Development of subjects specific pedagogy to build environmental awareness character on students in mining areas

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Abstract. Mining activities that are not managed properly can have negative impacts on the environment. Schools in the mining area must get more environmental education than schools in general. This is in order to grow the sense of environmental awareness for junior high school students in the mining area to be able to preserve the environment. This study aimed to develop subject specific pedagogy in science subjects for junior high school students residing in the mine area. The research method used refers to the research development procedure. The research instrument used was a validation sheet to determine the feasibility of the product developed. Subject specific pedagogy that have been developed for junior high school students include learning implementation plans, student worksheets, and environmental awareness character evaluation instruments. Based on the results of the validation of education experts, curriculum experts, material experts, and instructional media experts it was found that the subjects specific pedagogy developed is feasible to use. Based on expert opinion that the product developed can build the character of environmental awareness.

1. Introduction

Mining sector is one of the sectors that plays an important role in supporting national development. Indonesia has the potential of various types of mining materials, both metals and non-metals, construction materials and industrial rocks, coal, geothermal and oil and natural gas, which are quite abundant. Wise utilization of all types of mining materials can increase income and the national or regional economy.

Every mining activity almost certainly has an impact on the environment, both positive and negative. The positive impacts of mining activities include increasing employment opportunities, increasing the economy of other sectors, and increasing state and regional income in the forms of taxes, levies or royalties. However, mining activities that are not insightful or do not consider the balance and carrying capacity of the environment and are not managed properly can have a negative impact on the environment. These negative impacts include the occurrence of land movements that can cost both property and lives, loss of water catchment areas in hilly areas, destruction of landscapes, lubrication into rivers whose impacts can reach downstream, increase the intensity of erosion in hilly areas, the road through which mining materials are transported is damaged, disrupts the condition of groundwater, and the occurrence of large puddles filled with water, especially if excavation is conducted in the plain areas, and affects the social life of the residents around the mining site.
Efforts to awaken humans to stop any actions that cause a decrease in the quality of the environment, and with full awareness to stop any actions that damage the environment, then turn into doing activities that can preserve the environment so that the ecosystem is safe and preserved by the people. There are many ways that can be done to provide a good understanding of the environment to each individual, such as information, counseling, guidance, and education (formal and non-formal starting from kindergarten, elementary school to higher education)[1].

Environmental concern is a manifestation of the individual's mental attitude reflected in his behavior. Mental and behavioral attitudes can be called characters. The character can be interpreted as the character and personality of a person that is formed from the results of the internalization of various virtues (virtues) that are used as a basis for a way of thinking and acting[2]. The character of environmental care is not fully a talent or innate instinct, but it is also the result of an educational process in the broadest sense. Fostering or wrong educating an individual may result in a character that is less commendable towards the environment. Because of that good character must be formed for each individual, so that each individual can animate every action and behavior[3]. Character is not inherited from each individual's birth but is the result of human formation and the environment where they lived and grew up. The way to form the character formation academically is through education. Education makes it possible to shape character as human as expected[4].

Environmental education is an inevitable need if we want to create a peaceful society as dreamed of. Environmental education has a mission to shape human character in relation to its environment for the safety of humanity on earth[5]. Childhood experience has a strong influence on subsequent developments. Experience and a good understanding of the environment are introduced from an early age and will have a positive impact and will shape the character of students' environmental care in the future[6].

Based on the results of observations made by researchers in several schools in the mining area, the science learning tools used by students are almost the same as schools in general. Even though schools in the mining area should have more environmental education than schools in general. This is in order to grow the sense of environmental awareness for students in the mining area so they can maintain and preserve the environment. In connection with this description, it is necessary to develop subjects specific pedagogic for students who are in the mine area, so that when they grow up they can have an awareness to care about the mining environment.

2. Method
The development procedure used in this research and development is procedural development where the steps are explained concretely and in detail. The development procedure carried out refers to the procedure developed by Borg & Galls[7]. Borg and Gall found that the development research procedure basically consisted of two main objectives, namely developing the product and validating the product produced. The description of this development model is explained in Figure 1.

Details of the research procedures that have been carried out are as follows:
- Conducting library research activities, namely review of literature relevant to research. Literature studies are conducted to gather information, including by studying the integrated science subject curriculum for Secondary Schools. Field observations were made to see firsthand the state of the school environment in the mining area of West Nusa Tenggara Province.
- Planning aims to develop specific pedagogy subjects in the form of learning implementation plans, student worksheets and assessment instruments. At this stage, the science material chosen will be developed so that it can shape the character of the environment.
- Develop preliminary product forms to develop learning implementation plans, student worksheets and assessment instruments.
Figure 1. Research flow diagram

- Preliminary Field testing by validating by 2 science education experts. To do validation, a product assessment questionnaire has been developed.
- Main product revision based on input from expert validation. Revisions can be made based on expert judgment on learning implementation plans, student worksheets and assessment instruments. If the assessment of the product has shortcomings, then improvements are made to the product being developed.
- The Main Field Testing was conducted on 8 teachers in several schools in the West Nusa Tenggara Province mine. Test the teacher to get opinions about the specific subject of pedagogy developed from aspects: readability, graphics and practicality of use.
- The final revision is based on input from the teacher after evaluating the subjects-specific pedagogy that has been developed.

2.1 Data research tools
The instrument used in this research is the product feasibility questionnaire that has been developed. Preliminary Field testing is given a questionnaire to education experts, curriculum experts, material experts, and instructional media experts. Main field testing was conducted by giving questionnaire to 8 teachers in several schools in the province of West Nusa Tenggara. The questionnaire used to assess the learning implementation plan consists of several aspects including subject identity, indicator formulation, material selection, learning methods, learning activities, selection of learning resources, assessment of learning outcomes, language, and character formation. Assessment of student worksheets includes material suitability, conformity with construction requirements, conformity with technical requirements, and character formation. While the assessment of assessment instruments consists of several aspects including conformity of assessment techniques with learning, material, and linguistic objectives.

2.2 Data analysis
The product feasibility questionnaire sheet for specific pedagogy subjects is given to experts and teachers. Data obtained from questionnaire sheets was changed to interval data. The questionnaire provided contained five choices of responses about the product of the practicum manual developed, namely: very good (5), good (4), good enough (3), poor (2) and very poor (1) (Table 1). If the respondent gives a "very good" response then the statement item is given the number "5" and so also applies to the others. The score obtained is then converted to a value on scale 5 with reference to the table cited from Saifuddin Azwar [8], as follows:
Table 1. Conversion of Actual Scores to Five-Scale Values

| Score Interval                                      | Value | Categories |
|-----------------------------------------------------|-------|------------|
| $X > x_i + 1.5 \text{ SB}_i$                        | A     | Very good  |
| $x_i + 0.5 \text{ SB}_i \leq X \leq x_i + 1.5 \text{ SB}_i$ | B     | Good       |
| $x_i - 0.5 \text{ SB}_i \leq X \leq x_i + 0.5 \text{ SB}_i$ | C     | Good enough|
| $x_i - 1.5 \text{ SB}_i \leq X \leq x_i - 0.5 \text{ SB}_i$ | D     | Not good   |
| $X \leq x_i - 1.5 \text{ SB}_i$                     | E     | Very poor  |

Information:
- $x_i$ = Average ideal score = $1/2$ (ideal maximum score + ideal minimum score)
- $\text{SB}_i$ = Ideal standard deviation = $1/6$ (ideal maximum score - ideal minimum score)
- $X$ = Actual score (score achieved)
- Ideal maximum score = $\sum$ item criterion x highest score
- Ideal lowest score = $\sum$ item criterion x lowest score

3. Result and Discussion
The data obtained in the study of the development of learning devices is the result of validation data carried out by experts and assessment data carried out by educators and peers. Data from the results of validation and assessment are also equipped with input and comments on learning tools in the form of learning implementation plans, student worksheets, and learning outcomes instruments.

The aim of expert validation is to provide value and to determine the feasibility of specific pedagogy subjects that have been developed. The assessment carried out by experts and teachers is aimed at obtaining value for the learning devices developed. Validation and assessment also aim to obtain comments and suggestions, both in writing and verbally by discussing learning tools.

Validation and assessment of lesson plans based on lesson plans assessment components which include: subject identity, formulation indicators, material selection, learning methods, learning activities, selection of learning resources, assessment of learning outcomes, language, and character formation. Data on the results of the assessment of the lesson plans in the form of a score are converted to a scale of five. The product form of the lesson plans has been developed (Figure 2) and one of the results of the assessment from the material expert validator (Figure 3) as follows.

Based on the results of an assessment conducted by experts and teachers on the lesson plans, it can be categorized as feasible lesson plans to use.

Validation and assessment of student worksheets are based on the component of student worksheet assessment which includes: material suitability, conformity with construction requirements, conformity with technical requirements, and character formation. Data from the student worksheet assessment in the form of a score are converted into a scale value of five. Data on the results of assessments by experts and teachers on student worksheet will be presented as follows in Table 3.
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Figure 2. Example lesson plans product.

Figure 3. Example expert validation result.

Data from the assessment by experts, educators and peers on the lesson plans will be presented as follows in Table 2.

Table 2. Data from the average assessment of lesson plans by experts and teachers

| No | Indicators                                 | Score | Expert | Teacher |
|----|--------------------------------------------|-------|--------|---------|
| 1  | Subject identity                           |       | 10.0   | 9.0     |
| 2  | Indicator formulation                       |       | 15.0   | 11.5    |
| 3  | Learning methods                            |       | 15.0   | 11.5    |
| 4  | Learning Activities                         |       | 15.0   | 12.0    |
| 5  | Learning outcomes assessment                |       | 20.0   | 16.5    |
| 6  | Linguistics                                |       | 10.0   | 8.7     |
| 7  | Character building                          |       | 9.0    | 7.2     |
|    | Total                                      |       | 124.0  | 98.9    |

Table 3. Average data on the assessment results of student worksheets by experts and teachers

| No | Indicators                                    | Score | Expert | Teachers |
|----|-----------------------------------------------|-------|--------|----------|
| 1  | Material compatibility                        |       | 29.0   | 24.2     |
| 2  | Compliance with construction requirements     |       | 15.0   | 13.2     |
| 3  | Compliance with technical requirements        |       | 10.0   | 8.5      |
| 4  | Character building                            |       | 7.0    | 8.7      |
|    | Total                                         |       | 61.0   | 54.6     |
Based on the results of assessments conducted by experts and teachers on student worksheets, it can be categorized that the student worksheet is feasible to use. The product form of the student worksheet has been developed (Figure 4) and one of the results of the assessment from the material expert validator (Figure 5) is as follows.

![Figure 4. Cover student worksheet](image1)

![Figure 5. example expert validation.](image2)

Validation and assessment of the test of learning outcomes are based on the component of the assessment of learning outcomes which includes: Suitability of assessment techniques with the aim of material and language learning. Data on the results of the assessment of learning outcomes in the form of scores are converted to scale values of five. Data from the assessment by experts and educators on the learning outcomes test will be presented as follows in Table 4.

| No | Indicators                                                      | Score (Expert) | Score (Teachers) |
|----|----------------------------------------------------------------|---------------|-----------------|
| 1  | Suitability of assessment techniques with learning objectives  | 15.0          | 13.7            |
| 2  | Material                                                       | 10.0          | 8.2             |
| 3  | Linguistics                                                    | 10.0          | 9.0             |
|    | **Total**                                                      | **25.0**      | **30.9**        |

Based on the results of an assessment carried out by experts and teachers on the test of learning outcomes, it can be categorized as a test of learning outcomes that is feasible to use. The product form of the learning outcomes has been developed (Figure 6) and one of the results of the assessment from the material expert validator (Figure 7) as follows.
4. Conclusion

Based on the results of the validation of education experts, curriculum experts, material experts, and instructional media experts stated that pedagogic specific subjects which include: learning implementation plans, student worksheets and learning outcomes test instruments developed are feasible to use. Based on expert opinion and teacher assessment stated that the product developed can build the character of environmental awareness.

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