5th ICRIEMS Proceedings
Published by Faculty Of Mathematics And Natural Sciences
Yogyakarta State University, ISBN 978-602-74529-3-0

Megabiodiversity Utilization Model for Sciences Material to Improve Technology Literacy And Patriotism Character

Sukardiyono[1)], Dadan Rosana [2)]

[1] Physics Education Study Program, and [2]Science Education Study Program,
Faculty of Mathematics and Science, Yogyakarta State University
KolomboStreet No 1, Karangmalang, Depok, Sleman, Yogyakarta, Indonesia
Geomatics Engineering Study Program, Politeknik Negeri Batam
Jl. Ahmad Yani, Batam Kota, Batam, Indonesia

[1)]sukardiyono@uny.ac.id [2)] danrosana@uny.ac.id

Abstract. Indonesia is known as a megabiodiversity country that has immense biodiversity, such as plants, animals and genetics. As a tropical country, Indonesia also has many natural resources throughout its thousands of islands. Therefore, it is very important to utilize megabiodiversity as sciences learning material in order to improve the students' technology literacy and patriotism character. This study aimed at developing science learning materials through the implementation of megabiodiversity utilization model to improve the quality of Indonesian students which was marked the enhancement of technology literacy and patriotism character. The research method was using Research and Development [1] with Four-D Models, which was modified through R & D model [2]. The research stages included Define; Design; Develop and Disseminate. The research sample was the junior high schools student in the border line of Indonesia, i.e. Nusakambangan and Riau Islands . The result of this early stage of national institutional strategic research was in the form of learning materials on the megabiodiversity utilization that fulfill the criteria of valid, practical, and effective to increase technology literacy and to build the patriotism character among the graduate program students in outer Indonesia.

Keywords: Megabiodiversity, Learning Materials, Technology Literacy, Patriotism Character

INTRODUCTION

Indonesia is the second most biodiverse countries and, even, categorized as megabiodiversity. Indonesia has various types of abundant species both on land and in waters. This country covers only 1.3% of the world's total land but it possess enormous biological richness. It has 10% species of flowering plant from the entire flowering plants in the world, 12% of the world's mammals, 16% of the world's reptiles & amphibians, as well as 17% of the world's birds, and 25% of the world's fish. However, today, the biodiversity is threatened by various factors including global climate change and human invasion thta cause environmental destruction [3].

These genetic resources and biodiversity are priceless assets of the country and it can be potential national income to boost Indonesia's economic growth. The Indonesia's biodiversity is widely spread including in the outer areas or borderline whose condition is currently very lagging behind in case of equitable access to the economy and education, especially in those frontier, outermost and least developed regions or often referred to as 3T (*terdepan, terluar, tertinggal*) regions. It makes only a small portion of the megabiodiversity that has been effectively utilized to develop the economic potential in the surround areas. Therefore, it is very important to generate local genius institutions in various fields, such as agriculture, fisheries, marine, animal husbandry, pharmacy, medicine, and other fields for the optimal use of the biodiversity source. The success of this genetic empowerment model for the biological resources can increase the national economic growth of Indonesia and as an efforts to protect the state sovereigntye.

The region along the border line of Indonesia is prone to the crime like smuggling of illegal goods, especially drugs that are really dangerous for the nation's future. This area is also vulnerable to illegal logging which is detrimental to the economy and the high risk of natural disasters. It causes, in general, the border line people has unprosperous life and easily contaminated to negative influence. So, it is not impossible those area may fade away nationalism, patriotism, the sense of unity and integrity of the nation, including the awareness of the country defence. Indeed, it needs the urgent solution to regenerate the sense of belonging of our society for the nation integrity [4]. One of its manifestations is the establishment of the territory of sovereignty and the jurisdiction of Indonesia.

The community raising and empowering efforts in the border areas of the country as well as in areas prone to social conflicts actually contain the potential threat to the territorial integrity of the country, so, it should be a priority to be managed quickly. The risk of islands lost along the border or the territory needs to be anticipated fastly and more professionally. Therefore, a local empowerment model of genius institutions [5] is required to foster innert-depend strategies that integrate the application of appropriate technology by utilizing alternative energy, bioprospection and education. Because of the wide scope of the bioprospect field, bioprospection can be defined more broadly by exploring, collecting, researching and utilizing genetic as well as biological resources systematically to obtain new sources of chemical compounds, genes, organisms and other natural products that have scientific and/ or commercial values ([6]; [7]).

The potential role of megabiodiversity in Indonesia should be managed wisely and properly, especially in case of exploration and management to make sure its potential can be utilized optimally without causing environmental damage. This can be done, for example, by developing appropriate technology and environmentally sound development as well as continuously striving to raise awareness of attitudes, love and care for the environment. It may also nurture the patriotism value which is implemented in the form of innert-depend strategies. Those condition can be achieved through the empowerment of local genius institutions [8] and local wisdom [4].

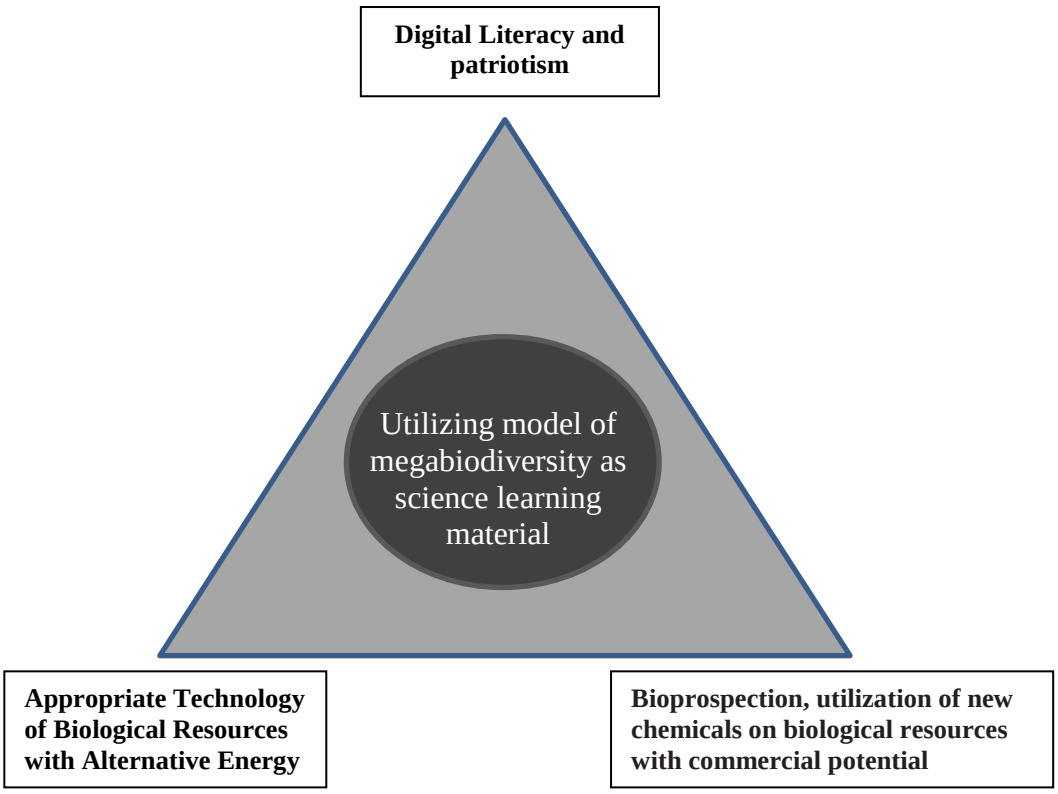

Figure 1. The framework for the development of the megabiodiversity learning model for the improvement of students' patriotism

The first phase of research on local empowerment of genius institutions to foster innert-depend strategies is focused on formal institutions i.e. the schools, through the development of megabiodiversitas learning models to improve students' patriotism. At this stage, the utilization model of megabiodiversity of the archipelago as sciences learning resource [9] in order to improve technology literacy and patriotism character. The next stage, the study

is directed to build patriotism characters for marginalized people which categorized as 3T region which usually includes conflict-prone areas at the borderline [10], through empowerment of human resources and educational institutions [11].

This research is the real action in the field of education in order to contribute to solve the national problems. The urgency of this study is related to regenerate the sense of belonging to the community for the state integrity [12] & [13], which one of its manifestations is the establishment of the sovereign territory and the jurisdiction of the Republic of Indonesia. The expected outcome is the growth of patriotism character through integrated science education.

Soil erosion is the process of transporting soil and rock material from higher regions to lower regions [10]. Erosion is in principle a process of soil rarefaction that is affected by the force of gravity [4]. Erosion is the transport of soil or parts of the soil from one place to another by natural media [1]. Water is the main force of erosion in the tropics, especially in wet tropical regions such as Indonesia. Erosion is one of the processes that cause changes in the form of land. Changes in landforms are caused by the erosion of the soil by water at different speeds and volumes. The difference is due to the length and slope of the slope and different land use.

One of the geomorphic processes occurring on the surface of the land is soil erosion [10]. In addition to erosion, there is also a landslide and weathering that is part of the geomorphic phenomenon. These three processes can cause changes in the shape of the land on the surface of the earth. Geomorphic processes that work on landforms result in a decrease in land quality. The decrease in the quality of land is caused by loss of nutrients and soil damage to land due to erosion and landslides. The loss of nutrients and the destruction of the soil affect the decrease in productivity of a land [10]. In addition to erosion and landslide factors, there are other factors that affect the quality of a land. In order to maintain the quality of land due to erosion processes occurring on the surface of the land, conservation efforts are needed [1].

Conservation is an act done for land use in accordance with the ability of land [1]. Each soil has different characteristics from one to the other. Different characteristics are caused by the origin of the parent material and the different formation process. Soil conservation needs to be done with a land characteristic approach that is using a unit form of land or geomorphology. Geomorphology has the main object of study is the form of land. Geomorphology is the study of the shape of the land on the surface of the earth both above and on the surface of the sea and related to nature, genesis, development process, the material arrangement, and its relation to the environment [10].

The shape of the land is a surface appearance of the earth with distinctive characteristics and can be distinguished by morphology, structure, and process and its development [10]. Variations of landforms are the result of changes in the shape of the earth's surface caused by geomorphological processes. The existence of geomorphological processes that work, causing the formation of different landforms and has distinctive characteristics on the surface of the earth. Different landforms require different ways of managing the soil.

The change of a landform is possible if there is a dominant influence on a landform. A hill that has a steep slope with high rainfall conditions has the potential to erode the soil due to the erosion process. The processes generated by geomorphological forces occur over a period of time, causing morphological changes in a given form of land. The morphological differences in a landform will determine the type and management of the land. Differences in land management require appropriate adaptation for humans. Errors in land management lead to land degradation that causes the land to become critical.

The steep slope and thin solum are the next environmental factors that can affect the quality of the land. These physical environmental factors have limited and hindered for more intensive land use. The existence of the use of sloping land on hilly land for agricultural activities actually triggers for the occurrence of higher erosion. Intensive land use is also influenced by a thick factor of solum. Soils that have deep and permeable solum are not easy to erosion [1].

The deep soil can absorb more water, thus reducing the amount of surface flow. Easily or not eroded soil is also determined other factors such as texture and soil structure and organic matter content. Other factors that can limit the quality of a land such as a drainage, rock distribution, and gravel in the soil surface, as well as the threat of flooding. To assess the ability of a land, it will first be classified land capability.

Kecamatan Kokap which is the study area in this study has experienced an intensive process of erosion and many events landslide. Intensive land use has also accelerated the rate of erosion. In addition to erosion, the environmental problems occurring in Kecamatan Kokap are a landslide. Based on previous explanations on erosion, landslide, and other limiting factors in Kecamatan Kokap has caused a number of losses. Losses incurred in the form of environmental damage, loss of property, can even cause casualties. On the basis of previous explanations, to solve the problems contained in Kokap Subdistrict, a land management formula based on land characteristics is required through conservation activities.

Based on the research problems that have been described previously, there are 2 research problems that will be the focus for further study in depth in this research, namely: 1) erosion is the environmental problems that cause environmental degradation of the environment, 2) Environmental problems that can affect the quality a land is not only erosion, there are other limiting factors such as landslide, soil erodibility, and thick solum. These limiting factors are used as a limiting factor in classifying land capability. Land use considerations are needed as a basis for land use directives.

METHODS

The main focus of this first phase of research is the development of the model design of the megabiodiversity utilization as a sciences learning resource to improve the technology literacy and patriotism character for junior high school students. This research design used the development type of "Prototipycal Studies" as suggested by [14] and Plomp [15]. The important thing to note in the development research is the quality of the learning model (product). Plomp [15], provides product quality criteria, namely valid (reflects state-of-the-art technology literacy and internal consistency), value-added, practical, and effective.

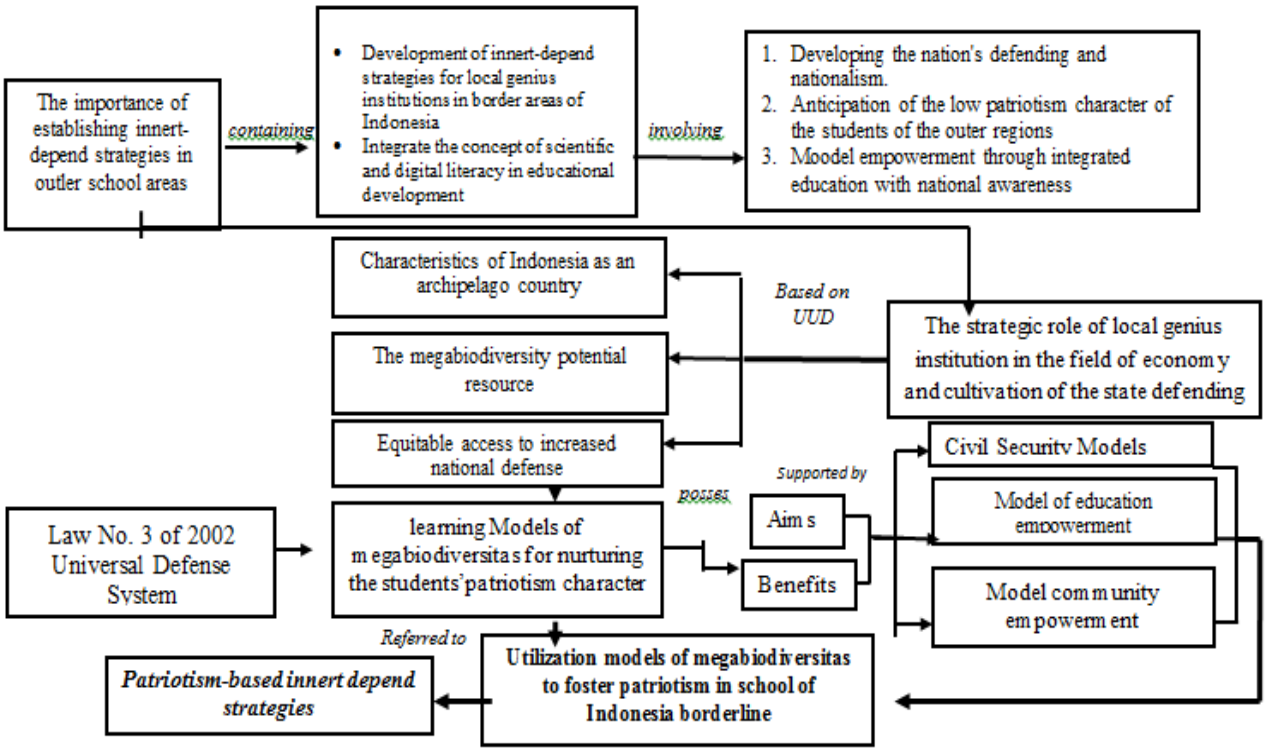

Figure 2. Research Paradigm

Innert-depend strategies are attitudes and behaviors of citizens who are imbued with their love of nation, the Republic of Indonesia based on Pancasila (Five Basic Principle of Indonesia) and the 1945 Constitution in maintaining the nation integrity. Each citizen shall have the right and obligation to participate in the state defense which has been set forth in the law. The awareness for state defense is basically the willingness for the nation dedication and to sacrifice to defend the country. The spectrum of innert-depend strategies is very broad, from the most subtle into the harshest, from good relations with fellow citizens or even fighting for the real threat with armed enemies. Those reflect to behave and to do the best for the nation and country.

The local genius institution, in this first phase, of research selects the school as an effective formal institution for the development of megabiodiversitas learning model. The selected junior high school students are located near the outer regions of Indonesia, namely Nusakambangan and Riau Islands. Those two region can be part of the community as pioneers and catalysts to implement patriotism model based on megabiodiversity. They can serve as one of the human resources for national development, both welfare development and defense or security development. Therefore it is necessary to improve the efforts of local coaching and empowerment genius institute that should be integrated with the sustainable implementation of innert-depend strategies in order to build the defense and security system based on empowerment of educational institutions, as shown below.

This research was using Research and Development method, as the research flow illustrated in Figure 2. The phase of “define” or “research and information collection” [2] was the initial research and data collection through literature study, needs analysis and field study. The design or planning phase [2] was the product design including the goal of the product use, the product user and the description of the product components. The stage of develop or develop preliminary form of product was an early product development. The disseminate phase had four developmental steps, namely preliminary field testing [2] which were initial field trials, main product revision or test results revision, main field testing or field trials and operational product revisions [2] or refinement of field test results. The research sample was the junior high schools student in the border line of Indonesia. The number of students who become the sample of research is 92 students, as follows; 42 students in Nusakambangan secondary school and 40 students from junior high school in Riau Islands.

The main objective of R & D is to develop and to validate the local genius institutional empowerment program or the model that will be used in the outer regions of Indonesia so that the purpose of developing the megabiodiversity utilization model becomes effective. This stage identified the key process skills and analyzed them in subset sets of the required skills. This analysis guaranteed the compactness of tasks in developing empowerment models of educational institutions, as their analysis reaches the selection of empowerment concepts, activity plan approaches to the selection of megabiodiversity learning models for the improvement of students' patriotism character as well as the design of their evaluations [16]. The activities of empowerment activities included discussion of information, modeling, assignment, group work, and practice [17]. Evaluation of the implementation process of megabiodiversitas learning model for the improvement of students' patriotism consisted of observation, performance test and practice test and collaborative model of educational institution empowerment. Patriotism includes proud attitudes towards the achievement of the nation, proud of the nation's culture, the desire to maintain the characteristics of the nation and the cultural background of the nation. Patriotism value examined in this research is; loyalty, courage, willing to sacrifice, and love of the nation and state.

RESULTS AND DISCUSSION

The development of the megabiodiversity learning model to nurture students' patriotism was done to foster innert-depend strategies in junior high schools of Nusakambangan and Riau Islands. The research and development procedure was divided into three stages: (1) define, (2) design stage, (3) development stage. In the development stage, product validation from experts, science teachers, and graduate program students were conducted. Validation aimed at obtaining both oral and written comments and suggestions in order to improve the initial draft of Subject Specific Pedagogic (SSP) of learning megabiodiversitas, it was tested in limited subject and then in wider scope. The results of the lessons plan product development of science learning could be explained through the validation result. The average score of the questionnaire response showed the validator's response on the feasibility of the lessons plan of five categories, namely 1 (poor); 2 (fair); 3 (quite good); 4 (good); 5 (excellent).

The product validation of megabiodiversitas lessons plan was divided into 4 assessment components. The assessment components included (1) learning objectives, (2) learning materials, (3) linguistic component and, (4) learning time. Each component had its own assessment aspect. The validation results of each component of the lessons plan converted into scores. The details of lessons plan validation results and its score conversion techniques can be seen in Appendix 1. The results of the validation components were presented in figure 3.

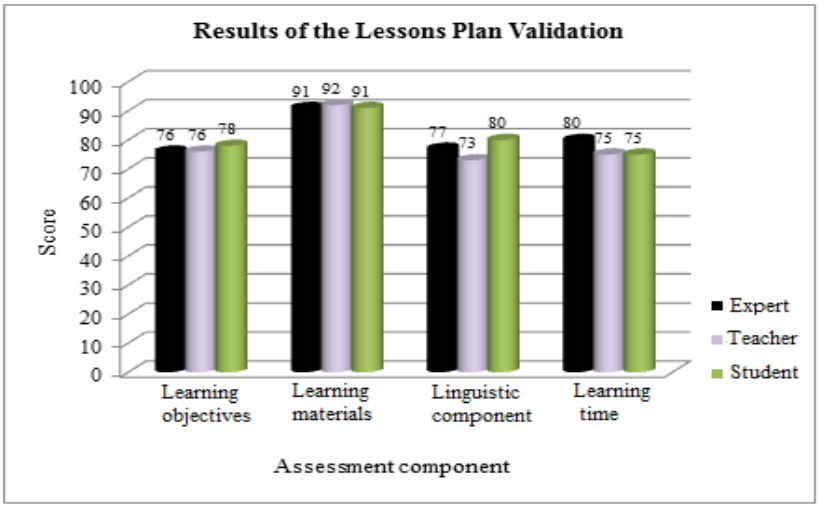

Figure 3. Results of the Lessons Plan Validation (megabiodiversity to nurture students' patriotism character)

In order to know the assessment results more clearly, then, the average results of product validation in the form of validator assessment score was converted into five scale scores [18]. The summary score converting results into five scale scores was presented in table 1.

Tabel 1. Results of the Lessons Plan Validation

No	Validator	Assessed Components	Scale Value 5	Category
1	Expert	Learning objectives	A	Excellent
		Learning materials	A	Excellent
		Linguistic Component	B	Good
		Learning time	A	Good
2	Teacher	Learning objectives	B	Good
		Learning materials	B	Good
		Linguistic Component	B	Good
		Learning time	A	Excellent
3	Students of Master Program	Learning objectives	B	Good
		Learning materials	A	Excellent
		Linguistic Component	B	Good
		Learning time	B	Good

Based on table 1, it was known that the product validation results in the form of lessons plan on each component was varied. If examined separately, then the components of the formulation of learning objectives considered as "excellent " by experts, science teachers and students. In the content presentation aspect considered as "excellent" by experts, science teachers and students of graduate programs. The language component was rated "good" by experts and science teachers while the students of the graduate program considered as "excellent". In case of the time allocation aspect, the expert considered as "excellent " while the science teacher and the students mentioned as "good". The results of the validation of the Lessons Plan component illustrated that the Lessons Plan product of the development outcomes was feasible for learning implementation.

The results of validator assessment on the developed lessons plan aspect in general met the criteria. The presentation of lessons plan content considered as "excellent" and rated "good" but it still needed some revision based on the suggestions and comments for certain items because not all items in the Lessons Plan component obtained maximum score (5) or "excellent" category.

Validation Result of Learning Materials

The validation of teaching materials of megabiodiversity performed by experts, science teachers and graduate program students covering three components. These components included content validity, contruct validity and face validity. Total of these three components were 20 aspects of assessment. The mean score of the response or assessment indicated the validator response on the feasibility of SSP of sciences course which covering five categories, i.e. 1 (poor), 2 (fair), 3 (quite good), 4 (good), 5 (excellent). The validation result of teaching materials component was depicted by the mean score from the validator on each component of the valuation, it was then converted into the score. The average of material validation result was further converted to category in the scale of five. The summary of the conversion from the validator response score on students' teaching materials coded into five scale can be seen in table 2.

Table 2. Validation Result of Material

No	Validator	Assessed Components	Scale Value 5	Category
1	Expert	Content Validity	A	Excellent
		Construct Validity	B	Good
		Face Validity	B	Good
2	Natural Science Teacher	Content Validity	A	Excellent
		Construct Validity	B	Good
		Face Validity	B	Good
3	Student	Content Validity	B	Good
		Construct Validity	A	Excellent
		Face Validity	B	Good

The Validation Results of Megabiodiversity Technology literacy

The validation coverage of the technology literacy test sheet about megabiodiversitas consisted of five components. The assessment components were: (1) the appropriateness between megabiodiversity technology literacy indicators and the item test, (2) the instrument completeness, (3) the problem construction, (4) the appropriateness of content/ substance, and (5) language aspect. Those five component validation results were presented in **FIGURE 5**.

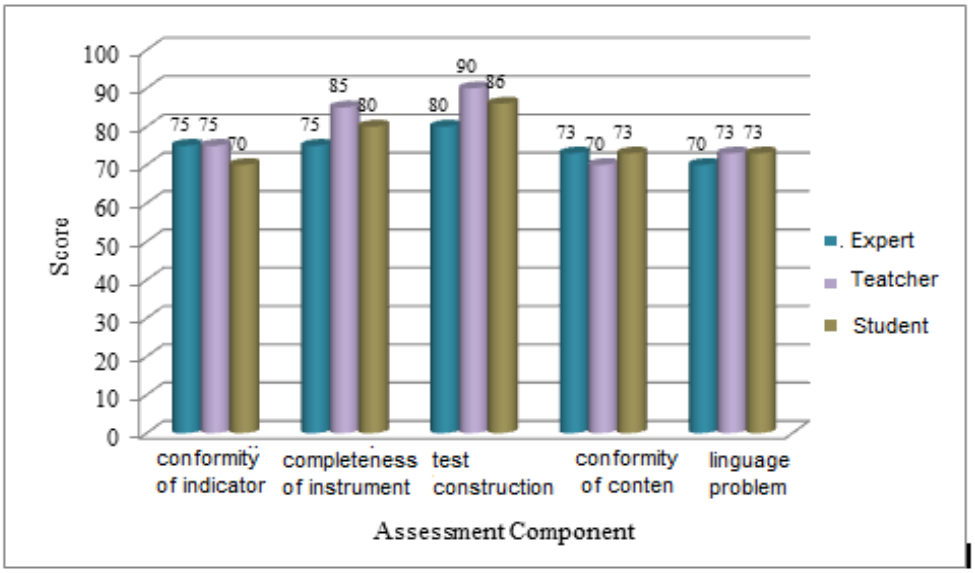

Figure 5. The Validation Results of Megabiodiversity Technology literacy Aspect

Based on figure 5, it can be seen that the assessment results of the technology literacy test components on megabiodiversitas was varied. If it was viewed from the component of the indicator appropriateness, the highest score was 75 and the lowest one was 70. In case of the instrument completeness component, the highest score was 85 from the teacher's party while the lowest score came from the expert with the score of 75. For the construction component, the highest score was 90 by the graduate program students and the lowest was from the expert judgments, i.e. 80. In the last two components, namely the content or substance appropriateness and the language aspect, the highest score for those two components was 73 and the lowest was 70. In general, the components validation for the technology literacy test on megabiodiversity can be categorized as good.

The validation result of each aspect in the technology literacy sheet about megabiodiversity in the form of score was converted to scale of five. The summary result of conversion score to the scale of five can be seen in table 3.

Table 3. The validation result of Technology literacy Test on Megabiodiversity

No	Validator	Assessed Components	Scale Value 5	Category
1	Expert	Conformity of indicator	B	Good
		Completeness of instument	B	Good
		Test Construction	A	Excellent
		Conformity of content	B	Good
		Linguage Problem	B	Good
2	Teacher	Conformity of indicator	B	Good
		Completeness of instument	A	Excellent
		Test Construction	A	Excellent
		Conformity of content	B	Good
		Linguage Problem	B	Good
3	Student	Conformity of indicator	B	Good
		Completeness of instument	A	Excellent
		Test Construction	A	Excellent
		Conformity of content	B	Good
		Linguage Problem	B	Good

Based on TABLE 3, the tested components in the technology literacy test sheet on megabiodiversitas categorized as "good" and "excellent ". From the five components of the assessment above, the components that were rated "excellent" by each validator, i.e the content appropriateness aspect. The other four components of the validator scores were also declared as “Good” category. The overall compoenents can be categorized as "good".

The Result of Limited Trial

The limited trial was conducted among eight grade students of junior high school in Nusakambangan and Riau Islands. The trials selection was random by considering the differences of the students’ ability. It was conducted after the initial draft based on validation results. This trial aimd at testing the readability of the developed SSP product including the learning materials, as well as measuring the validity of the test items on megabiodiversity technology literacy aspect and its reliability of each instrument. In addition, the objectives of the limited trials were to collect the information in the model framework and instrument improvement. The obtained information in this limited trials was gathered in form of technology literacy data about the megabiodiversity and students’ patriotism character.

The data of learning implementation was obtained from the observation sheet which was evaluated by two observers. Each observer provided an assessment of the pattern of the instructional implementation of the teacher based on the learning stages in the observation sheet. The assessment was performed by experienced observers and the learning experts to make sure its objectivity and appropriateness.

The assessment of the learning implementation covering preliminary activities, core activities and closing. The learning involved five phases including, (1) the problem orientation, (2) the organizing of the stuents, (3) the investigation or group investigation, (4) the students’ work presentation and, (5) the evaluation/ technology literacy

about megabiodiversity. This limited trial was conducted twice with the learning implementation data as presented in table 4.

Table 4. The Result of Learning Implementation in the Limited Trial

Component	Score			
	Lessons 1		Lessons 2	
	O1	O2	O1	O2
Score	15	13	15	16
Percentage of Learning Achievement	78%		86%	
Instrument Reliability	93%		97%	

The assessment results of the implementation of learning activities can be seen through the given scores by the observer. At the first meeting, the score of each observer was 15 and 13, respectively. By having those scores, then, the instrument reliability with Borich equation was 93%. Meanwhile, the second meeting score of each observer was 15 and 16, respectively, where the reliability level of the observation instrument for the second meeting was 97%. According to Borich (1994: 117), a good observation instrument should have R score bigger than or equal to 75% (≥75%). Based on these results it declared that the instrument of learning implementation observation can be considered as "good" to be used in the learning process.

Megabiodiversity Technology literacy Instrument Validation

The test about megabiodiversitasy technology literacy was in the form of 8 items description and it was represented by the indicator of technology literacy about megabiodiversity. Then, to find out the valid item as well as its reliability of the test instrument, it was used score interpretation from Corrected Item-Total Correlation on each item of Cronbach's Alpha.

The test instrument consisted of eight items to measure students' technology literacy on megabiodiversity sciences related to the static fluid course. As shown on table 13, it was found that eight items were valid because they had Corrected Item-Total Correlation scores which were bigger than r table (> 0.361). In addition, the reliability score of the technology literacy instrument was 0.868 which indicated (0.868> 0.60) the test instrument was reliable to be used. It means the test instrument for technology literacy of mega biodiversity was valid and reliable to be used for data collection with wider scope of trial.

The wide trials were part of the development study to implement the product in learning. The SSP product was the result of revision and evaluation from the limited trial results. The ultimate goal of extensive trials was to increase the technology literacy of megabiodiversity as well as to enhance the patriotism character of junior high school students. In addition, this extensive trial also aimed at obtaining information as material that can be used for the evaluation and revision of the final product of the SSP.

The obtained information from the results of extensive trials were data observation results of the learning implementation with the SSP product, the results of questionnaires on patriotism character before and after the learning as well as the data on students' megabiodiversity technology literacy before and after the learning implementation.

The implementation of systematic sciences learning was reflected in the developed model of the lessons plan product. The implementation of the lesson was assessed by two observers using the observation sheet. Learning implementation data consisted of 4 meetings as presented in table 5.

Table 5. The Result of Learning Implementation

Lessons	Learning Implementation (%)	Category	Instrument Reliability	Information
1	72	Good	0.92	Reliable
2	77	Excellent	0.93	Reliable
3	81	Excellent	0.96	Reliable
4	88	Excellent	0.93	Reliable

Based on **TABLE 5**, it was known that the learning implementation having the category of "good" and "excellent " since the mean percentage of observers at the first meeting was 72% with “good” category. Meanwhile, the percentage of learning activities in the three meetings lasted 77%, 81% and 88%, respectively. The results were obtained from the given mean score from the observer divided by the total score of instructional learning. In addition, the percentage of observer agreements in assessing the implementation of learning can be calculated with Borich equation with the agreements percentage over 90%.

The Questionnaire Result of Patriotism Character

The students of the control and the experiment class completed the questionnaire of patriotism character. The goal was to know whether any differences in case of the patriotism between the students of the control and the experimental class. It was done by the students before the first meeting and they were asked to complete the same questionnaire after the last meeting (4th meeting). Most of the students’ patriotism character was still low because more than 50% of students had the character of patriotism "moderate". It can be seen that 37% of students showed the patriotism character in the category of "quite bad" and even 16% of them categorized as “bad”. The percentage of final outcomes of patriotism character in the control class increased. The percentage of patriotism character of students catagorized as "good". This was reflected in the percentage score improvement of the category from "quite good" into "good".

The achievement of each indicator was different. In general, the average score of all indicators got some improvements from the initial patriotism character (questionnaire result before the learning) to the final patriotism character (questionnaire outcomes at the end of the learning). Based on these results, it can be seen that the biggest improvement was in indicator 3 while the smallest one was in indicator 7. However, all indicators can not be separated because it described the patriotism character of students in the control class at the beginning and the end of learning. In the experimental class, the questionnaire was completed before the first lesson and after the 4th meeting. The majority of students in the experimental class showed "poor" patriotism character since 56% of the students categorized as "quite bad" and 16% was "bad". It indicated that the students’ patriotism character in the experimental class was generally low. There was some increase in the students patriotism character after the end of learning which was more than 60% of students showed "good" category of patriotism character. These results indicated that there were some difference in case of patriotic character before and after the learning in the experimental class.

The learning implementation using SSP megabiodiversitas gave a positive impact on the students’ patriotism character. It was reflected in the results that the number of students in the experimental class mostly dominating the category of "good" and “excellent" for patriotism characters compared to the control class based on the final test result.

Test Results of Megabiodiversity Technology literacy

The data on megabiodiversitas technology literacy consisted of pre-test and post-test result. The purpose of these two types of tests was to know the difference of the treatment results of each class or between the two classes, namely the experimental class and the control class. The type of given test in the pre-test and post-test was the essay test related to the static fluid material. The test contained 8 items that were used as the indicator in measuring technology literacy about the students’ megabiodiversity in those two classes. The results of the technology literacy test on the megabiodiversity were summarized in table 6.

Table 6. The Summary of the megabiodiversity technology literacy

Explanation	The result of megabiodiversity technology literacy			
	Control Class		Eksperiment Class	
	Pre-test	*Post-test*	*Pre-test*	*Post-test*
Highest Score	78.6	91.2	77.4	91.7
Lowest Score	34,.6	63.3	38.2	72.1
Mean	58.8	77.6	60.1	84.2
Average gain	0.51		0.62	

Table 6 showed that there were some differences in test results in the two classes. For the control class, the highest score on the pre-test was 78.6 and the lowest was 34.6. The mean of the control class score at pre-test was 58.8 with the number of students above the passing grade (> 75) was 5 people and below the passing grade was 27 people. in

the post-test control class, the highest score reached 91.2 and the lowest score was 63.3. The mean score of the control class for the post-test was 77.6 with the number of students above the passing grade (> 75) was 24 people and below the passing grade was 8 people. Based on the score of pre-test class and post-test, it was obtained the average gain of the control class was 0.51. It indicated that the standard gain of the control class was in the "moderate" category.

In the experimental class, the highest pre-test score was 77.4 while the highest post-test reached 91.7. The mean score of pre-test in the experimental class was 60.1 with the number of students with the score (> 75) was 7 people. Meanwhile, the average post-test of the experimental class was 84.2 with the number of students above the passing grade was 31 people. The standard gain rate in the experimental class was 0.62 in the "moderate" category. Based on these results, it can be concluded that the average results of the technology literacy test about megabiodiversity in the experimental class was higher, either the mean score or if it was seen from the average of the gain standard [19] & [20].

CONCLUSION

Based on the research results and discussion, it can be concluded the results of the model development and learning media of megabiodiversity to develop the patriotism character are as follows; (1) the results of the model development and learning media of megabiodiversity to develop the character of patriotism of learners are feasible to be applied in the sciences learning of junior high school, (2) the model application of and learning media of megabiodiversitas to develop the character of patriotism is effective to increase the technology literacy about megabiodiversitas among junior high school students, it can be seen from the score difference and gain score (3) the model application and learning media of megabiodiversity to develop the character of patriotism is effective to increase patriotism character of junior high school students, it was proved from the percentage of students' patriotism character after following the lesson.

ACKNOWLEDGMENTS

Our gratitude goes to DRPM of Ministry of Research, Technology & Higher Education, also LPPM of Universitas Negeri Yogyakarta which has provided opportunities as well as funding and managerial support for the implementation of this research activity.

REFERENCES

1. Thiagarajan, S, et al. *Instructional Development for Training Teachers of Exceptional Children*. Washington DC. National Center for Improvement of Educational Systems. Pp: 57-59. (1974)
2. Borg, W. R. and Gall, M. D. *Educational Research An Introduction*. New York: Longman. Pp: 183-194 (1983)
3. A. Occhipinti-Ambrogi, D. Savini. Biological invasions as a component of global change in stressed marine ecosystems. Marine Pollution Bulletin 46, 542–551. (2003)
4. H. Farhan & K. Anwar. The Tourism Development Strategy Based on Rural and Local Wisdom. *Journal of Sustainable Development; Vol. 9, No. 3; 2016, p: 170-181*. (2016)
5. M.K. Adhi, The strategy of cultural poverty alleviation based on empowering local genius, *International Journal of Science and Research (IJSR), Volume 5, Issue 11, 2016, p:1569-1574.*(2016)
6. Lohan, D. and S. Johnston. *The International Regim for Bioprospecting*. UNU/IAS All Right Reserved. 26 pp: 120-135. (2003).
7. P.R. Gepts. *Asymmetric gene flow and introgression between domesticated and wild populations*. In: H.C.M. den Nijs, D. Bartsch, J. Sweet (eds.), Introgression from Genetically Modified Plants into Wild Relatives, Proc. Conf. on Genetically Modified Plants into Wild Relatives and its Consequences, 21-24 January, 2003, Amsterdam. CABI, Wallingford, Oxfordshire, UK. (2004)
8. N.M. Ruastiti. The concept of local genius in Balinese performing arts. *Mudra, Vol 26, Number 3, December, p: 241-245.* (2011)

9. R.C. Behera & D.K. Das. *Environmental Science: Principles and Practice*. Kindle edition, PHI, New Delhi.(2008)
10. L. Schroeder. *Global Biodiversity. East Africa, ENVS 220, Map*. https://ds.lclark.edu/sge/2011/09/28/ global-biodiversity/ [30 November 2014]. (2011)
11. Vitousek, P.M., Mooney, H.A., Lubchenco, J., Melillo, J.M., 1997. Human domination of Earth's ecosystems. Science 277, 494–499.
12. F. Achard, H.D.Eva, H.J.Stibig, P.Mayaux, J.Gallego, T.Richards, & J.P. Malingreau. Determination of Deforestation rates of theWorld's Humid Tropical forests. *J Science* 297, 999–1002. (2002)
13. Gaston, K.J., Blackburn, T.M., Goldewijk, K.K., 2003. Habitat conversion and global avian biodiversity loss. Proceedings of the Royal Society of London Series B-Biological Sciences 270, 1293–1300.
14. Akker, J. Van den. *Principles and Method of Development Research*. London. In: van den Akker, J., Branch, R.M., Gustafson, K., Nieveen, N., & Plomp, T. (pnyt.)". Design approaches and tools in educational and training .Dordrecht: Kluwer Academic Publisher (1999)
15. T. Plomp & N. Nieveen. *An Introduction to Educational Design Research*. Proceedings of the seminar conducted at the East China Normal University, Shanghai (PR China), November 23-26, 2017. (2007)
16. *F.Kurnia, D. Rosana*, Supahar. Developing evaluation instrument based on CIPP Models on the Implementation of Portfolio Assessment. *AIP Conference Proceedings* 1868, 080003; doi:10.1063/1.4995187. aip.scitation.org/doi/abs/10.1063/1.4995187 (2017).
17. D. Rosana, N. Kadarisman, A. Maryanto, & A. Sugiharsono. The Evaluation of Science Learning Program, Technology and Society Application of Audio Bio Harmonic System with Solar Energy to Improve Crop Productivity. *Jurnal Pendidikan IPA Indonesia*, 6(1), 63–70. https://doi.org/10.15294/ jpii.v6i1.9596. (2017).
18. J.A. Asrofah, D. Rosana, Supahar. Developing evaluation instrument based on CIPP models on the implementation of portfolio assessment. *AIP Conference Proceedings* 1868, 080003; 10.1063/1.4995187. pp: 080006-1 - 080006-9. (2017)
19. Duffy, J.E., Stachowicz, J.J., 2006. Why biodiversity is important to oceanography: potential roles of genetic, species, and trophic diversity in pelagic ecosystem processes. Marine Ecology Progress Series 311, 179–189.
20. Hendriks, I.E., Duarte, C.M., Heip, C.H.R., 2006. Biodiversity Research Still Grounded. Science 312, 1715.