learning material are already suitable with the moral message of communicative value.	4	5	3	4	4	4	80
Average							82
Criteria							Very Suitable

Based on the product tryout analysis given to a limited group consisting of 6 students from class XI, it is found out that the average score of suitability is 82 with the criteria "very suitable". It is proved from the average response of the students in the limited tryout which states that the cover is already attractive, font type is easy to read, material explanation is easy to follow and gives new knowledge, every activity is provided with character value and with the Biology module the students are highly motivated to learn the subject matter.

This result is used as a base for the suitability of Biology learning material product to move forward to the next stage that is dissemination or socialization of the product in a limited manner to class X MIPA-2 at SMAN I Caringin.

d. **Dissemination**

Dissemination stage at this research is dissemination / distribution in a limited way that is done to class X MIPA 2 SMAN 1 Caringin. To measure product effectiveness, the researchers use two instruments that are questionnaire about student character and questionnaire about environment moral evaluation that are given after two learning sessions are finished.

1. Effectiveness Test of Students' Character

There are 4 basic contents of characters values that are developed in the learning material; they are religious, honest, responsible and communicative values.

The results of questionnaire to test students' character after using the developed Biology learning materials based on character education in the lesson of bio diversity class X show the average score character test obtained by the students is 78%, that means it is effective in helping the learning process.

This claim is supported with the results of students' attitude observation when they are having discussions, doing post test, and answering questionnaire to score their character and 78% of the students reach the learning objective. The students are helped with the use of the Biology module because the delivery of the message and the learning content are combined with character value.

This fact is in line with what Tita Meliawanti, (2016) states that learning material based on character education is marked with the existence character values that can build positive character of the students. Learning material is considered effective when 60% of the students reach the learning objectives or reach a certain achievement based on proportion test.

Effectiveness of character values that are formed can be seen from the average scores they get in the character test for each indicator, as shown in figure 2.

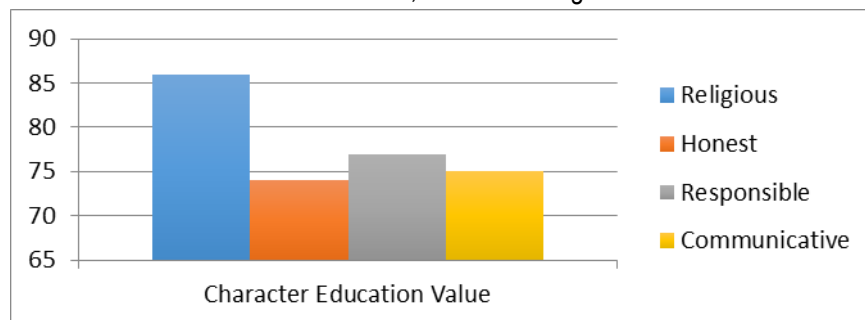


Figure 2. The effectiveness of Biology learning material development based on character education per-Indicator.

Figure 2 shows average score character test per indicator that the students get after using the developed biology learning material during learning sessions. The average scores per indicator are for religious value with the percentage of 86% as "very effective", honest value indicator of 74% as "effective", responsible value indicator with the percentage of 77% as "effective", and communicative value indicator of 75% as "effective" in the use the Biology learning material based on character education. All the illustrations about character values that are incorporated in the learning materials are made based on events or phenomena that can be seen and felt around school, so that they help students to comprehend better the application of the character values found in the materials.

This is in line with Hariyanto's theory (2017), that one of the principles of an effective character education is that the ethical values as the base of good character building is well promoted. Biology learning material based on character education is a facility that teachers use to facilitate promoting ethical values to the students their learning processes.

The illustration of implementing character values in learning materials designed with contextual learning, so that the students are helped in connecting learning materials with real life. This is also in accordance with Kurniawan's theory (2016) that the goal of character education is becoming intermediary to realize a certain character which is implemented by contextual educational process.

2. Effectiveness Test on Students' Environmental Morality

Questionnaire results on students' environmental morality test after using the developed Biology learning material based on character education about bio-diversity in class X shows an average score of 76% .

The environmental morality effectiveness that is formed can be seen in the obtained average score for each indicator in figure 3.

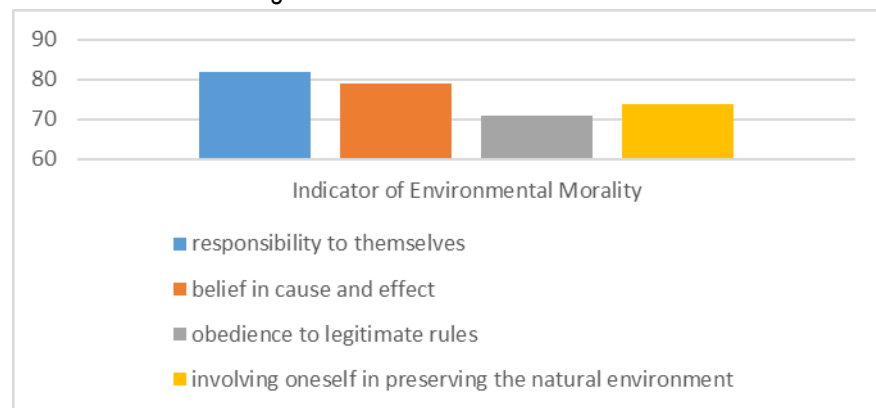


Figure 3. Effectiveness of the Development of Biology Learning Material Based on Character Education to Environmental Morality per-Indicator.

Figure 3 shows the average score of character per indicator that the students get after using the developed biology learning material in their learning process. The average score obtained for responsibility to themselves is with the percentage of 82% "very effective", the indicator of belief in cause and effect with the percentage of 79% is rated as very effective, the indicator of obedience to legitimate rules with the percentage of 71% is considered effective, and the indicator involving oneself in preserving the natural environment with the percentage of 74% means being effective in using the developed character based education for Biology learning material.

Kesuma (2013) states that morality as a life aspect that can influence other aspects of life. One of them is social environment aspect that gives accepting attitude that will give an opportunity for individuals to experience consequences of his own behaviors, so that a kind of belief can be built in making independent decisions, increasing self confidence and also trust on other people.

According to Kesuma (2013), (akhlak) attitude is equal to morality. Akhlak (attitude) is mind's movement that triggers the body to take actions without prior thinking. It is the mind's condition that produces actions easily without having to think first. Based on that definition it can be known that in the context of morality there are desires that are accustomed, as a result it can create actions easily, without much prior consideration or thought prior. So important is the role of morality in students' life that students actions or behavior to the environment can be based on environmental morality.

According to Supriadie (2012) morality logical reasoning can influence the way someone thinks objectively that can determine whether the behavior will be good or bad. Similar to Supardie, according to Tuncer (2011) environmental moral reasoning can reflect a process that can determine an idea or action that is good or bad in keeping and protecting the environment.

B. Students' Response and Teachers Opinion after Using the Developed Biology Learning Material

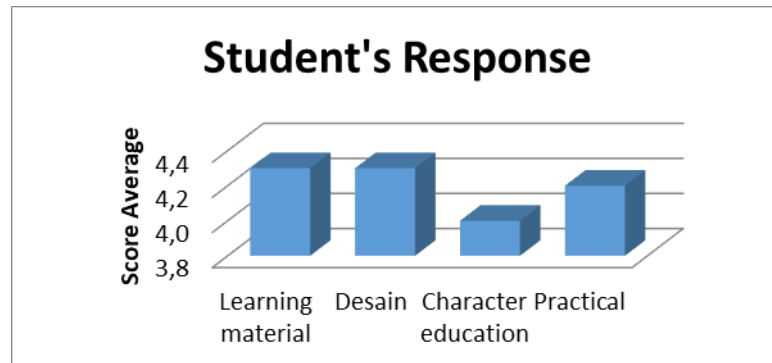


Figure 4. Students' response on the Developed Biology Learning Material Based on Character Education.

Response from students as users of the learning material should be taken into consideration. Indeed the result based on the response the students to the developed learning material as can be seen in Figure 20 belongs to "very good" with the percentage of 84%. The result of students' response is considered very good and very suitable if the percentage is >80% (Arikunto, 2012). This indicates that the students prefer Biology learning material which is developed based on character education which are concise, practical, easy to understand, and attractive appearance. This finding is in accordance with Arif Solahudin's statement (2011) that a learning material is good when the students feel the material assists them in understanding concepts, gives them interest, and motivates them to learn independently.

Teachers are some of the users of learning media. Besides students' response, the teachers' response to the developed Biology learning material based on character education are also used to measure the learning media effectiveness. The teachers' response to the developed Biology learning material can be seen in Figure 5.

Teachers response on the developed biology learning material based on character education can be seen in figure 5.

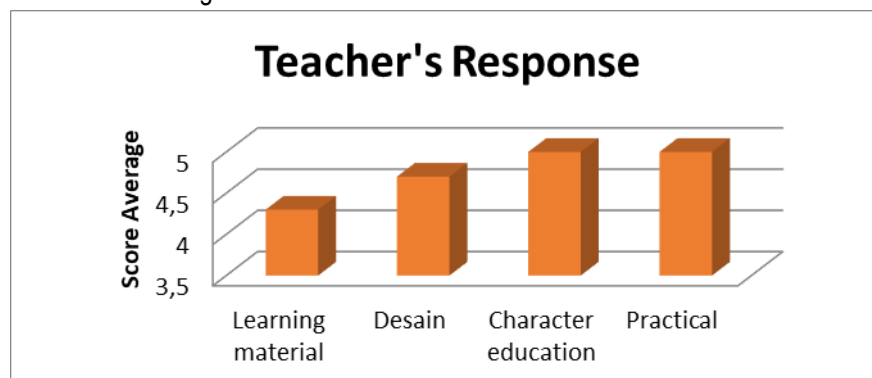


Figure 5. The result of Biology Teachers' Response on the Developed Biology Learning Materials Based on Character Education.

The result of the data derived from teachers' responses to the development of Biology learning material based on character education is very good as seen in figure 21; the average score from the data is 95%. According to Arikunto (2012) a media is said to be good if it gets a score of >80%. This shows that the character based Biologi learning material that is developed is suitable to be used in Biologi learning process. The teachers feel they are helped with the availability of this learning material, because it is already provided with students' discussion sheet, material and evaluation so that it facilitates their learning process.

CONCLUSION

Based on the research result and the material development it can be concluded that the Biology learning materials based on character education is effective in shaping attitude / students' character and environmental morality. Therefore, this learning material can be categorized as suitable, practical and effective to be used in Biology learning process at Senior High School. Further research is needed to conduct in order to find out the significance of the development of biology material based on character education toward students' creativity in designing more than one chapter of the material by using experiment and control class.

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