



**Learning Materials on Environmental Change of Waste and Waste Recycling With SETS Bervisi Module to Improve Student Learning Outcomes in SMA**

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**Info Article**

*History Article:*

*Received : October 2017*

*Accepted : December 2017*

*Published : January 2018*

*Keywords:*

*Module; SETS; Science Environment Technology and Society; Students' learning results*

**Abstract**

*The development of science curriculum aims to achieve the dimensions of knowledge competence, scientific work, and scientific attitude as daily behavior in interacting with society, environmental and technological utilization. Teaching materials are used in the form of book packages and not yet available learning modules. This study aims to determine the feasibility and effectiveness of SETS biological module vision of environmental change and recycling of waste as teaching materials. This research is a research and development with a quasi-experimental design. The design of this study used a pretest-posttest control group design pattern. The population in this study were all students of class X MIA SMA N 2 Purbalingga, with class X MIA 3 sample as experiment class, and class X MIA 2 as control class. The product was developed in the form of a Biology learning module with SETS vision of recycled materials, waste and environmental waste recycling. The prerequisite test includes the normality test of pretest learning results, with  $\alpha = 0.05$  with the initial conditions of the control class and the experiments not significantly differing. The result of posttest obtained then analyzed by t-test. The result of t-test analysis obtained  $t$  arithmetic price  $>$   $t$  table price  $10,58 > 1,67$ , it can be stated that there is a significant difference between the result of control study and student experiment class. Based on the result of the research, it is concluded that 1) Biology Module SETS is suitable to be used as teaching materials, 2) the use of SETS biology module to study environmental change, waste and waste recycling effectively improve student learning outcomes.*

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p-ISSN 2252-6579  
e-ISSN 2540-833X

## **INTRODUCTION**

The 2013 curriculum is designed with characteristics in which the school is part of a community that gives learners a learning experience to apply what is learned in school to the community and leverages the community as a learning resource for developing attitudes, knowledge, and skills. Therefore, the development of the curriculum of Biology of SMA 2013 is conducted to achieve scientific competence of scientific work knowledge, as well as a scientific attitude as daily behavior in interacting with society, utilization of technology and environment (Kemdikbud, 2016).

The result of early observation of X class student in SMAN 2 Purbalingga is known that Biology learning has not linked the knowledge gained with technological development, its impact on environment and society. Teaching materials used in the form of a book package and not yet available learning modules. Most students assume that the Biology subject is a rote subject with a lot of material that is difficult.

Based on the results of interviews with some of the students of class X, they have never used the teaching materials in the form of modules and also wanted a teaching material that can help them study Biology subjects. The teaching materials used by the students must be in accordance with the environment of the learners. This is supported by Indriawati et al. (2016), which states that the activities and teaching materials must be in accordance with the environment of learners as well as related to the potential of environmental resources so that learners get an experience-oriented learning experience.

According to Binadja et al. (2005) to achieve the expected competence, an approach is needed in learning that is able to relate the things studied with aspects of science, environment, technology, and society. The SETS (Science, Environment, Technology, and Society) approach according to Binadja (2005) is a study by linking the learned with the corresponding aspects of Science, Environment, Technology, and Society as a form of integrated interconnectedness.

Biology Learning is very close to the world of learners. Learning resources can come from anything that exists in itself as an organism and the surrounding natural environment. Currently, the source of learning can be taken through the virtual world. Both in the form of animated films or real films or images of anatomical sightings of various types of microscopes that can be accessed by learners. Although information technology helps learners develop literacy utilization of textbooks as a source of learning is still needed to stimulate interest in reading and improve the creativity of learners. But books are not the only source of learning. Modules prepared by teachers that give learners the opportunity to develop creativity and stimulate skills.

Based on this research, it is necessary to develop a SETS visionary module designed to help learners to study environmental change materials, waste and waste recycling. Learning to use the surrounding environment as a learning resource, as well as linking materials with technological developments and their impact on the environment and society in accordance with competencies in learning in the Curriculum 2013.

## **RESEARCH METHODS**

This research was conducted on May 4 until May 24, 2017, at SMAN 2 Purbalingga. The subjects of this study were students of class X MIPA 2 (34 people) and MIPA 3 (33 people). Class X MIPA 2 as control class and class X MIPA 3 as experiment class.

This research is a research development, Research, and Development (R & D). The research undertaken in order to develop the Biology learning module has a SETS vision of basic competence 4.11 on environmental change materials, waste and waste recycling.

The research design used was Quasi-experimental design with pretest-posttest control group design model. Learning is done using the SETS vision module in the experimental class and without using the module in the control class.

Small-scale trial samples were 10 participants in class X MIPA 1. Large-scale trials of 34 control class students (X MIPA 2) and 33 experimental class students (X MIPA 3). Sampling is done by purposive sampling technique.

Data collection techniques used are interviews, observation, written tests and student reports. Validation of material and media experts are conducted to assess and simultaneously test the feasibility of the SETS vision module. The effectiveness of the use of modules is calculated using t-test by looking at the significant differences in student learning outcomes and questionnaire responses of students and teachers.

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## **RESULTS AND DISCUSSION**

Biology teaching materials used in SMA Negeri 2 Purbalingga class X in the form of a book package. One package book is a must-have book package for students while the other one is a package of books available in the library. The compulsory package of the students is a biology textbook from publisher Intan Pariwara whose content has been adjusted with Permendikbud RI No. 24 of 2016. While other book packages are books from publisher E in 2013.

The product produced in this research is Biology learning module with specification covering (1) module size with length 29,7 cm, width 21,0 and thick 0,4 cm; (2) letter size 11; (3) type of letters used Abadi MT Condensed Light; (4) the image on the cover is adapted to the material; And (5) the material used for cover is ivory paper 260 gsm while the material content is HVS 80 gsm paper.

The learning module consists of 34 pages divided into 3 parts, namely introduction, content, and cover. The introductory section consists of 8 pages divided into 6 components, namely sub cover, basic competence, introduction, table of contents, reader guide, concept map, and glossary. The contents section consists of 24 pages consisting of learning activities that contain material and practicum along with practice questions. The final section consists of a bibliographic reflection column.

Characteristics of the module lie in the core that is part of the learning activities in the module. Learning activities in modules integrated with SETS. Students undertake scientific work in learning (Doing Science), linking scientific work with environmental preservation efforts (Environment Edu for), suggesting ways/techniques that can be used to overcome them (Technology) and how the impact on society (Society).

Research that has been done to obtain the results that include the feasibility of vision module SETS, student learning outcomes and responses of teachers and students. The research results obtained are presented as follows.

### Feasibility SETS Vision Module

Based on the data of Table 1, the feasibility of SETS vision module on material and media validation by experts obtained the result that Biology module with SETS vision is feasible to be used as teaching material with an average of 85,78%.

**Table 1** Feasibility Score of SETS Vision Module.

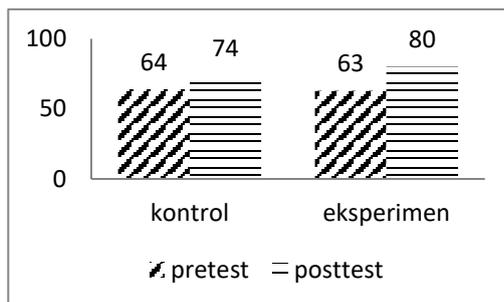
| No | Aspects of eligibility | Score (%) | Criteria  |
|----|------------------------|-----------|-----------|
| 1  | Material validator     | 84,54     | Very good |
| 2  | Media validator        | 87,02     | Very good |
|    | Average                | 85,78     | Very good |

The module validation results on the material experts show excellent scores for module assessment on a presentation that include the interrelation between Biology with other science as well as social aspects of society, environment, and technology. The number of scores obtained interpreted that the modules developed were worthy of use as teaching materials. Assessment from media experts obtained excellent results so that the SETS vision module is worthy of use as a teaching material. This is because the presentation of the material is interactive and participatory, which motivates the learners to be involved in the achievement of basic competencies. The presentation of the material also put learners as subjects of learning.

### Effectiveness of Biology Module SETS Vision

The results of cognitive learning in this study showed good results, all learners in the experimental class to complete means that all participants of the experimental class have reached the value above 75 Figure 1. This is in accordance with research Winarti et al. (2016) which states that the experimental class learning outcomes using SETS-laden modules are better than control classes that use resource materials from publishers.

Water pollution practices lead students to play an active role in observing the effects of pollution due to the use of chemicals discharged into direct water, analyzing pollution impacts, technologies that can be used to overcome pollution and how it affects people according to SETS elements. This is in accordance with research Syuru et al. (2015) that with SETS visionary learning, students can be active and motivated by real learning and tasks in the surrounding environment.



**Figure 1** Average student learning outcomes

The average of learning outcomes in the experimental class is higher than the control class, it is apparent on the second t-test of posttest value of the class that the mean of learning outcomes of the control and experimental students is significantly different. Based on the results of the t-test, obtained t arithmetic 10.58 greater than t table 1.67 ( $\alpha = 5\%$ ). The average learning outcomes of the experimental class are higher than the control class because the learning process in the experimental class uses the SETS vision module. This is in line with Triwijananti et al. (2014) which states that learning using conservation-based modules can improve student learning outcomes. Widyaningrum et al. (2013) added that learning by the module in high school on environmental preservation materials improves student learning outcomes significantly. Further, Esmiyati et al. (2013) state that the integrated IPA SETS vision module used as teaching material is able to help students achieve the established KKM that is  $\geq 75$ , so it is effective and applicable for students.

The learning outcomes of the experimental class were higher than the control class. This is because the experimental class students use the SETS vision module in the lesson in which students are invited to discuss the group, conduct environmental pollution experiments in which students define variables and arrange work steps in experiments based on scientific methods, analyze data, summarize experimental results, create simple technological works, To care more about the environment and society. Each member of the group helps each other and concentrates fully on the assigned task. This is what improves learners' understanding of competencies related to environmental change, waste and waste recycling. Mulyono et al. (2012) state that learners need to be involved in a variety of appropriate activities in the learning process to develop scientific skills of learners. According to Nisa et al. (2015), the use of modules in learning can improve students' literacy skills. Mubarak et al. (2015) also showed that by learning to use the SETS visionary biology learning module, the teacher-centered learning became student-centered learning.

Student-centered learning provides students with opportunities to engage in relevant activities. The students not only learn the theory but also practice the concepts they have learned. Schumm and Bogner (2016) added that the use of modules in science learning can improve students' literacy skills in both cognitive, affective and psychomotor literacy. This is in line with research Wijayanti et al. (2013) SETS visionary learning can improve the thinking skills of the process of science.

The effectiveness of the SETS visionary biology module also appears from students' responses to the module during the lesson. The average student questionnaire response result (Figure 2) shows that 72% of students agree that the Biology module has a SETS vision effectively used as material or environmental change, waste and waste recycling.

The highest percentage of students' responses with 85% gain was the SETS vision module making it easier for students to study environmental change materials, waste and waste recycling. Understanding the material becomes easier because the module is given pictures, samples of pollution, practicum activities and field observation and waste-recycling product manufacturing projects. The results of this study are in accordance with Susilowati et al. (2013) which states that

project activities or learning that produce products can provide immediate experience and provide opportunities for learners to construct their own knowledge by pouring project ideas done so that knowledge obtained by learners more meaningful.



**Figure 2** Average Results of Student Feedback Analysis of the SETS Vision Biology Module

Students interested in studying the SETS vision module are shown by the percentage of students' responses to the module. Interest response studying module by 85% is because learning using SETS vision module is varied according to the research of Shofiyah et al. (2014). Students are not only working on the modules but discussing groups, planning water pollution experiments, reporting and producing waste recycling products. The display of attractive and colorful drawing modules enables interested experimental group students to read and study the modules. This is in line with Fitriani et al. (2013) students feel interested in learning to use the module because the material presented is arranged logically and systematically accompanied by color images and interesting. Winkel (1991) added using learning aids such as drawing, the learning process becomes more interesting and can increase the love and appreciation of students for science. Goff et al. (2017) also state that learning using a module produces students who have a higher level of conceptual understanding than non-modular learning because with the module can facilitate students learning outside the classroom.

Learning materials on environmental change, waste and waste recycling can invite students to play an active role in learning. A pleasant learning atmosphere arises when students play an active role in learning so that it can motivate students to learn. This is in line with Nugraha et al. (2015) a pleasant learning environment can lead to high learning motivation in students. Exciting learning will make students optimize their thinking power to process the learning materials provided by the teacher.

The student's highest response to the module is also shown in the information contained in the module that is in accordance with the development of science and is up to date with the percentage of 85%. This is because in the module contains references in the form of research journals related technology to overcome the latest environmental pollution (up to date). In accordance with Depdiknas (2008), module material would be very good if using current references that have relevance from various sources such as research journals. Module material does not have to be written entirely, only in the module it shows the reference used so that students read more about the material.

The teacher's response to the module is very good. The teacher gives an assessment that the contents of the module are good, students will feel happy with the color module drawings so as to attract the attention of students to learn it. Biology Module SETS is very well applied in learning, so teachers have alternative teaching materials that can foster students' interest to be innovative, creative, and can connect knowledge with technological developments, and their impact on environment and society. Implementation of this module is expected to generate the interest of teachers to create similar materials that match the characteristics of students so that learning objectives will be achieved.

## CONCLUSION

SETS biology module has been developed which has SETS integrated characteristics in learning. The module contains a description of the learning activities where students perform scientific work (Doing Science), care about the environment (Environment), create simple technological works (Technology) and approach to society (Society). Biology Module SETS developed feasible to be used as teaching materials and effective use as teaching materials.

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