

Development and Validation of e-Books during the Post-Pandemic to Improve Attitude towards Environmental Care in Case of Indonesia

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Abstract—Indonesia has natural diversity in the form of tropical rain forests, the sea, flora, and fauna. Information technology adaptation is needed considering its development and use is getting higher, especially during the pandemic and post-pandemic periods. Through information technology in the form of E-books based on local wisdom, an attitude of caring for the environment grows. This research aims to combine information technology, environmental-based science learning, and local wisdom in growing students' environmental care character. Through the use of e-books based on Google's website as information technology in implementing a green science learning model that is oriented to local wisdom. This study develops and validates an e-book based on local wisdom through the ADDIE research design. The results of the analysis and discussion are that the development of an e-book based on Google's website with a green science model oriented to local wisdom is declared valid and feasible to use with an average percentage of 90.74% from the three experts. Then the results of student responses also showed a positive response from students with a percentage of 90.29%. The application of google site-based e-books in the green science model oriented to local wisdom in learning can increase the growth of environmental care characters for junior high school students as evidenced by the results of multiple regression analysis of significance 0.00 below 0.05.

Keywords—e-Book; Google site; green science learning model; local wisdom; environmental care character

I. INTRODUCTION

In the new normal era after being released from the pandemic, Indonesia began to rise and begin to be able to adapt to the pandemic environment. Likewise, education was also affected by the pandemic which eventually adopted technology and information as a solution in the learning process. Adaptation in digital learning is beneficial in pandemic learning because it can reduce the spread of the coronavirus [1]. Layali et al in their research argue that E-learning can be positively accepted in learning during a pandemic [2]. In addition to the pandemic, Indonesia has experienced a decline in culture and care for the environment because people cannot leave their homes so cultural activities do not run effectively. Research conducted by Yanuarita & Haryati [3] took samples in socio-cultural conditions in Indonesia which showed a negative impact during this pandemic. Meanwhile, Indonesia is a country that is rich in cultural diversity. This culture has been passed down from generation to generation by the ancestors

until now. If these problems are not addressed, Indonesia can lose its original culture and education can also have an impact.

Local culture or local wisdom is also essentially the foundation of the philosophy of education in Indonesia as a filter in an outside culture that enters through electronic media. This local wisdom can also shape the character of discipline, honesty, cooperation, responsibility, environmental care, and tolerance [4]. This local wisdom can be developed and integrated into the educational curriculum [5]. Even in the research of Ratminingsih et al [6], learning media integrated with the local culture can increase students' basic competence in learning. In social life, local wisdom is ingrained and becomes a guide in determining a decision. The local wisdom can be expressed in the form of learning models or learning tools. Local wisdom is associated with scientific and rational real life. Local wisdom also has a relationship with the environment or nature so that local wisdom in learning is more contextual.

The green science learning model is a learning model that contains the characteristics of the learning model according to Arends [7]. The characteristics of the model include the underlying theory, learning objectives, syntax, and classroom management. The green science learning-oriented model is a learning model that is based on the environment. Environmental-based learning was first initiated by Jan Ligthart in 1859. The next figure who moved environment-based learning was J.J Rousseau. The learning idea is to bring students to real situations within the main learning environment. Piaget [8] supports this by stating that children's thinking in the formal operational period is no longer centered on what is seen, but can think of a hypothesis. Besides being able to have an impact on student character, the green science learning model also requires learning media and, books/student worksheets as an aid in learning.

Previous research on educational technology in general regarding the use of technology in learning has not discussed integration into aspects of local wisdom. For example in research Sindi et al [9] stated that today's education, especially in pandemic conditions, applies technology and information in the classroom because it includes kinesthetic, visual, and auditory aspects. Learning media in education in the digitalization era is now applying technology and information as mandatory. Constraints in digital learning are concentration

in learning, interaction in activities, and decreased motivation, but information technology-based learning can still find a place if it is packaged interactively and innovatively to generate enthusiasm for learning [10]. It is indeed needed in the development of learning media in technology because in the digital era there are now many programs that are used. According to Xin & Singh [11], the transformation in educational technology is now available in various platforms that can be used, such as e-learning, e-books, learning management systems, and evaluation systems learning. e-Books are part of the learning media in the form of interactive electronic-based textbooks for access [12], [13], [14].

The difference and the novelty of the research carried out is the development of e-books made into google sites for easy access, e-book content containing local wisdom-based science learning models in growing environmental care characters. The choice of developing an e-book makes it easier for students to access and use it because it can be used with electronic media [15]. The use of the google site is easier in design, development, and implementation, especially free and unpaid aid, which can be used by all groups. The cultural element is local wisdom in green science learning as character building. So to combine the components of technology, teaching, and culture, it is developed, integrated, and implemented to grow the character of caring for the environment.

II. METHOD

A. The Research Model

The research was conducted using a research and development (R&D) research model. The development procedure used refers to the ADDIE development model. Branch [16] describes the ADDIE model development procedure including analysis, design, development, implementation, and evaluation steps. The procedure for developing the ADDIE model in this study can be explained through the flow chart in Fig. 1 below:

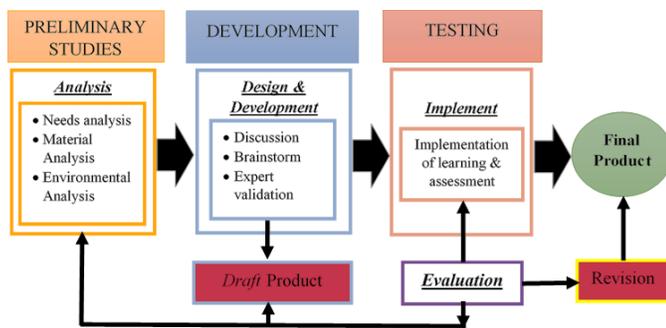


Fig. 1. ADDIE Model Development Flow.

Following Fig. 1 shows the stages of development to implementation. The analysis phase contains an analysis of needs in learning, especially during a pandemic and online learning. Regarding the need for technology and information in learning, these components are examined into learning materials that can be linked to culture and environment in learning natural sciences. The Design and Develop stage is a follow-up to the analysis stage, which requires learning media that combines technology, local culture, and green

science learning model learning in growing the character of caring for the environment. The selection of e-books through the Google site as a development product with the contents of the green science learning model based on local wisdom foster a caring character for the environment. The developed learning media products are then tested for feasibility and discussed with the Experts in the Group Discussion Forum.

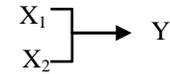


Fig. 2. Product Implementation Paradigm.

Product development results are implemented in learning to be tested using quantitative analysis. According to Fig. 2, X_1 is the independent variable. The first independent variable is the development of e-books based on google sites, X_2 is also the independent variable is a green science learning model based on local wisdom, and Y is the dependent variable is the character of environmental care. This is followed by the evaluation stage of the implementation of the e-book based on the Google site as a development product with the contents of the green science learning model based on local wisdom to cultivate the character of caring for the environment, questionnaires, and student responses.

B. Research Sample and Instrument

To implement and evaluate product development, a sample of 32 students was taken at Bumiayu Junior High School, Brebes Regency, Indonesia to collect response data.

Evaluation of the application of student worksheets was taken using a questionnaire and student responses. The student response instrument using student worksheets also uses a response questionnaire. Both instruments use a Likert scale of 1-4 with a description of a score of 1 is not good, a score of 2 being quite good, a score of 3 being good, and a score of 4 being very good.

C. Data Analysis

The feasibility test data is used to determine the feasibility of the product that has been developed through expert validation, which consists of 3 experts including material experts, technology media, and models. Furthermore, implementation is carried out to students to determine student responses using student worksheets. Taking expert validation sheets and student response questionnaires through qualitative data which is converted into quantitative data with a Likert scale of 1-4. Furthermore, the data is analyzed and considered feasible if it is declared valid using descriptive analysis. Based on the following equation (1):

$$P = \frac{\sum x}{\sum x^i} \times 100\% \quad (1)$$

Info :

P : percentage of expert/practitioner validity.

$\sum x$: total number of respondents' answers.

$\sum x^i$: the total number of ideal scores in one item.

The data is then converted based on the validity conversion which can be seen in Table I.

TABLE I. VALIDITY CONVERSION GUIDELINES

Score Range (%)	Category
90 – 100	Very valid
75 – 89	Valid
65 – 74	Quite valid
55 – 64	Less valid
0 – 54	Invalid

The data from the implementation of the use of e-books based on google sites in the local wisdom-oriented green science learning model were analyzed through multiple regression tests. Multiple regression test aims to determine the effect of the use of e-books through Google sites in the local wisdom-based green science learning model on the character of environmental care. By using the IBM SPSS 25 application in multiple regression tests with the following hypothesis:

H_0 The variable of e-books based on google sites in the local wisdom-oriented green science learning model affects the character of caring for the environment.

H_a Variable e-books based on google sites in the green science learning model oriented to local wisdom do not affect the character of caring for the environment.

The multiple linear regression equation used for data analysis on Eq. (2).

$$Y = a + b_1X_1 + b_2X_2 \quad (2)$$

According to equation (2), the values of X_1 and X_2 are independent variables of the study with Y as the dependent variable. Where a is a constant coefficient, b_1 is a variable coefficient of X_1 and b_2 is a variable coefficient of X_2 which is obtained from the results of data analysis.

The result of the multiple regression test is interpreted that the significance value of the SPSS calculation results is less than the degree of freedom, which is 5% (Sig. < 0.05), then the hypothesis H_0 is accepted. This means that there is an influence on the use of e-books based on Google sites in the green science learning model oriented to local wisdom on the character of caring for the environment. Conversely, if the significance value is more than 5% (Sig. > 0.05), then there is no effect, meaning that H_0 is rejected.

III. RESULT AND DISCUSSION

The findings and discussions were carried out by developing an e-book of local wisdom oriented towards green science learning through the ADDIE design. The development of this e-book product was validated by several experts to test its feasibility. Then it was tested and evaluated on improving the attitude of caring for the environment in junior high school students. the ADDIE development process is produced as follows:

A. Analysis Stage

The analysis stage is carried out by analyzing needs, materials, and the environment. At this stage, as complete information as possible is extracted to obtain everything needed to proceed to the next stage. The analysis phase is carried out by direct observation of students, teachers, curriculum, and the school environment. The needs, material, and environmental analysis stages are carried out by analyzing essential learning materials and learning media so that they can be used in learning that relates to these myths and fosters an attitude of caring for the environment. The results of observations for the analysis of needs, materials, and the environment in the development of learning media, the following is a description of the analysis:

TABLE II. DESCRIPTION OF THE ANALYSIS STAGE

No.	Aspects analyzed	Analysis Results
1.	Need analysis	Innovative natural science learning based on technology without losing cultural and environmental values. By using an e-book-based Student Worksheet in which students interact in learning activities.
2.	Material Analysis	Natural science learning has themes and materials that can be related to cultures such as mythical culture and the environment. All of Indonesia has a wide variety of cultures and nature because it is an archipelagic country.
3.	Environmental Analysis	The education sector can contribute to environmental sustainability. Students are taught indirectly through learning in nature.

Table II shows the need for learning that combines learning about natural science, culture, and technology to develop e-books based on Google sites in a green science model oriented to local wisdom to foster an attitude of caring for the environment.

B. Design and Development Stage

The next stage is product development, namely from product drafts according to Fig. 3. The use of google sites is easy to use in the process of making e-books, without using complicated web coding, you can create good website features.

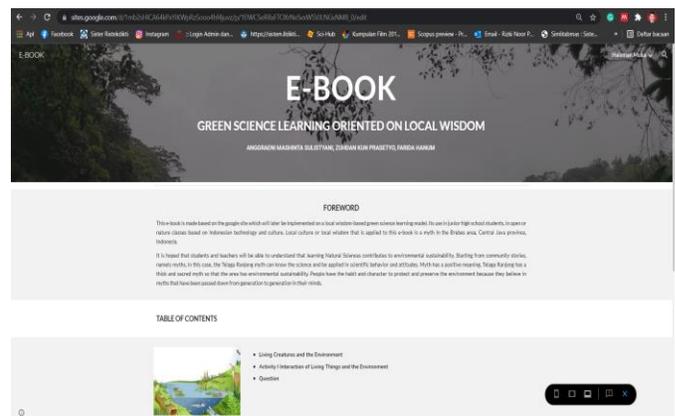


Fig. 3. Product Draft Start Page View.



Fig. 4. E-book Display in a Smartphone.

Even by using the Google websites that we have designed, they can be accessed in the form of a smartphone display as shown in Fig. 4. The goal is to facilitate access so that students can use it anywhere and anytime.

The feasibility test of the product development draft from Fig. 3 and Fig. 4 was carried out through a Forum Group Discussion (FGD) between product makers and experts who assessed the feasibility of the product. Each expert who participated in the FGD provided an assessment and suggestion for the product. The results of the e-book validation questionnaire based on Google sites in the local wisdom-oriented green science model from the Learning Model Experts obtained scores according to Table III.

Following Table III, the total score is 31, and the conversion score is 86.11%, so it is included in the Valid category. From the two scores, according to experts, the product model is valid and suitable for use in learning. Suggestions from model experts are to realize the application of e-books in the learning of green science models oriented to local wisdom with student activities in the environment.

The results of the e-book validation questionnaire based on google sites in the local wisdom-oriented green science model from the Material Experts obtained scores according to Table IV.

Based on Table IV, the total score of 32 is calculated, and conversion score is 88.89, so it is included in the Valid category. From the two scores, according to the expert, the product material is valid and feasible to be implemented or applied in learning. Suggestions from material experts for product development, namely the learning theme is made to foster an attitude of caring for the environment.

TABLE III. MODEL EXPERT VALIDATION SCORE

No.	Assessment Indicators	Score	Percentage Conversion Score	Category
1.	Products are presented systematically	4	100	Very Valid
2.	Each technology-based activity presented has a clear purpose	4	100	Very Valid
3.	The activities presented can foster conceptual understanding, environmental care attitudes, and observation skills	4	100	Very Valid
4.	The product provides sufficient answer space	3	75	Valid
5.	Use of google sites	3	75	Valid
6.	The language used is following the level of students' cognitive development	3	75	Valid
7.	The language used is communicative	3	75	Valid
8.	The sentences used are clear and easy to understand	3	75	Valid
9.	Clarity of instructions or directions	4	100	Very Valid
total score		31	86,11	Valid

TABLE IV. MATERIAL EXPERT VALIDATION SCORE

No.	Assessment Indicators	Score	Percentage Conversion Score	Category
1.	Products are presented systematically	4	100	Very Valid
2.	Each technology-based activity presented has a clear purpose	4	100	Very Valid
3.	The activities presented can foster conceptual understanding, environmental care attitudes, and observation skills	3	75	Valid
4.	The product provides sufficient answer space	4	100	Very Valid
5.	Use of google sites	3	75	Valid
6.	The language used is following the level of students' cognitive development	3	75	Valid
7.	The language used is communicative	4	100	Very Valid
8.	The sentences used are clear and easy to understand	3	75	Valid
9.	Clarity of instructions or directions	4	100	Very Valid
total score		32	88,89	Valid

The results of the questionnaire validation assessment of e-books based on google sites in the local wisdom-oriented green science model from Media Technology and Information Experts obtained scores according to Table V.

TABLE V. MEDIA TECHNOLOGY AND INFORMATION EXPERT VALIDATION SCORE

No.	Assessment Indicators	Score	Percentage Conversion Score	Category
1.	Products are presented systematically	4	100	Very Valid
2.	Each technology-based activity presented has a clear purpose	4	100	Very Valid
3.	The activities presented can foster conceptual understanding, environmental care attitudes, and observation skills	3	75	Valid
4.	The product provides sufficient answer space	4	100	Very Valid
5.	Use of google sites	4	100	Very Valid
6.	The language used is following the level of students' cognitive development	4	100	Very Valid
7.	The language used is communicative	4	100	Very Valid
8.	The sentences used are clear and easy to understand	4	100	Very Valid
9.	Clarity of instructions or directions	4	100	Very Valid
total score		35	97.22	Very Valid

Based on Table V, the total score is 35 and the result of the calculation of the conversion score is 97.22, so it is included in the Very Valid category. From the two scores, according to the Media Technology Expert, the product is very valid and feasible to be implemented or applied in learning.

Nine assessment indicators in validating e-books based on Google sites in a local wisdom-oriented green science model, each measuring the feasibility of several aspects. These indicators become the basis for the assessment of experts. Based on the scores obtained from the three experts, then the scores of the three experts on average obtained a score of 90.74% which means that the student worksheets are very valid and can be applied to local wisdom-oriented green science learning models.

The expert's assessment of the product is suitable for use in learning, the comments of the experts support technology as a means of learning media by combining culture. Due to the pandemic conditions that force people not to leave the house, learning is now adapting to online-based learning [17]. Through this e-book, students can be helped in re-learning the material because the content can be accessed anytime and anywhere. Expert comments regarding the development of e-books based on google sites which are implemented in a local wisdom-oriented green science learning model must be applied in learning to find out how it affects students.

C. Implementation and Evaluation Stage

The implementation phase through the use of the product in grade 7 junior high school students as many as 32 students. The implementation is carried out by bringing students to open natural locations, precisely at Telaga Ranjeng in Brebes

Regency, Central Java Province, Indonesia according to Fig. 5. This activity is carried out by integrating technology, namely e-books based on Google sites that can be accessed via smartphone applications.



Fig. 5. Students Conduct Learning Activities at Ranjeng Lake.

Students are asked to carry out activities according to the instructions on the student worksheets in the e-book while at Telaga Ranjeng as shown in Fig. 5. Student activities continue to apply the health protocol when interacting with the environment and the community around Telaga Ranjeng. The teacher only directs and guides in activities and explains learning material. After the students carried out the activity, a response questionnaire was distributed to find out the student's responses to the student worksheet. From the results of the student response questionnaires obtained in Table VI.

TABLE VI. STUDENT RESPONSE QUESTIONNAIRE RESULTS

No.	Response Indicator	Total Score of Respondents	Percentage Conversion Score	Category
1	The e-book presented is interesting and based on information technology	120	93.75	Very Valid
2	Each activity presented has a clear purpose	102	79.68	Valid
3	Activities related to environmental care	104	81.25	Valid
4	Clarity of description of local wisdom	122	95.31	Very Valid
5	The clarity of local wisdom, namely the myth of Telaga Ranjeng in science learning	123	96.09	Very Valid
6	Accuracy of presentation of material with learning objectives	120	93.75	Very Valid
7	Environmental awareness in learning	123	96.09	Very Valid
8	The suitability of the material with google sites-based technology media	107	83.59	Valid
9	Use of standard and clear language	100	78.12	Valid
10	The language used is communicative	119	92.96	Very Valid
11	The sentences used are clear and easy to understand	124	96.87	Very Valid
12	Ease of use	123	96.09	Very Valid
TOTAL		1387	90.29	Very Valid

Based on Table VI, the percentage score of student responses to student worksheets is 90.29%, indicating that students after using and carrying out activities on the student worksheets have a positive response. Judging from direct observation, students enjoy and have fun during learning. Enjoy the learning process based on technology, environment, and local wisdom. During the learning activities, students were supervised and observed to collect data on the environmental care characters that grew in junior high school students. The environmental care character data were analyzed through multiple regression tests to determine the effect of the independent variable (X_1 & X_2) on the dependent variable (Y).

The results of the partial variable test in multiple regression analysis are to determine the effect of each/partial of the independent variables (X_1 & X_2) on the dependent variable (Y) obtained following Table VII using SPSS 25 software.

TABLE VII. THE RESULTS OF THE REGRESSION ANALYSIS OF EACH INDEPENDENT VARIABLE ON THE DEPENDENT VARIABLE

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	21,984	13,142		1,673	0,105
	X1	,430	,118	,496	3,634	0,001
	X2	,368	,123	,409	2,994	0,006

a. Dependent Variable: Y

Based on Table VII in row X_1 obtained the value of Sig. 0,001 is smaller than the value of the degree of freedom, which is 0,05 ($0,00 < 0,05$). Supported by the value of t-count SPSS analysis results in Table VII in row X_1 get a value of 3.634 which is greater than the t-table that is 2,045 ($3,634 > 2,045$). The significance interpretation and t-test analysis show that the X_1 variable is the use of e-books based on google sites which affects the Y variable of caring for the environment.

This shows that the independent variable of e-books based on google sites can influence the development of environmental care characters for junior high school students. Through e-books based on Google sites in a green science model oriented to local wisdom, students are allowed to cultivate themselves individually with group collaboration. Research, by Harjono et al [18] stated that e-books by adding interaction features by adding student activities, videos, and animations helped in strengthening students' concepts. Alqahtani et.al [19] also in their research on the effectiveness of e-learning during a pandemic, the current e-learning needed must prioritize different individual learning and provide control to students in learning. Through interactive activities carried out in e-book content based on Google sites in a local wisdom-oriented green science model, students are invited to interact fully in learning activities.

The second independent variable analysis, seen in Table VII rows X_2 , obtained the value of Sig. 0,006 is smaller than the value of the degree of freedom, which is 0,05 ($0,006 < 0,05$). Supported by the t-count row X_2 , the result of the SPSS Table VII analysis is 2,994, the value is greater than the t table is 2,045 ($2,994 > 2,045$). The significance interpretation and t-test analysis showed that the variable X_2

was the implementation of the local wisdom-oriented green science model which affected the Y variable for the environmental care character. The green science model itself applies the concept of environmental-based natural science learning, coupled with an Indonesian local wisdom oriented that is obedient and protects the environment in its application. The research of Sera et al [20], explains that local wisdom knowledge is considered very relevant to modern ecological principles so that it can be used in environmental or natural management. Ismawati [21] also stated that through local wisdom, we can instill environmental care with trusted habits and cultures. Christiawan [22] through strong local wisdom in an area can control the exploitation of nature, including forests. So, through learning the green science model oriented to local wisdom, students get to know environmental care by getting to know the culture that is embraced around them.

Then the results of the analysis of two independent variables (X_1 & X_2) on the dependent variable (Y). Data from e-books based on Google sites in a local wisdom-oriented green science model that is carried out to foster an attitude of caring for the environment. Based on multiple regression analysis using SPSS 25 software according to Table VIII.

TABLE VIII. THE RESULTS OF THE ANALYSIS OF MULTIPLE REGRESSION

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	194,897	2	97,449	12,928	0,000 ^b
	Residual	218,603	29	7,538		
	Total	413,500	31			

a. Dependent Variable: Y

b. Predictors: (Constant), X2, X1

Based on Table VIII in column Sig. shows a value of 0,000 when compared to the value of the degree of freedom of 0,05, the value is smaller ($0,000 < 0,05$). It is confirmed that the calculated F value is 12,928 which is greater than the F table value, which is 3,32 ($F_{\text{count}} > F_{\text{table}}$). Following the significant value and F value, a decision was made that the accepted hypothesis is that there is a simultaneous influence on the use of e-books based on google sites (X_1) in the green science model oriented to local wisdom (X_2) there is a simultaneous influence on environmental care characteristics (Y).

e-Books based on Google sites in the green science model are oriented towards local wisdom to foster an attitude of caring for the environment, basically instilling in junior high school students to protect the environment, ecosystem management, and conservation. Due to the effects of a pandemic that does not allow students to go out for activities, as a result, they form a character who is indifferent to the environment [23]. Combining technology, and green science learning, namely learning natural sciences based on the environment and local culture can grow the character of caring for the environment. It is evident from the results of the SPSS analysis in Table VIII which shows the simultaneous effect on increasing the character of caring for the environment by using e-books based on google sites in a local wisdom-oriented green science model.

This can also be applied in learning in other schools so that students have a sense of concern for their environment. The values contained in local wisdom are closer and closer because they are part of everyday life so they are easy to understand. According to Glasson et al [24] and Ilhami et al [25] also stated that learning that links local content will deepen the material and increase the community's sense of care for environmental sustainability. According to Uge et al [26], it is explained that local wisdom is rarely used properly, especially in learning it can have an impact on environmental sustainability. Sofyan et al. [27] also support local wisdom that is applied in learning, through modules based on local wisdom students can learn about the culture and the environment.

IV. CONCLUSION

The conclusion from the data analysis and discussion shows the success of combining information technology, green science learning and local wisdom through the development of e-books. The success of e-book development is shown by the percentage of the three experts, namely 90.74%, indicating that the e-book based on Google sites in a local wisdom-oriented green science model is declared valid and feasible to use. Activities and the use of student worksheets and from direct observation students enjoy and have fun during learning. The implementation also shows the results of multiple regression analysis of Sig. $0.000 < 0.05$, which means that the development of an e-book based on Google sites in a local wisdom-oriented green science model influences and fosters an attitude of caring for the environment.

V. RECOMMENDATIONS FOR FURTHER RESEARCH

Indonesia has a diversity of cultures and rich natural resources so it is necessary to introduce students so that they know about culture and the environment as well as learn. It takes learning to link culture and the environment both in media, models, teaching materials, and other learning materials

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