Effectiveness of Waste Enviropreneur Learning Tools on Critical Thinking Skills

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Abstract. Empowering students to help prepare themselves for the 21st century. One of the skills needed is critical thinking. The ability to think critically can be honed by applying waste environmental learning tools. This study aims to determine the effectiveness of the waste environment learning tools on students' critical thinking skills. The study used a semi-experimental study with a pretest-posttest nonrandomized control group design. Data collection occurs before and after online learning activities using questions and rubrics. The research subjects were two tenth classes of Biology. Data analysis used Ancova showed $\alpha < (\alpha = 0.05)$. Based on data analysis, there are differences in students' critical thinking skills with learning to use and not to use waste environment learning tools.

1. Introduction
The 21st century is a time where human civilization has changes so that humans face many challenges to living together with these changes (1). Responding to the challenges of the 21st century requires scientific and social competence (2). Education plays an important role in improving the skills of students (3) especially critical thinking skills. Students should be rational and effective in choosing alternatives in responding to challenges (4). Critical thinking processes or activities include activities to conceptualize, apply, synthesize, and evaluate information resulting from observation, experience, reflection, reasoning, or communication (5). Indicators of critical thinking skills include focus, supporting reasons, reasoning, organization, conventions, and integration (6).

Empowerment helps students solve challenges (4), one of the challenges referred to is an environmental change caused by environmental pollution. One of the class X biology materials discusses environmental changes. The diversity of human activities (7,8) of all ages (9) some of which can be a cause of environmental pollution (10,11), which occurs because of the many pollutants (12).

Overcoming environmental problems, such as waste pollution, requires efforts from various parties, one of which is educational institutions. Educational institutions can play a role in facilitating students in studying environmental change and how to deal with environmental pollution (13). Philosophically, it can be said that the cause of environmental pollution is because environmental knowledge is still wrong, so it is necessary to provide correct information about the environment and how to protect it (14). A study shows that providing information through the environmental pollution module can better affect students' views of the environment (15). Critical thinking development can occur through learning (16) and can be done in all disciplines (17). One of the strategies that can be applied in Biology learning is to apply the waste enviropreneur learning tool.
Enviropreneur learning tools are designed to help empower students' critical thinking skills. The learning tools referred to include lesson plans, teaching materials in the form of modules, and evaluation tools in the form of critical thinking skills questions. Modules are prepared based on the syntax of problem-based learning (PBL) learning models. PBL is student-centered learning while the teacher acts as a facilitator (18). PBL learning uses problems as the subject of learning (19,20). Problems in PBL learning are analyzed by students and then a solution is sought so that students can think critically and are skilled in solving problems (19). PBL syntax consists of 5 main steps, namely providing problem orientation, preparing students to be ready to learn, guiding investigations, and directing the presentation of work. A study shows that PBL can significantly improve students' critical thinking skills (21). Increasing critical thinking skills through PBL can occur because PBL students are trained to understand concepts and meanings, and can apply them to a problem (22). Research on learning using PBL-based modules shows an influence on increasing students' critical thinking (23). Besides, PBL-specific processes can support the development of students' critical thinking (24). Based on the explanation above, research is needed to determine the effectiveness of waste enviropreneur learning tools.

2. Experimental Details

The effectiveness of the device was determined through quasi-experimental research using a pretest-posttest nonrandomized control group design. The study population was students of class X, and the sample used was 27 students of class X SMA A as the experimental class and 20 students of class X SMA B as the control class. The experimental class is a class where learning uses trash enviropreneur devices. The control class is a class whose learning does not use waste environmental equipment (learning as usual). The research hypothesizes that the waste enviropreneur learning device affects students' critical thinking skills.

Environmental waste learning tools include lesson plans, modules, and questions. The lesson plans and modules have gone through the validation test phase of teaching materials and materials and are declared valid. The instrument used in this study included critical thinking skills. This question has been tested on 101 tenth grade students and the results are from 9 questions that are valid and reliable as many as 6 questions so that these questions can be used to test the effectiveness of waste environmental learning tools on critical thinking skills. Learning is carried out online through the Whatsapp application, so data collection is carried out online through the Google Form facility. The collected data were analyzed using the Analyst of Covariance Test (ANCOVA). Before carrying out the ANCOVA test, first, a preliminary test is carried out, namely the normality test and the homogeneity test.

3. Result and Discussion

3.1. Prerequisite Test Results

The results of the normality test showed data had a p value> 0.05, which means that the data were normally distributed (Table 1). The results of the homogeneity test showed data had a p value> 0.05, which means the data was homogeneous (Table 2).

| Table 1. Critical Thinking Data Normality Test Result |
|-----------------------------------------------------|
| Critical Thinking Pretest | Critical Thinking Posttest |
| N | 47 | 47 |
| Normal Parameters | | |
| Mean | 53.7234 | 57.2301 |
| Std. PreDeviation | 6.84439 | 9.02200 |
| Most Extreme Differences | | |
| Absolute Positive | .123 | .093 |
| Negative | -.069 | -.050 |
3.2. Hypothesis Test Results

The hypothesis test shows p < 0.05, which means that there are differences in the critical thinking skills of students who use the trash enviropreneur learning device and those who don't use the waste enviropreneur learning device. The results of hypothesis testing using ANCOVA are shown in Table 3.

Table 2. Critical Thinking Data Homogeneity Test Result

| Source                        | Type III Sum of Squares | df | Mean Square | F      | Sig. |
|-------------------------------|-------------------------|----|-------------|--------|------|
| Corrected Model               | 2855.258                | 2  | 1427.629    | 70.661 | .000 |
| Intercept                     | 61.426                  | 1  | 61.426      | 3.040  | .088 |
| Critical Thinking Pretest     | 1561.564                | 1  | 1561.564    | 77.290 | .000 |
| Enviropreneur Learning Tools  | 616.019                 | 1  | 616.019     | 30.490 | .000 |
| Error                         | 888.977                 | 44 | 20.204      |        |      |
| Total                         | 157682.613              | 47 |             |        |      |
| Corrected Total               | 3744.236                | 46 |             |        |      |

The result of learning tools application analysis shows the difference in the results of critical thinking skills between the experimental class and the control class. The existence of differences in learning outcomes indicates that the problem-based learning (PBL) based waste enviropreneur learning tool is effective in improving students' critical thinking skills. This can happen for the following reasons.

First, the use of the PBL model as a basis for the preparation of learning tools helps improve students' critical thinking skills. This is following by a study that states that PBL can significantly improve students' critical thinking (21). PBL focuses learning on students (18), through the main activity of solving problems (19,20) which indirectly trains students to solve problems through critical thinking (19). PBL can encourage students to understand concepts and meanings, as well as apply them to a problem to find the right solution (22), through critical thinking obtained by using various information and assessing its truth, effectiveness, and productivity. PBL is effective in helping students store long-term knowledge and is effective in helping students apply their knowledge (25), thus enabling students to be reflective and flexible in taking action (20).
The learning process in PBL can support the development of students' critical thinking (24). The development of students' critical thinking can be seen based on the improvement of students' critical thinking skills indicators. Indicators of critical thinking skills include focus, supporting reasons, reasoning, organization, conventions, and integration (6). The effectiveness of the waste environment learning tools based on problem-based learning (PBL) was also proven by an increase in the percentage of students' critical thinking skills scores on each indicator. Learning outcomes on focus indicators were 68.41%, supporting reasons 52.05%, reasoning 35.69%, organization 69.95%, conventions 74.27%, and integration 70.06%.

The lowest learning outcomes are on the focusing indicator, this is because many students do not provide conclusions about the answers. For example on the question about the impact of burning rubbish, student A answered: “to cause air police”. The highest increase in the integration indicator, students generally have conveyed all the structure needed to answer the question (6). For example on the question about the impact of burning trash student B answered "the impact of air pollution is that the forest becomes deforested and causes floods easily, the ecosystem is also damaged, the cause is the temperature is too hot, cigarette butts are littered, illegal forest burning" This answer has the appropriate structure. with the answers on the grid, namely there are impacts and causes of garbage fires.

The second reason, because of the use of contextual environmental problems. One of the problems that are presented in learning that uses waste enviropreneur learning tools is the environmental conditions in the city of Malang, for example, the condition of TPA Supit Urang which has mountains of garbage. Contextual problems can help students increase activeness and learning outcomes (26), besides contextual facts help improve students' scientific thinking skills (27). This can occur because contextual facts strengthen student involvement in the material being taught (28). Contextual learning can improve critical thinking skills (29,30).

4. Summary
Based on the results of the analysis and discussion, it shows that the waste enviropreneur learning device based on problem learning is effective for improving students' critical thinking skills. Both the use of learning tools consisting of learning implementation plans, modules, and evaluation tools that are arranged in an integrated manner can have a good impact on learning outcomes. Further research needs to be done to improve the quality of learning tools so that they can help improve other skills.

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