Development of Biomagz Based on Local Wisdom on Biodiversity Material in High School

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Info Article	Abstract
	This study aims to describe the feasibility of Biomagz Based on Local Wisdom and test the effectiveness of Biomagz Based on Local Wisdom on learning outcomes and student's environmental care attitude. The method used is research development *(R & D)*. Products are validated by material and media validators, and revised before being tested. Small-scale trials (readability test) use 10 students from class X MIPA 1, while large-scale trials use class X MIPA 2 with the experimental design *Pre-experimental Design* with the type of *Pre-test and Post-test One Group Design.* The results of the study show the variety of learning resources used previously including biological, teacher, internet, biology books, and the environment around students. The Feasibility of Biomagz Based on Local Wisdom obtained an average score of 92.21% with very decent criteria. Large-scale trials with an average *N-gain value* 0.49 in the medium category, the average classical completeness is 85.29%, and the environment care attitude of students is based on the observation result of 92.9% with a high category and the result of the inter-student assessment is 86, 18% with a high category. Based on the results of this study, it can be concluded that Biomagz *Based Local Wisdom* is well worth and effective on learning outcomes and student's environmental care attitude.

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INTRODUCTION

Biology is one of the fields of science that studies everything about living things. In biology there is a collection of processes and values that can be applied in real life, so it takes more than just a collection of facts and concepts. Many students are not able to develop their understandings of biological concepts because the acquisition of knowledge and processes are not well integrated. If biology is only taught by memorization, students who have initial knowledge of various biological phenomena cannot use their knowledge during the learning process (Saptono, 2011).

Early knowledge can be obtained by students from the environment around students in the form of biological phenomena that are easily found in everyday life. Based on the results of interviews with Biology Teachers of SMA N 3 Salatiga in August 2017, biology learning especially on biodiversity material has utilized the environment around the school as a source of learning. During the biodiversity learning process , students observe and take note flora around the school within a certain time limit. Time constraint is one of the obstacles to assess biodiversity in a wider scope, especially in Indonesia.

Books can be one solution to overcome the limitation of time in reviewing biodiversity in Indonesia, but based on the results of observations class X MIPA of SMA N 3 Salatiga have not had their own biology textbooks. The books provided by the school are in limited number and can only be used during biology lesson. Books provided by the school must be returned to the library when the lesson is finished. Based on the results of student needs analysis, as many as 59% (of 90 students representing each class) said that the textbooks provided by the school were less attractive and did not improve student's reading interest, interesting and light learning supplements were needed so as to increase students' reading interest. The lack of records that students have and the unavailability of biology textbooks for each individual are some of the causes of student learning outcomes. Learning outcomes on biodiversity material in 3 classes (100 students), only 48% of students received a ≥KKM score.

International Union for Conservation of Nature (IUCN) in December 2013 stated that Indonesia is ranked 4th as a country that has the highest number of endangered species. Data stated the number of endangered species reaches 1206 species. This condition certainly needs special attention because biodiversity is the core of the ecosystem and natural balance and is a source of human needs.

Salatiga City is inseparable from the threat of environmental damage. Data of Kantor Lingkungan Hidup (KLH) in 2015, along 60 kms or 50% of the 120 kms of river flow in Salatiga City was polluted. The cause of pollution was an increase in industrial activity and household activities of the people living on the banks of the river. The habit of people throwing waste into the river causes damage to the ecosystem of a number of rivers. This level of pollution continues to increase from year to year, if this is ignored then it can affect the balance of the ecosystem and have an impact on the lack of biodiversity, it is necessary for the attitude of the community to care for the environment through the learning process can be developed.

The process of forming a society that cares about biodiversity in the plant world for the younger generation can be done through local wisdom based learning (Utama & Kohdrata, 2011). SMA N 3 Salatiga is located in Salatiga City which is still close with local wisdom, one of them which is in the Kauman Kidul Village that utilizes a variety of biodiversity in local wisdom called *dawuhan* in the form of *mero deso* and *slametan wiwitan*. Local potential in the

form of local wisdom has not been utilized by teachers in biology learning activities on biodiversity material.

Magazine development has been done by (Asfuriyah & Nuswowati, 2015) at MTs Nurul Huda Banyuputih. In this study produced a product based on Contextual Learning magazine that has been applied as an alternative learning resource for students of class VII SMP / MTs to increase students' interest in learning. This research is in line with the research conducted (Fatonah *et. al.* , 2017), the results of his research in the form of reproductive Biomagz themes that have been successfully applied and are worthy of being used as supplements in learning for students of class XI P A MI to improve student learning outcomes and caring attitudes to reproductive health. The mean learning outcomes of students of reproductive system material using Biomagz is higher than KKM and increases students' caring attitudes towards reproductive health.

Based on the research background, it takes a form of innovation that can support and assist the learning process, one of which is visual media in the form of Local Wisdom-Based Biomagz. Biomagz Based on Local Wisdom as a learning supplement is expected to help students meet the basic competencies expected especially in biodiversity material. In addition to improving learning outcomes, Biomagz Based on Local Wisdom about biodiversity is also expected to improve environmental awareness to prevent and overcome environmental damage that has an impact on reducing biodiversity.

RESEARCH METHOD

This study was designed as a *Research and Developement* (R & D) research with the implementation phase adapted from Sugiyono (2016). The research stages are in accordance with Sugiyono (2016), namely identifying potentials and problems, collecting data, designing products, validating designs by material and media validators, design revisions, product testing, product revisions, usage trials, product revisions, product revisions, and final product .

Identification of potentials and problems was carried out by observing Salatiga Senior High School 3, while data collection was conducted through interview methods to the Salatiga City Tourism Office and community leaders who understood local wisdom. The interview results in the form of recommendations on local wisdom that are relevant to biodiversity material and continued with the collection of documentation. Local Wisdom-Based Biomagz Design is prepared based on the results obtained at the data collection stage. Product test phase in the form of legibility test conducted at SMA N 3 Salatiga with the respondent amounted to 10 students, while the large scale with the X-class respondents MIPA 2 (34 students). The design of the study in a large-scale trial used a *pre- experimental design* with the form of *one-group pretest-posttest design.*

In this study, the data needed include: the variety of learning resources used by the teacher, the feasibility, and the effectiveness of the product. The variety of biology learning resources was analyzed descriptively. Feasibility of Biomagz Based on Local Wisdom by material and media validator, readability test, and student and teacher responses were analyzed descriptively Percentage. Effectiveness data in the form of learning outcomes seen from the value of the *pretest* and *posttest*, and sought improvement using the *N-gain* formula and classical completeness of students. Environmentally conscious attitude seen from the results of observation and assessment among the students who analyzed descriptively p ersentase.

RESULTS AND DISCUSSION

The purpose of this study was to describe the variety of learning resources on the topic of biodiversity, describe the feasibility of Biomagz- Based Local Wisdom, and test the effectiveness of Biomagz- Based Local Wisdom. Biomagz Based on Local Wisdom is said to be feasible if the evaluation by the validator reaches a minimum of eligible criteria with a minimum percentage of 61% (Sulistyowati & Poedjiastoeti, 2013) . Biomagz Based on Local Wisdom said effective if the student learning outcomes obtained there is an increase in *pretest* and *poststest scores* based on *N-gain* criteria reached ≥75% with a minimum criteria being, classical completeness reached> 75%, and the attitude of caring for students at least moderate criteria.

Types of Learning Resources Used Before

Based on the results of the study, it was found that the learning resources used previously in SMA N 3 Salatiga had several types, namely messages in the form of biological material, people in the form of teachers, materials in the form of internet and biology books, and environment in the form of environment around the school. Biology books used in previous biodiversity learning have quite complete aspects of material presentation, consisting of concept maps, keywords, material, questions about evaluations and student activities. Biology books provided by the school are printed in black and white and there are many descriptions on each topic.

In the learning process, students do not optimize biology books that have been provided, students state that the books provided are less attractive. Based on the results of the analysis of the needs of students, it can be concluded students need sumb er additional learning for mempe lajari matter of biodiversity, one reason is the biology books are provided to school is limited, but it is less environment utilizing sekit ar students as a learning resource, it takes innovation to provide resources learning for students who are interesting and able to increase reading interest. Magazines become one of the alternative learning media that can be used by teachers, an attractive and colorful appearance supporting the presentation of biodiversity material that requires many illustrations. Most of the pictures in the magazine that were developed were obtained from the City of Salatiga and its surroundings, so students easily recognized and understood the concept of biodiversity. The results of the analysis of the types of learning resources used by the teacher previously became a reference in the preparation of Biomagz Based on Local Wisdom.

Biomagz Development Base Local Wisdom

Picture 1 Cover of Biomagz Base Local Wisdom

The development stage of Biomagz Based on Local Wisdom consists of feasibility test and readability test. The feasibility test of Local Wisdom-Based Biomagz is carried out by material and media validators. Material and media validation sheets refer to the biology textbook assessment instrument National Education Standards Agency (BSNP, 2014) which has been modified as needed. The score for the feasibility of evaluating Biomagz Based on Local Wisdom by material and media validators is presented in Figure 1.
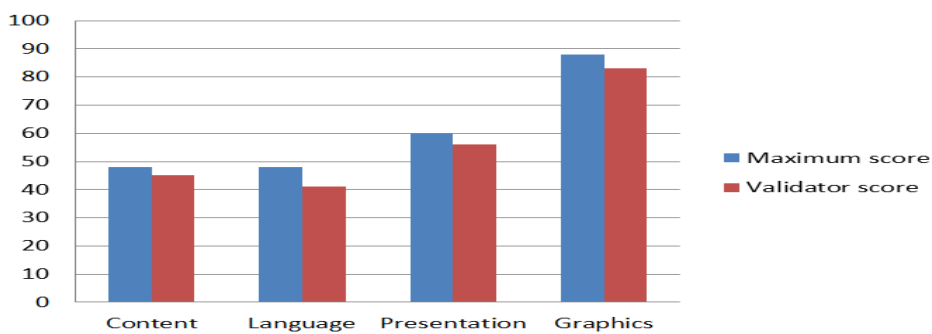
Figure 1 Percentage of instrument validation's result Biomagz Based on Local Wisdom

Based on Figure 1 about the results of the Biomagz Based Local Wisdom feasibility test by the material validator and the media, the feasibility value was 92.21% with very feasible criteria. One of the subcomponents of the content component that gets the maximum score is the statement giving concrete examples from the closest environment of students, this helps students to more easily understand the examples given. Lilia & Widodo (2014) states that when students are involved directly with examples in their daily environment during learning, they are able to provide positive differences in learning outcomes and be able to improve student learning outcomes.

In the presentation subcomponent, the validator assesses the systematic presentation of sequences in accordance with the established curriculum and the goals students must achieve after the learning activities. The presentation of material in a coherent manner is an effort to avoid students' confusion in understanding material. Prastowo (2012) states that the criteria for teaching materials are all materials (both information, tools, and texts) that are arranged systematically, which displays a complete figure of competencies that will be mastered by students and used in the learning process with the purpose of planning and reviewing the implementation of learning. Biomagz Based on Local Wisdom is equipped with images that are in accordance with the material, *layouts are* adapted to images and descriptions so that it is easier for students to understand.

The presentation of Biomagz Based on Local Wisdom uses many images and colors so that it is expected to be able to provide an attractive appearance for students. According to Dewi *et. al.* (2016), colored images make it is easier for students to learn. Images are expected to increase reading interest because it can help students to imagine. Imagination can help students to remember verbal words (Slavin, 2012). Olurinola & Tayo (2015) conveying the use of color in text illustrations will allow students to have more learning experience and students are able to maintain information obtained further because color has the potential to increase environmental stimulation and affect human memory performance.

Validation by material validators includes components of language and graphics. Language components consist of conformity with students, readability, innocence, coherence and clutter of thinking flow, conformity with the rules of Indonesian language, use of terms and symbols symbols. Based on the evaluation of media validator, Biomagz Based Local Wisdom obtain p ersentase 85,41% with very decent criteria on linguistic component. The use of sentences that are easily understood by students can make students more quickly capture the contents of the magazine and remember it, this is in line with the results of student responses to large-scale trials where the language statement used in Communicative and easy-to-understand Local Wisdom Biomagz reaches 85,29 % with the criteria are very decent, supported by the results of the readability test which reaches 78,5% with eligible criteria.

The component of graphics reaches 93,75 % with very decent criteria by the media validator. The instrument of graphic validation consists of size, layout, typography, cover illustrations, content layout, typography content, and illustration of Biomagz content based on local wisdom. Biomagz Based on Local Wisdom is printed on art paper, the use of artpaper paper according to the procedure will produce bright, sharp and durable prints. Biomagz Based on Local Wisdom is printed according to ISO standards, namely A4, A4 size makes it easy for students to read magazine content because the font size is not too big or not too small for students. The use of A4 paper size is also adjusted to teaching materials in general and considers the need for layout of contents in magazines, paper size greatly influences writing and drawing, this is supported by Prastowo (2012) who stated that the size of teaching materials can be accommodated according to learning needs.

Biomagz Based on Local Wisdom which has been revised according to the suggestion of the validator and the lecturer, then it is tested for readability in terms of language, understanding, writing, and addition . Based on the results of the readability test on 10 students of class X MIPA in SMA N 3 Salatiga, the following results were obtained:

Table 1 Results of readability questionnaire analysis on smale scale trial

| No.	Statement	Percentage (%)	Criteria
1.	The look *of the* Biomagz *Cover* Based on Local Wisdom is interesting	75	Worthy
2.	Posts with size and type are easy to read	87,5	Very decent
3.	Color selection is appropriate	85	Very decent
4.	The proportion of images according to the writing	85	Very decent
5.	The illustration / image displayed is clear	72,5	Worthy
6.	Illustrations / images displayed in accordance with the material	85	Very decent
7.	Image layout is appropriate	80	Worthy
8.	Writing language used is easy to understand	72,5	Worthy
9.	The material presented is easy to understand	72,5	Worthy
10.	Spelling according to EYD	72,5	Worthy
	Average percentage	78.5	Worthy

The Effectiveness of Biomagz Based on Local Wisdom

Data on the effectiveness of Biomagz- Based Local Wisdom is obtained from learning outcomes and student's environmental care attitude. Learning outcomes are seen based on an increase in pretest and posttest scores and classical completeness.
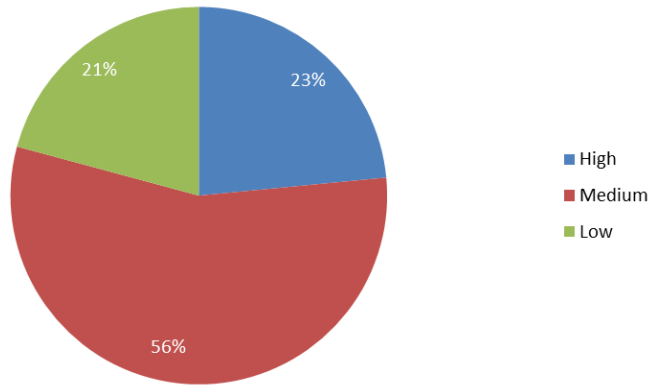
Figure 2 Percentage of N-gain calculation results on biodiversity material

Based on Figure 2 the results showed that the pretest and posttest scores of class X MIPA 2 had increased. Local Wisdom-Based Biomagz *is* declared effective if 75% of students experience an increase in pretest and posttest scores with moderate to high criteria. Based on the *N-gain* calculation of 79,41% has a moderate to high *N-gain* category, then the product effectiveness indicator has been fulfilled. Average N-gain value is 0.49 with medium category.
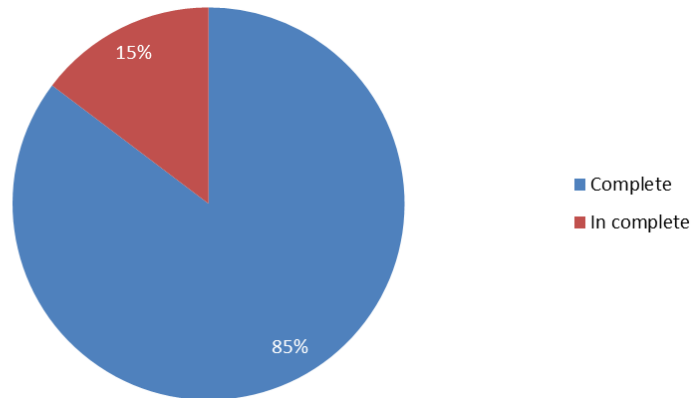
Figure 3 Percentage of classical completeness on biodiversity material

Based on Figure 3, students who complete are 85%, while based on the classical completeness formula obtained 85,29%. Achievement in large scale trials show that the use of Biomagz Based on local wisdom positively affects cognitive achievement of students on the material of biodiversity, it is supported by research Dani *et. al.* (2017), the average learning outcomes of students who use biology magazinesare higher than the average learning outcomes of students who do not use biological magazines. In line with Pratiwi *et. al.* (2017) which states that biological magazines can be used directly without a computer device and are able to support student learning independently. Magazines are presented with easy-to-understand language with information relating to material.

The first factor that has a positive effect on student learning outcomes is the number of images that help students to understand the material being taught. The picture on Biomagz Based on Local Wisdom is printed clearly and with proportional size, its function is to give an overview to students, for example the picture of Indonesian flora and fauna. Original images of Indonesian flora and fauna are presented to students accompanied by local names and scientific names, in addition, also accompanied by a brief description of the flora or fauna. The pictures provided help students recognize the flora and fauna that may not have been seen directly. Images on Biomagz Based on Local Wisdom are printed in color as an effort to improve aesthetic value and facilitate students in learning, because color is very influential when teaching biodiversity. Supported by Prawiradilaga (2004) which states that the functions of visual signs such as symbols, colors, and images or shapes used in the process of delivering learning information can facilitate a person's memory of the material that has been obtained, so students will more easily capture and store more information long.

The second factor is the use of examples from the environment around students and the local wisdom of Salatiga which is integrated with biodiversity material. In the learning process, students are also invited directly to observe the biodiversity in the school, so students get information from the magazine and are equipped with direct observation. as stated Jannah (2016), student learning outcomes that utilize the environment as a learning resource are better than student learning outcomes using conventional learning, thus the use of the environment as a learning resource as well.

Learning materials biodiversity not only use Biomagz Based Local Wisdom as a source of reading, but also used as a discussion group for then reviewed d al am the form of a large group. The use of Local Wisdom-Based Biomagz as a material for discussion is at the fourth meeting when students study the topic of biodiversity benefits, they read and understand the descriptions and drawings in the magazine, then are asked to analyze other examples of daily life. Problem solving is able to create an atmosphere of teaching and learning that is more effective in influencing students' critical thinking skills and requires students to be active in thinking critically in solving problems so that they can help students achieve better learning outcomes compared to students who obtain information through lecture model learning and discussion only (Ristiasari *et.al.,* 2012) .

Local Wisdom-Based Biomagz presents a variety of Indonesian biodiversity information and around students, although a lot of information is presented, students are not only required to read magazines. Students are also required to analyze various biodiversity and provide appropriate examples. The flora and fauna around the students are important provisions to construct an understanding of the concept of biodiversity, so students not only get new information, but are also able to associate with what they have seen and understood before. This is in accordance with Jean Piaget's opinion on constructivism theory that understands

learning as a process of forming knowledge by students that is obtained from the results of initial knowledge construction that has been acquired with newly acquired knowledge, so that learning is more meaningful (Ummi & Mulyaningsih, 2017)

The effectiveness of the use of Biomagz Based on Local Wisdom is also seen based on students' environmental care attitude. Data on environmental care attitudes are obtained from the results of observations and assessments between students. Data on environmental care attitudes are presented in Figure 4.
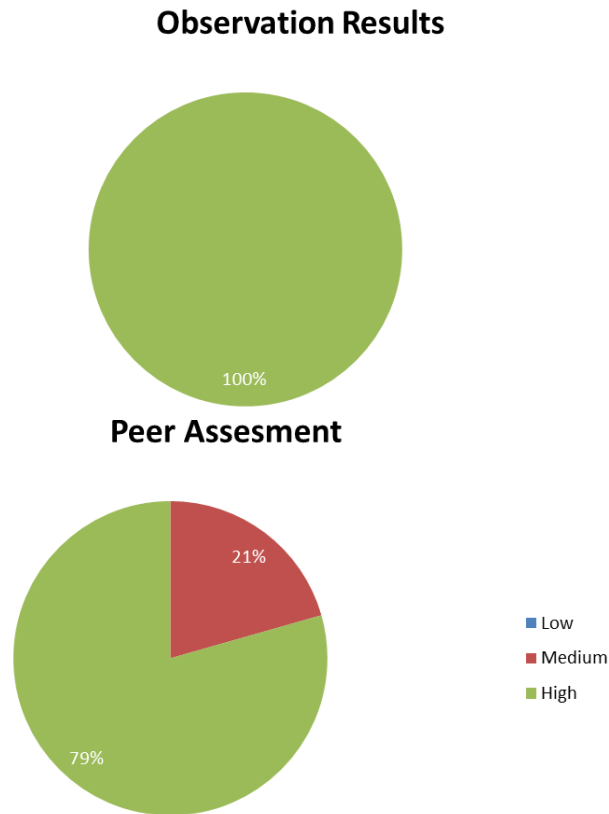
Figure 4 Percentage of students's environmental care attitude

Several factors can influence students' environmental care attitude, based on research (Silalahi *et. al.* , 2016) there is an influence of sources of information on environmental knowledge in students. The source of information obtained by students has an important role to recognize the environment and environmental problems, so students participate in preserving the environment. Biomagz Based on Local Wisdom also acts as a source of information for students regarding biodiversity material that is able to improve environmental awareness.

High environmental care attitude is also influenced by the learning process in the classroom. Biomagz Based on Local Wisdom contains several environmental problems that occur in Salatiga and its surroundings. Students are not only asked to read, but also analyze how the problem can arise and the right solution to the problem in accordance with the results of the group discussion. According to Khanafiyah & Yulianti (2013) environmental education is emphasized on changing attitudes, then the steps taken are by exposing students to existing

environmental problems. Through group problem solving, students not only remember the accepted theory, but actively participate in finding solutions to environmental problems around them.

The positive effect of the presentation of problems on Local Wisdom Based Biomagz on environmental care attitudes is supported by Djuandi's research (2016) which shows a difference in the caring attitude of the experimental class students environment which is taught by problem-based learning before and after treatment. Wahyuni's research *et. al.* (2017) shows an increase in environmental care attitude both explicitly and implicitly for students who get problem-based learning.

The theme of local wisdom on Biomagz which contains biodiversity, environmental problems, conservation efforts, and local wisdom of Salatiga City and its surroundings has a positive influence on student's environmental care attitude. As stated by Djulia (2005), that local content has an important role in increasing students 'understanding of the material and being able to increase student's concern for nature and can enrich learning material. Based on research by Apriana (2012), in biology learning, the local context that is included during learning greatly helps the process of awareness of students and the community regarding the importance of nature conservation, is able to clarify customary rules, and rules regarding humans with their natural environment.

The Effectiveness of Biomagz Based on Local Wisdom is supported by student and teacher responses. Student responses show that students are interested and happy with Biomagz Based on Local Wisdom developed. The result of student responses obtained 88,9% with very decent. Students better understand biodiversity material and make students more active in learning. Based on teacher responses obtained 90% with very good decent, Biomagz Based on Local Wisdom helps students understand biodiversity material and can be used as supplements for students.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the learning resources used by biology teachers in SMA N 3 Salatiga include messages, people, materials, and the environment. The use of material in the form of biology books has not yet shown examples around students and the wisdom of Salatiga City. Biomagz Based on Local Wisdom has fulfilled the eligibility criteria as a learning supplement according to the material validator and the media obtained a percentage of 92,21 % with very decent criteria. Biomagz Based on Local Wisdom is effective on learning outcomes and students' environmental care attitude in learning.

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