



The Effectiveness and Validity of Biomagz Based on the Museum Purbakala Sangiran in Evolutionary Learning in Senior High Schools

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Abstract

This study aims to analyze the validity and analyze the effectiveness of Biomagz as a supplement to teaching materials on the evolutionary material of students in class XII of high school. Although the existence of teaching material sources in schools is complete, based on the explanations from students, teaching materials with an attractive appearance will motivate students to study harder. The development of biomagz is compiled based on observations made at the Museum Purbakala Sangiran which has the potential to be a source of learning, especially on evolutionary material. The development of biomagz based on the Sangiran Museum of Antiquities refers to basic competency standards in accordance with the 2013 curriculum, using Indonesian and designed as attractive as possible. The research was carried out with the aim of analyzing the characteristics of biomagz development, analyzing the validity and analyzing the effectiveness of biomagz as a supplement to teaching materials on the evolutionary material of class XII high school students. This research included R&D research. As many as 15 respondents of class XII MIPA 2 at SMA Negeri 2 Pekalongan were selected by random sampling in filling out the biomagz readability questionnaire. The effectiveness test stage was carried out at SMA Negeri 4 Pekalongan class XII MIPA 3 which amounted to 35 students with learning outcomes tests. The data collection method uses readability test questionnaires, tests and user response questionnaires. The data obtained based on the calendar and user response questionnaire can be analyzed with percentage descriptive techniques. The learning outcomes analyzed can then be compared with the expected percentage of classical completion. The results of the study showed that based on the results of the development of biomagz based on the Museum Purbakala Sangiran, it has characteristics including having an attractive appearance with a colored background, and presented with a variety of images obtained from the Sangiran Antiquities Museum. Biomagz was declared valid and had very decent criteria with media validation results of 93.6% and material validation of 84%. In addition, biomagz was also stated to be very good in the readability test and received a positive response from students and teachers on the results of the user's response to use. The percentage of student responses is 91% and the percentage of teacher responses the user's response to use. The percentage of student responses is 91% and the percentage of teacher responses is 95%. In addition, biomagz was declared effective because $\geq 85\%$ of students had test scores above the standard score of KKM completion. The conclusion of the research is the characteristics of the development of biomagz as a supplement to student teaching materials based on the Sangiran Antiquities Museum which is interesting and can be used as a support for learning activities in the research process, biomagz based on the Sangiran Antiquities Museum is declared feasible as a supplement to evolutionary teaching materials, and biomagz is declared effective because $\geq 85\%$ of students have test scores above the value of the drinking completion criteria or KKM. The supporting suggestion of this research is that the development of biomagz can be presented through a page that can be accessed by students anytime and anywhere.

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INTRODUCTION

Learning can be defined as setting events that exist outside the learner and designed and utilized to facilitate the learning process (Jufri, 2013). In learning, the learning process is the most important activity and must involve two parties, namely teachers as educators and students as learners. The learning process has the aim of increasing the quantity and quality of aspects of student knowledge, values, attitudes and skills and gaining various experiences. Based on this description, learning can be defined as a learning process that utilizes learning resources by involving facilitators and learners who aim to gain knowledge, skills and positive values for both parties (Fakhrurrazi, 2018).

Biology learning is learning that is not only delivered with modifications of the learning model, but learning media is also very necessary so that teaching materials can be truly understood by students. Biology has competencies that require students to be able to understand, apply, analyze factual, conceptual, and procedural knowledge. Therefore, biology learning carried out in schools must be carried out optimally. Optimization of biology learning can be supported by supporting components of learning in order to achieve the desired learning objectives. The supporting components of learning can be in the form of learning strategies, learning methods, learning media or sources of teaching materials (Akbar & Mukminan, 2019).

In accordance with the results of a survey conducted to students at SMA Negeri 4 Pekalongan using a questionnaire, data obtained that 70% stated that the availability of books and other teaching materials at SMA Negeri 4 Pekalongan was complete enough, and during the pandemic they had no difficulties in accessing books and materials. teach because the facilities at SMA Negeri 4 Pekalongan are adequate. However, the problem is the quality of the teaching materials. As many as 50% of the total students who filled out the questionnaire explained that the images in the teaching materials were blurry images, not very clear and even some teaching materials had colorless images, making it difficult for students to understand the lessons being taught. Lack of these teaching materials can be an obstacle for students in understanding biology lessons, thereby reducing interest in reading and students' motivation to learn.

Based on the identification of problems in SMA Negeri 4 Pekalongan, learning supplements are needed that are more interesting, easy to carry by students, and are expected to improve student learning outcomes in biology subjects, especially evolutionary material. This type of learning supplement that can be developed is related to biology magazines or commonly known as biomagz. Biomagz is short for Biology magazine. Nurdiyanah (2015:11) also explained that biology magazines are sources of information in printed form and contain the latest biological information to be presented to students.

Research with the theme of developing science magazines has been widely applied by other researchers before, it's just that the subject or focus of the basic competencies used is different. Kurniawati (2015) with the title Development of Invertebrate Biosmart Magazine to Improve Activities and Learning Outcomes of High School Students explained that the research results were declared valid by experts. The material expert gave a validation score of 84%, the media expert also stated it was valid with a score of 81.4%. Besides being valid, this magazine is also effectively used by students as a learning resource for class X SMA N 1 Kejobong.

The development of teaching material supplements has various objectives, Rena (2014: 12) explains that one of the goals of developing teaching material supplements is as a means of increasing student motivation and learning outcomes. Supplements of teaching materials are considered capable of supporting the learning process and the development of students' knowledge both at school and at home.

Biomagz was developed based on the potential that exists in the Museum Purbakala Sangiran. Saputra, Maridi & Agustina (2016) stated that as many as 80% of students explained that the Sangiran Site presented an overview of the discovery of ancient human fossils in Java and their stratigraphy. 70% of students also think that the Sangiran Site is referred to as an ancient human laboratory that can be used as a source of evolutionary learning. This statement is supported by Asmara (2019), museums have an important function in the world of education. Starting from elementary level education to top level education, in elementary level education to top level education.

Based on the background, this study aims to analyze the effectiveness and validity of Biomagz, especially for class XII high school students who are expected to improve learning outcomes and mastery of students' concepts after using Biomagz as a teaching material supplement.

RESEARCH METHOD

This research is included in the type of R&D research. R&D research is a type of development research that has several stages before being finally implemented in the school environment. This study was adapted to the steps of the R&D research method by Sugiyono (2019) with the following procedures: Potential and problem analysis, data collection, biomedical design, validation of *biomagz*, revision I biomemagz, small-scale trials, revision II biomes, large-scale trials, revision III *biomagz* and final product.

In potential and problem analysis stage, the researcher analyzed the problems and needs of students using survey methods and interviews with teachers at SMA N 4 Pekalongan and the Museum Purbakala Sangiran. Researchers collect data that will be used as material for designing biomes, the data can be in the form of journals, books, web pages, and the results of observations made at the Museum Purbakala Sangiran. The design stage, which is the activity of designing the product (*biomagz*) and continued with the product validation stage. Product validation is carried out by material experts and media experts. The results obtained based on the validation process are then analyzed and used to revise the biomass. *Biomagz* was then piloted on a small scale. The results of the small-scale test are used to correct the deficiencies that are still found in the biomass before being tested on a large scale.

In the effectiveness test stage, the product is implemented to students at school. This stage aims to test the effectiveness of the product on a large scale. The subjects used in this study were 35 students of class XII MIPA 3 at SMA Negeri 4 Pekalongan. The technique used during the effectiveness test is a one shot case study. The data collected includes student learning outcomes, and student and teacher responses. Methods of data collection using questionnaires, tests and observations. The instruments used are expert validation questionnaire sheets, learning evaluation questions or learning outcomes sheets, student response questionnaire sheets and teacher response questionnaire sheets as well as student activity observation sheets. The data obtained based on the effectiveness test can be analyzed and can be used as a *biomagz* improvement. Student learning outcomes were analyzed for remedial activities. The results of student and teacher questionnaires were also analyzed to make improvements to the biomass. Student learning outcomes, observations of student activities and the results of questionnaires can be used to conclude the effectiveness of the products that have been developed when used in the learning process.

RESULTS AND DISCUSSION

The purpose of this study was to analyze the validity and effectiveness of Biomagz as a supplement to teaching materials for the evolutionary material of class XII senior high school students. Biomagz is said to be effective if student learning outcomes or the percentage of classical completeness students get results >85% of the Minimum Completeness Criteria (KKM) of 70.

Biomagz Validity

The validation results obtained by media experts and material experts are used as a reference for product development improvements. Indriyati & Isnaeni (2022) stated that in the validity test or product feasibility test, validation is a technique used to assess the feasibility of the product being developed. This is supported by Sugiyono (2019) who explains that design validation is a process of assessing the feasibility of the product design to be developed.

The results of the validity test analysis based on material experts and media experts are more shown in the table below.

Tabel 1. Analysis table of *Biomagz* validation results by experts.

Aspek yang dinilai	Obtained value		Average percentage (%)	Criterion
	V01	V02		
Content Aspects	24	-	85,7	Very worthy
Construction aspects	22	-	78,6	Worthy
Language aspects	18	-	90	Very worthy
Aspects of writing appearance	-	13	86,7	Very worthy
Aspects of Image display	-	24	100	Very worthy
Aspects of <i>Biomagz</i> function	-	22	91.6	Very worthy
Overall number (%)	84	93,6	88,8	Very worthy

Based on the results of the validity test contained in table 1, it is stated that evolutionary biomass is very feasible to use. This is because *Biomagz* obtained an average validation value of 88.8%. The material validity assessment instrument consists of three aspects and consists of 20 questions. In the aspect of content the value obtained is 85.7%. In the construction aspect, the score is 78.8%, while in the language aspect, the score is 90%. The three aspects of the assessment have assessment items that get a positive response by the material validator. In addition to the validation value, the validation instrument also obtained several suggestions from expert validators. All criticisms and suggestions are used for improvement in order to produce products that are developed for the better. The validator provides suggestions regarding the completeness of the contents of the biomegz that must be considered. This is because at the beginning of the material validation process in the section on the origin of biomes, it only consisted of several theories on the origin of life. So it is advisable to add other theories of the origin of life such as: the theory of the origin of prokaryotes, the theory of the origin of eukaryotic, the theory of the origin of mitochondria etc. In addition to the theory of the origin of life, the material validator also added that if the mutation material should be added an illustration of a mutation in the form of a picture of a mutation that occurs in one species and the addition of material on the mechanism of evolution.

Apart from the evolutionary material in the biomegz, validation is also carried out based on the media. The media validity assessment instrument consists of three aspects and is composed of 17 questions. In the aspect of writing, the value obtained is 86.7%. In the aspect of image display, the score is 100%, while in the magazine function it is 91.6%. The three aspects of the assessment also received a positive response by media validators. Many revisions are given by media validators, such as the neatness of paragraphs, page numbers that are left behind, number of questions in TTS, and the source of the image is more specified and the distance between the source and the images presented is more re-arranged. Because of these suggestions, improvements were made by adding page numbers and question numbers to the TTS, changing the font and spacing used in the Canva application so that the paragraphs are neater and spaced more regularly. In the image display, the source needs to be more specified and the distance between the source and the image is adjusted.

In addition to suggestions for making several revisions, the media validator also suggested that the supplement of this *Biomagz* teaching material be equipped with evidence of plagiarism to strengthen its originality. Based on the results of the check which was carried out through the turnitin check page in the unnes library, the results obtained were 18% turnitin and this result stated that the *Biomagz* product was a supplement to original or authentic evolutionary teaching materials.

Product Effectiveness

In the effectiveness test, the method used is one case shot study, which is one method that is often used in educational research. Arikunto, (2013: 123-124) explains that the one case shot study is included in the pre-experimental design category or commonly referred to as quasi-experimental. Pre-experimental design is a term used to describe a type of experiment that does not meet scientific requirements. Meanwhile, One case shot study is a simple design using one treatment which is considered to have an effect on the research subject. This design uses test scores and compares the results obtained in the form of the percentage of classical completeness with the desired standard (KKM).

Teaching and learning activities at SMA Negeri 4 Pekalongan in class XII MIPA 3 use Biomagz as a supplement to biology teaching materials that have been developed and at the same time test the effectiveness of these supplementary teaching materials. During learning activities, Biomagz is used as an alternative source of learning and aims to increase students' learning motivation. This is in line with the research of Indriyati & Isnaeni (2022), the supplement of teaching materials developed is an alternative used to achieve learning objectives. Evolutionary learning is carried out for 3 meetings or 12JP with 2 JP used as a Daily Test or learning evaluation using test questions that have been tested for validity. Usage test on a large scale in the form of product effectiveness can be measured based on the value of learning outcomes from student learning outcomes. Biomagz can be declared effective if the learning outcomes of at least 85% of the students reach the KKM standard. Based on the test results, there are 3 students who have scores below the KKM standard. The following table shows the results of the analysis of the Classical Completeness Percentage of Students.

these calculations can be declared reliable or trustworthy. After all the questions are declared valid, and the evolutionary material learning activities have been completed, a post test can be conducted in class XII MIPA 3 SMA Negeri 4 Pekalongan. Based on the post test results, there were 3 students who had scores below the standard value (KKM).

The large-scale test was carried out with a one shot case study approach, namely by looking at the average value of student learning outcomes and then comparing it with the desired standard value. In this case the standard value used is the standard KKM score for the school in biology, which is 70. Based on the results of the post-test analysis of students, the data shows that the average post-test score of class XII MIPA 3 students is 81.6286 with classical completeness of 91. %. A total of 32 students were declared to have scored above the standard value or KKM set in biology subjects, namely 70, and 3 of them received scores below the KKM standard. Students who get a score below the KKM are encouraged to continue to follow the remedial program held in order to get the maximum final score. Remedial activity is one of the actions given to students after the daily test takes place. According to Uskarina's opinion, Meyumi (2019), students who have not reached the specified standard of completeness or KKM need to be given remedial activities. Remedial learning is expected to help students understand the learning difficulties experienced by students in order to improve student learning outcomes.

Tabel 2. Table of Percentage Classical Completeness of Students

Perolehan hasil belajar siswa	Jumlah siswa
Siswa tuntas	32 anak
Siswa belum tuntas	3 anak
Jumlah seluruh siswa	35 anak
% ketuntasan klasikal	91,4%

Based on the table above, the learning outcomes of class XII MIPA 3 students at SMA Negeri 4 Pekalongan are already above the expected percentage of classical completeness and has increased

compared to the percentage of classical completeness on evolutionary material in the 2020-2021 academic year. The results of the analysis stated that the percentage of classical completeness of students of SMA Negeri 4 Pekalongan, class XII MIPA 3 obtained a result of 91.4%. According to Fauzan et al., (2019) a class can be said to be successful or complete learning if the class contains at least 85% of students who have completed their studies. The results of the percentage of classical completeness in the evolutionary material for the 2021-2022 academic year have increased compared to the percentage of classical completeness in the evolutionary material for the 2020-2021 school year, based on these data, it can be stated that the supplementary evolutionary biomedical teaching material tested at SMA Negeri 4 Pekalongan can be used as an alternative learning resources and can optimize learning activities.

Final scores are obtained based on the combined and average of test scores, and skill scores during evolutionary learning. The high final score of students cannot be separated from the use of Biomagz and the function or purpose of developing Biomagz as a supplement to teaching materials so that students can be more motivated in learning, especially in evolutionary KD. This is in accordance with the explanation of Hastari, et al (2019) that e-modules have a high effectiveness in improving student learning outcomes and student activity in the classroom. This statement is supported by Pramana, et al (2020) that teaching materials in the form of modules, teaching material supplements, or other forms of teaching materials can be used to improve and have a better impact on student learning outcomes. This is in accordance with the role of teaching materials in learning activities as a tool that can be used by teachers in explaining the material to be taught. Nurhidayah et al. (2017) also describes that the appearance of attractive teaching materials can provide visual stimulation, so as to improve student learning outcomes, and help streamline the learning process.

Students who score below the KKM are encouraged to continue to follow the remedial program in order to get the maximum final score. Remedial activity is one of the actions given to students after the daily test takes place. According to Uskarina (2019), students who have not reached the specified standard of completeness or KKM need to be given remedial activities. Remedial learning is expected to help students understand the learning difficulties experienced by students in order to improve student learning outcomes. Based on the analysis conducted, the 3 children scored below the KKM due to students' cognitive performance, which was then exacerbated by an unstable internet network when taking the test. However, based on the results and discussions that have been described. Biomagz as a supplement for teaching materials on evolutionary material can be used in the teaching and learning process of students so that they can improve the learning outcomes of class XII students.

CONCLUSION

Based on the results of data analysis and discussion of research results, it was concluded that Biomagz was feasible and effective to be used in high school biology teaching and learning activities. Biomagz has a feasibility test result of 84% (very feasible) on the material component, and 93.6% (very feasible) on the media component. Biomagz was declared effective because 85% of students had test scores above the drinking completeness criteria or KKM.

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