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The Implementation I-SETS based Learning Tools to Improve Learning Outcomes and Problem Solving Skills on Ecosystem Material in MTs

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Abstract

The research aims to identify the characteristics, validity, readability, and effectiveness of I-SETS teaching devices as well as improve learning outcomes and skills in solving ecosystem material problems. This study used experimental and control classes and then measured the results of the pretest and post test with the N-gain formula. The results of the research showed that the teaching device based on I-SETS has the characteristics of ecosystem material content that is integrated with Islamic values in the Quran and hadith and applies SETS learning measures. (Science, Environment, Technology, and Society). The results of the data analysis showed that in the experimental and control classes, the percentage of N-gain test results was in the range of 0.3-0.7 for MTsN Semarang and MTsN Salatiga with moderate criteria. There was an improvement in environmental problem-solving skills in the experimental class compared to the control class with medium criteria, as well as an elevation of attitudes toward the environment. Students showed excellent criteria. Based on research results, I-SETS-based teaching devices are valid and usable and can improve learning outcomes and skills to solve ecosystem material problems.

How to Cite

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INTRODUCTION

Indonesia is one of the countries with a large population with an increasing rate of population growth. This will affect the volume of garbage in 2022 to reach 17.8 million metric tons per year. The remaining unmanaged waste of 4.1 million tons per year with the greatest composition comes from household waste of 37.6 percent (Kehutanan et al., 2022). Waste and garbage have great potential for environmental pollution, leading to the deterioration of the quality of the living environment (Permadi & Murni, 2013). This will have an impact on the ecology, so it can disrupt the balance and destroy the existing ecosystems (Hanifatin, 2015).

An ecosystem is an order of complete unity between interacting elements of the living environment. Ecosystem problems also occurred in Semarang District, including the decline in river water quality due to pollution, drought, landslides, and floods, as well as the loss of biodiversity and land damage due to wild mining that can lead to soil erosion. (Dinas Lingkungan Hidup Kabupaten Semarang, 2018). Rawapening is one of the 15 priority lakes in Semarang district that need to be rescued because of its very worrying condition. This is due to the decline in water quality, drainage, and lake deposits due to sedimentation (Soeprobawati et al., 2010). One of the follow-up efforts of the government of Semarang district to prevent damage to ecosystems and the environment is through education.

Madrasah is an institution of Islamic education that, in the process of its studies, integrates science and religion. A conducive, clean, and healthy environment is expected to create a pleasant atmosphere so that the learning process can proceed well. The influence of the school environment on the student's character is enormous. However, education involving the environment to solve problems in the surrounding environment has not been much applied. Therefore, innovation in the learning process must be done in the form of models and learning instruments.

The problems presented by AKM are in various Science, Environment, Technology, and Society (SETS) is a learning model that has a scientific and technological component that involves students in investigating, analyzing, and applying concepts and processes to real problems and situations (Fatchan & Soekamto, 2018). The development of science is still to be balanced with the application of technology that is friendly to the

environment. Learning in madrasah in developing science can integrate with environmentally friendly technology, have an impact on society, and contain Islamic values so that the purposes of the curriculum of madrasah can be achieved. Therefore, in order to be able to solve these problems, it is necessary to undertake development research entitled "Development of I-SETS-based Learning Devices to Improve Learning Outcomes and Skills to Solve Ecosystem Material Problems in MTs.

METHOD

The design of the I-SETS-based teaching device is based on the results of the analysis of the curriculum, learning objectives (ATP), indicators, as well as the needs of teachers and pupils. The testing of the learning device based on I-SETS is carried out on 2 Madrasah details of 2 classes per madrasah. At this stage, the testing is conducted in 2 classes, consisting of 1 control class and 1 experimental class, with a total of 118 students. In the I-SETS approach, the syntax used is a combination of sources from previous research and the integration of Islamic values into the learning process shown in Table 1.

Problem-solving skills are the ability of the student to determine what to do using the information available (Oktaviani & Dance, 2018). The problem-solving skills of the pupil are the problem-solving skills (PSS). Problem-solving skills have been identified as important educational skills for students (Cornoldi et al., 2015). Some PSS indicators, according to some experts and research applied in this study, include: a. identifying problems; b. data collection; c. formulating solutions; d. implementing solutions; e. evaluation. In this study, data collection techniques are carried out to produce I-SETS-based learning devices to improve the cognitive learning results of IPA and skills to solve ecosystem material problems in MTs that meet the criteria of validity, effectiveness, and readability.

Tabel 1. Sintak I-SETS

Stage	Description
Initiation (Initiation/ Invitation/ Appreciation/ Exploration against students)	The teachers ask about nature, about adaptation in nature and its impact on the environment and its relationship with Islamic values in the Qur'an.

Formation or development of concepts	Students build knowledge through demonstrations and others.
Application of concepts in life	Students analyze problems or problem solutions from concepts previously understood and can apply them in everyday life.
Concept Monitoring	provide an explanation of the correct concept of the analysis carried out to prevent misconceptions that occur during the learning process.
Evaluation	to find out the achievement of the learning objectives and learning outcomes that have been acquired by the students.

RESULT AND DISCUSSION

I-SETS (Islamic, Science, Environment, Technology, and Society) is a tool that includes teaching materials, teaching modules, LKPD, and learning outcomes tests that are all based on I-SETS. In addition to Islamic, there are other aspects of SETS (science, environment, and society) in the teaching material.



Figure 1. LKPD I-SETS

Students gave an assessment that the teaching materials and LKPD are interesting and easy to use in learning, so that the learning process can run smoothly. The learner work sheet developed

based on I-SETS is shown in the LKPD, consisting of syntax or SETS learning steps and PSS indicators or problem-solving skills that are already integrated with the values in the Qur'an or Hadith, as shown in Figure 1. The learning test in the pupils that analyzed using the N-Gain test shown in Figure 2.

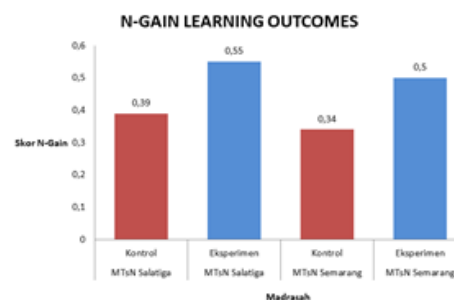


Figure 2. N-gain Learning Outcomes

Based on the results of the N-Gain test, it was shown that in the experimental and control classes, the percentage of N-Gain was in the range of 0.3–0.7 with moderate criteria. Besides, there's a pretty significant difference of up to 20% between classes. The next test is the normality and homogeneity test. Based on the results, the learning data is not normally distributed but homogeneous. This is because the Wilcoxon test is carried out to see if there is a difference between learning outcomes using the I-SETS device and not. Based on the results and the known asymptote sig value of $0.000 < 0.05$, it is concluded that "hypothesis accepted." This means there are differences between the learning outcomes using the SETS learning device and those on the pre-test and post-test, so it can be concluded that there is an influence on the use of the Sets learning device on the learners. To determine the difference between the average differential value of increased learning outcomes using the I-SETS teaching device, the teaching devices usually performed the Independent Mann-Whitney Test because the data did not meet the normality assumptions. The test results are shown in Figure 3.

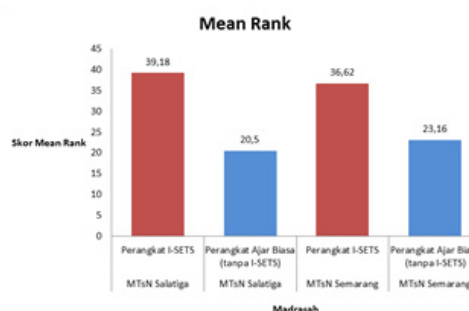


Figure 3. Mean Rank Learning Outcomes

In their research, Rahmaniati and Supramono (2015) showed that the average value of learning results after applying I-SETS was higher in the experimental group than in the control group that did not apply I-SETS. Additionally, the significance values of 0.000 and 0.001 ($p < 0.05$) were obtained in both madrasahs, so there was an influence on the use of I-SETS in the learning process. In addition to the test of learning outcomes, an analysis of the environmental problem-solving skills of the pupils is carried out. The data from the analysis showed that Mr. Kolmogorov-Smirnov's value was > 0.05 , so the data was distributed normally. To further understand the improvement in problem-solving skills in analysis using the N-gain test shown in Figure 4 below.

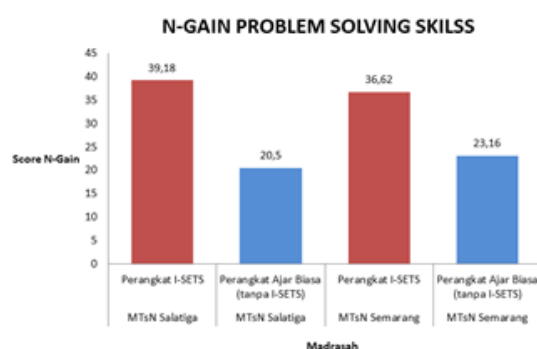


Figure 4. N-gain PSS

Based on the results of the SPSS analysis obtained, N-gain results up to 0.5 with a moderate criterion in improving the skills of solving problems in the student's environment. The results of the data raised for the attitude of concern to the student environment showed a ratio of 3.80, with a very good category filled by 40 students. The results of the study show that the use of I-SETS LKPD is effective in improving learning outcomes and environmental problem-solving skills. Other studies have shown that the integration of Islamic values in problem-based learning has a significant impact on the ability of students to study environmental pollution materials (Susanti, Asyhari, and Firdaos, 2019). The overall results of the research show that the development of I-SETS teaching tools consisting of teaching materials, teaching modules, LKPD, and valid and useful assessment instruments based on I-SETS can also improve learning outcomes and skills to solve ecosystem material problems in Madrasah. In the study, Yulistiana (2015) showed that SETS-based science learning can improve learning outcomes and process skills (Zahra et al., 2019), as well as any activity. In addition to student learn-

ing outcomes and skills, SETS-based learning can enhance environmental concerns, as shown in the Suryawan & Agustina (2017) study, namely increased learning outcome scores in the medium category and environmental care scores with very good categories in SETS-based learning.

CONCLUSION

I-SETS teaching devices are composed of teaching materials, teaching modules, LKPD, learning outcomes evaluation instruments and problem-solving skills, all of which contain ecosystem material content that is integrated with Islamic values in the Qur'an and Hadith and implement SETS (Science, Environment, Technology, and Society) learning measures. The SETS-based teaching tools on eco-system material in MTs are valid and have excellent readability.

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