The Effect of Environmental Pollution Module on Environmental Worldview in Senior High School

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Abstract. This study aimed to know the effect of environmental pollution module on the environmental worldview in senior high school. This type of research is quasi-experiment. The research instrument was a scale of the New Ecological Paradigm (NEP). This research conducted at SMAN 1 Lembar. The research subjects were 54 students of class XI Mathematics and Natural Science. Samples were taken by cluster sampling with the equality test. The analysis of data used One-way Analysis of Covariance (ANCOVA). The results showed there was the effect of the environmental pollution module on the environmental worldview in senior high school with p-value < .005.

1. Introduction
Education has a role in creating quality human resources. Through education, it is expected to develop innovative souls, who can develop their potential and play a role in development in various aspects of life [1]. Education must continue to make better innovations to face future challenges and meet people's needs. One effort that can be done to realise these hopes is by providing facilities that are by the development of science and technology [2]. One effort that can be done to improve the quality of education is by developing teaching materials that are following the curriculum and the conditions of the students being taught [3, 4].

Teaching materials developed according to the needs of teachers and students and adequately used will be one of the essential factors that can improve the quality of learning [5].

Excellent teaching materials can not only improve conceptual understanding, but also develop skills such as analysing, interpreting, summarising, and solving problems with creative solutions [3]. Teaching materials can change the role of teachers and students in the learning process. At first, the teacher was the only source of information in the class and students were only recipients of the data. With the existence of teaching materials, the teacher is not only the only source of learning in the class, but the teacher is more directed to act as a student facilitator in the learning process. Meanwhile, using teaching materials developed according to the needs of students, students are directed to become active learners by studying the material contained in teaching materials first before participating in classroom learning. One teaching material that can be used in learning is the module.

Modules are printed teaching materials that are arranged to be learned by students independently. Modules are also referred to as independent teaching materials because they have been equipped with instructions for self-learning, which means that students can carry out learning activities without direct educators [6]. Modules are teaching materials arranged following the subject matter, design learning, and disseminated to students to be used in learning activities [7]. The use of modules is very important in
Learning because it is not limited by the time of learning so that it can be used for active and detailed learning from the material being studied [8]. Modules are one of the appropriate teaching materials developed and used by the environmental conditions of students. Environmental pollution module has been developed and is by the analysis of teacher and student needs and environmental conditions around students [9].

Environmental worldview is a collection of assumptions and beliefs about how nature works and how humans relate to the environment, including environmental ethics, or ideas about what is right or wrong with how we treat the environment [10]. Environmental worldview is also interpreted as a human perspective on the situation [11]. This environmental worldview can be measured using the scale of the New Ecological Paradigm (NEP) with five indicators including: (1) the reality of the limits of growth, (2) anti anthropocentrism, (3) damage to the balance of nature, (4) rejecting exceptionalism, and (5) ecological crisis [12]. Based on the statement above, this research needs to be done to explore the effects of the application of environmental pollution modules to NEP support.

2. Method
2.1 Design
The design of the research conducted is a quasi-experimental study, which is a type of research used in education [13]. The design of the research was nonrandomized control pre-test post-test design. The experimental class was conducting learning activities with the environmental pollution module and the control class conducting learning activities with student worksheets. This research was conducted in SMAN 1 Lembar, West Nusa Tenggara Province. Participants in this study consisted of 54 grade-tenth students in academic years 2018/2019. The hypothesis in this study is there is the effect of the environmental pollution module on the environmental worldview in senior high school.

2.2 Procedures
The treatment was a 2- to 3-week environmental pollution module devoted to global environmental problems, with some emphasis on changes in environmental balance, environmental pollution, and management of the environment. Experimental data came from students receiving the environmental pollution module. Control data came from students who did not have the environmental pollution module. The scale of the NEP was distributed at the time before treatment and after the treatment of environmental pollution module.

2.3 Assessment
Measurement environmental worldview used NEP scale. In was designed to identify five possible components of an ecological worldview: (1) limit of growth; (2) anti-anthropocentrism; (3) the fragility of nature’s balance; (4) rejection of “exemptionalism”; and (5) the possibility of an eco-crisis [12]. The NEP consist of 15 Likert scale question, three on each component. Possible scores range from a minimum of 15 to a maximum of 75. The odd-numbered NEP statements are coded as follows: Strongly Agree (SA) = 5, Mildly Agree (MA) = 4, Unsure (U) = 3, Mildly Disagree (D) = 2, Strongly Disagree (SD) = 1. Values assigned to even-numbered statements are coded in the exact opposite manner.

In addition, individuals segmented into three groups based on the sum of their NEP scores. The groups are comprised as follows: (1) Anti-environmental: respondents with a NEP score of 50 or less; (2) Moderately: respondents with a NEP score of greater than 50 and less than 59; (3) pro-environmental: respondents with a score of 59 or more [14]. The effect of applying the applied environmental pollution module was analysed using one-way ANCOVA provided that the data is normally distributed and homogeneous [15].

| No. | Question                                      |
|-----|----------------------------------------------|
| 1   | We are approaching the limit of the number of people the earth can support |
| 6   | The earth has plenty of natural resources if we just learn how to develop them |
| 11  | The earth is like a spaceship with very limited room and resources |
| No. | Question |
|-----|----------|
| 2   | Humans have the right to modify the natural environment to suit their needs |
| 7   | Plants and animals have as much right as humans to exist |
| 12  | Humans were meant to rule over the rest of nature |
| 3   | The fragility of nature’s balance |
| 8   | When humans interfere with nature, it often produces disastrous consequences |
| 13  | The balance of nature is very delicate and easily upset |
| 4   | Rejection of exemptionalism |
| 9   | Human ingenuity will ensure that we do NOT make the earth unliveable |
| 14  | Despite our special abilities, humans are still subject to the laws of nature |
| 10  | Humans will eventually learn enough about how nature works to be able to control it |
| 11  | Eco-crisis |
| 15  | The so-called “ecological crisis” facing humankind has been greatly exaggerated |
|     | If things continue on their present course, we will soon experience a major ecological catastrophe |

Source: Dunlap et al (2000) [12]

2.4 Environmental Pollution Module

The module development model adapts the Analyze, Design, Develop, Implement, and Evaluate (ADDIE) development model [16]. Environmental pollution module has been developed and is by the analysis of teacher and student needs and environmental conditions around students [9]. The environmental pollution module used, shown in Figure 1.

![Figure 1. Environmental pollution module](image)

The environmental pollution module developed has a final form in the form of a printed book. The module has fulfilled the eligibility requirements in terms of material, media, practicality, and readability [17]. The main components of this environmental pollution module include titles, learning objectives, material descriptions, learning activities, summaries, formative tests, self-evaluations, and study journals. The component was compiled and adjusted [6, 18, 19]. Other components, modules, identity, introduction, usage instructions, table of contents, list of images, table list, introduction, summative test, self-evaluation, answer key, summary map, reference list, and a glossary about the preparation of teaching materials [19].

3. Results and Discussions

Environmental pollution module is known to have a significant influence to improve environmental worldview students. It is known that the indicator of natural balance damage is an indicator that has the highest increase score with a percentage of 11.8% while the indicator with the lowest increase is rejecting
exceptionalism with a percentage of 5.9%. The comparison between the control class and the experiment showed that the experimental class had an increase in environmental worldview scores by 9%.

![Environmental Worldview Values of Experiment Class](image1)

**Figure 2.** Environmental worldview values of experimental class

![Environmental Worldview Values of Control Class](image2)

**Figure 3.** Environmental worldview values of the control class

![Comparison Environmental Worldview of Experiment and Control Class](image3)

**Figure 4.** Comparison of environmental worldview in the experimental and control class

Hypothesis test results showed there was the effect of the environmental pollution module on the environmental worldview in senior high school with p-value < .005.
Table 2. Tests of between-subjects’ effects

| Source          | Type III Sum of Squares | df | Mean Square | F   | Sig. |
|-----------------|-------------------------|----|-------------|-----|------|
| Corrected Model | 584.939                 | 2  | 292.469     | 16.761 | .000 |
| Intercept       | 748.409                 | 1  | 748.409     | 42.891 | .000 |
| Pretest         | 286.366                 | 1  | 286.366     | 16.412 | .000 |
| Group           | 130.977                 | 1  | 130.977     | 7.506  | .008 |
| Error           | 889.895                 | 51 | 17.449      |       |      |
| Total           | 202043.000              | 54 |             |       |      |
| Corrected Total | 1474.833                | 53 |             |       |      |

a. R Squared = .397 (Adjusted R Squared = .373)

This module is known to have a significant influence on students' environmental worldviews. That modules that examine environmental problems can have a significant influence on increasing the score of NEP [20], which is an indicator that measures environmental worldview. NEP itself is a very good indicator and is suitable for measuring the worldview of one's environment [12, 20, 21, 22]. The NEP scale is already widely used to measure environmental worldview [11, 20, 23, 24, 25, 26]. The results of the analysis showed that the environmental pollution module has a significant influence on environmental worldview, as evidenced by the results of the ANCOVA test with \( p \)-value < .005.

4. Conclusion

Based on the results of the analysis showed there was the effect of the environmental pollution module on the environmental worldview in senior high school with \( p \)-value < .005. Based on this result we also recommend other research and teaching materials need to be developed that can increase students’ environmental worldview, awareness, and attitude.

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