Learning Models in Environmental Education IT-Based at Vocational High School

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ABSTRACT
The objective of this study is to build a learning model IT-based at vocational secondary school. This learning model is called model of Environmental Education (EE) or EE model. Teachers use this model in delivering environmental learning validly, practicability and efficiently. This study was a developmental research. This study produced three product components. They were learning device, instrument and website program. They were used to measure the degree of validity, practicability and the effectiveness of this learning model. There are some results of tryout I. The first is practicability. The EE model has been practical. However, based on the results, there are still some parts that need to be improved to get better achievement. The second is effective. The EE model has not been effective based on the students’ activities. Eight of the students’ activities that are assessed have not been achieved overall. The students’ response to the learning process is on positive category and the ability of teachers in the learning process management has also been on a high category. This study is then continued to tryout II. In tryout II, EE model has been practical. All aspects of the components have been carried out correctly. In addition, EE model has been effective. The completeness of student activities in the learning process is in compliance with expectations. The ability of teachers to manage the learning process is in high category and the students’ response to the learning process has been in the positive category.

Key words: Environmental education model, vocational high school, website program

INTRODUCTION

The implementation of the curriculum is the guidelines for teachers in the learning process by referring to the standard content and passing grade on a unit level education in primary and secondary schools, including vocational high schools. The government builds the vocational high school to create a passing grade which has a skillful and professional competence at the secondary level. Therefore, its graduates are prepared to work in a small and medium industry in which these industries produce waste that can pollute the environment. Hence, learning about environment on the technology group focuses on developing the competence of students about environmental knowledge that can be competitive, participatory and conducive. In addition, this learning also examines changes in student behavior to the environment.

Environmental Education (EE) is a program of environmental management subjects which pioneered since 1984 until now. The delivery of the learning is in the form of integrative. However, the results have not been felt in the environment and the community. It means that there is a failure in the education through sustainable development. Esa (2010) reveals “identification of the current status of pre-service secondary teachers’ knowledge, attitude and practices of the environment is necessary to assess their level of readiness to integrate ESD into their teaching.” Learning about the environment can be combined with the other relevant subjects. It aims not only at building the cognitive dimension but also the dimensions of viewpoints, attitudes and behavior of the learners in interacting with the environment.

Referring to the above explanation, it needs to change perspectives, attitudes and behaviors of teachers in the process of learning in the classroom. The change is from the
traditional learning to student learning center. Students should receive information using information technology to build the knowledge, concepts and more quickly understand the material. Smaldino et al. (2011) reveal the function of computer that “Contents, computer system can deliver instruction by allowing them to interact with the lesson programmed into the system; this is referred to computer-based instruction”.

The EE model is designed using a computer-based information technology. It is the learning that is intentionally designed containing material, student worksheets and evaluation presented online using the internet. There are two previous studies about the development of EE model. The first is Zulkifli (2013) entitled learning model of Islamic education ICT-based at SMA Negeri 4 Kendari, Southeast Sulawesi Province. The initial results of the study show that Islamic learning still elusive by teachers and students before implementing ICT-based learning model, in which the results of the study is always small. The second is Riyana (2010) entitled Improvement of Teachers Pedagogic Competence through the Application of the Model of Teacher Education Center Interactive Virtual (Eduactive). Improvement of teacher qualification requires a learning model that is designed specifically in the system of distance education. Utilizing the advantage of the interactive nature of information technology and e-learning is to increase the competence of teachers.

The EE model ICT-based can assist teachers in delivering learning. During this time, the teacher is providing learning materials conventionally. Design models oriented to the utilization of the computer program has been validated by the environmental education experts and practitioners for the validation models, learning the device, instrument and the website program. One model approach used is Assure model developed by Smaldino et al. (2011) and Joyce et al. (2004). They aver that there are five key components of learning model. First, syntax is a sequence of stages for activity phases. Second, in the social system, teachers and students have each role and rule that is used. Third, principles reaction is a standard that must be met both teachers and students in the classroom. Fourth, the support system is a necessary condition for learning to use tools or media. Fifth, instructional impact is the results achieved by the students in the learning process.

The resulting model is tried out on students of vocational high school in the form of website (www.beautiful-uncp.com). It is to obtain data for measuring the practicability and effectiveness of the model.

**MATERIALS AND METHODS**

**Kinds of the research:** The type of study was research development. It was the development through stages or phases producing a learning model. This learning model was called Model of Environmental Education (EE) or EE model. The quality of this model can be assessed by some criteria according to Nieveen (1997). The criteria were validity, practicability and effectiveness. The development of this model was followed by the learning device and packed in the form of web application program using a computer program.

**Research instrument:** There were some instruments used on EE model packaged in the form of website application. They were (1) Assessment sheet, (2) Observation sheets, (3) Questionnaire about student response, (4) Student assessment sheet and (5) Validation of each instrument.

**Tools and instruments validation:** The model was tried out. The learning device was packaged in the form of website application using computer programs. Instruments that already met the validity were implemented for the second-grade students at SMK Negeri 2 Palopo academic year 2013/2014.

Reliability of the media is calculated using the following equation:

$$R = \frac{\text{Agreements}}{\text{Disagreements} + \text{Agreement}} \times 100\%$$

Where:

- **Agreement** = Number of frequency for suitability between two observers
- **Disagreement** = Number of frequency for unsuitability between two observers
- **R** = Reliability (Instrument is reliable if its reliability less than or equal to 0.75/(R) ≥ 0.75 (Borich, 1994)

**Data analysis techniques:** The data was analyzed in two ways, as follows:

- Data analysis for validity of the model used descriptive analysis
- Data analysis for practicability of this model used an average of observations from each meeting

Furthermore, reliability of the observation sheet for the feasibility of this model is calculated by using the percentage of agreement equation (Borich, 1994) as follows:

$$R = \frac{\text{Agreements}}{\text{Disagreements} + \text{Agreement}} \times 100\%$$

Where:

- **A** = Frequency of data suitability between two observers
- **D** = Frequency of data unsuitability between two observers
- **R** = Coefficient (degrees) instrument of reliability

This instrument is reliable if its reliability less than or equal to 0.75/(R) ≥ 0.75 (Borich, 1994).
Analysis of data on the effectiveness of environmental education model:

- **Analysis of the mastery of learning materials for waste and pollution**: Determine the category of the ability to understand the materials, material waste and pollution is based on Winkel (2007)
- **Activities of the students**: The students doing a particular activity are based on the equation:

  \[
  P_{wi} = \frac{\sum w_i (RPP)}{\sum w (RPP)} \times 100\%
  \]

Where:
- \(P_{wi}\) = Ideal time percentage to perform a certain activity
- \(\Sigma w_i\) = Amount of time allocation in the lesson plan for the specific activity
- \(\Sigma w\) = Amount of the allocation of time for the entire activity at each meeting on a lesson plan (Trianto, 2012)

**RESULTS**

**Analysis of the validity of Environmental Education (EE) model**: The validity of Environmental Education (EE) model is assessed by four experts and practitioners by giving the book of EE model along with the assessment sheets to be evaluated and analyzed as follows:

- **Aspects of supporting theory**: The average value obtained \(\bar{X}\) was 3.5. If this value is confirmed by the criteria of validity, it is concluded that this value is very valid. It means that the supporting theory used on EE model has met the very validity
- **Aspects of the syntax**: The average value \(\bar{X}\) is 3.3. It can be concluded that the value is valid. It means that the EE model reviewed from the aspect of syntax has met the validity
- **Aspects of the social system**: The average value \(\bar{X}\) is 3.5. It can be concluded that the value is very valid. It means that the EE model reviewed from the aspect of the social model has met the validity
- **Aspect of the reaction principle**: The average value \(\bar{X}\) is 3.4. It can be concluded that the value is valid. It means that the EE model reviewed from the aspect of reaction principle has met the validity
- **Aspect of the support system**: The average value \(\bar{X}\) is 3.3. It can be concluded that the value is valid. It means that the EE model reviewed from the aspect of support system has met the validity
- **Aspects of instructional and companion impact**: The average value \(\bar{X}\) is 3.5. It can be concluded that the value is very valid. It means that the EE model reviewed from the aspect of instructional and companion impact has met the validity
- **Aspect of learning implementation online**: The average value \(\bar{X}\) is 3.5. It can be concluded that the value is very valid. It means that the EE model reviewed from the aspect of learning implementation online has met the validity
- **Aspects of online learning and the tasks in learning activities**: The average value \(\bar{X}\) is 3.3. It can be concluded that the value is valid. It means that the EE model reviewed from the aspect of online learning and the tasks in learning activities has met the validity
- **Aspects of evaluation**: The average value \(\bar{X}\) is 3.5. It can be concluded that the value is very valid. It means that the EE model reviewed from the aspect of evaluation has met the validity. Figure 1 describes the overall validity of the environmental education model.

**Validation of instruments**: Development of the instruments that have been designed to provide a general overview of validity, practicability and the effectiveness as follows:

- **Validity**: The aspect of assessment model is highly reliable because the reliability coefficients of \(R = 0.96\). It means that overall this aspect of the assessment model is eligible in terms of validity and reliability. Therefore, the assessment model sheet can be used, although there is a minor revision.

![Fig. 1: Validity of EE model](www.ansinet.com/510)
Table 1: Aspects of assessment

<table>
<thead>
<tr>
<th>Aspects of assessment</th>
<th>Reliability coefficient (R)</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Validity</td>
<td>0.96</td>
<td>Very high</td>
</tr>
<tr>
<td>Practicability effectiveness</td>
<td>1</td>
<td>Very high</td>
</tr>
<tr>
<td>Learning Management</td>
<td>0.97</td>
<td>Very high</td>
</tr>
<tr>
<td>Student activities</td>
<td>1</td>
<td>Very high</td>
</tr>
<tr>
<td>Students’ response to PLH model</td>
<td>1</td>
<td>Very high</td>
</tr>
<tr>
<td>Worksheet online</td>
<td>1</td>
<td>Very high</td>
</tr>
<tr>
<td>Test of mastery learning outcome</td>
<td>1</td>
<td>Very high</td>
</tr>
</tbody>
</table>

- **Practicability**: The aspect of assessment for the feasibility of EE model is highly reliable with the reliability coefficients of $R = 1$. It means that this aspect is eligible in terms of validity and reliability. Therefore, the assessment of the feasibility of EE model can be used, although there is a minor revision.

- **Effectiveness**: Instrument of effectiveness consists of: Observation sheet in learning management is highly reliable with the reliability coefficients of $R = 0.97$. It means that this aspect is eligible in terms of validity and reliability. Therefore, the aspect of the observation sheet in learning management with EE model can be used.

- Observation sheet for student activities is highly reliable with the reliability coefficients of $R = 1$. It means that this aspect is eligible in terms of validity and reliability. Therefore, the aspect of the observation sheet for student activities can be used.

- Students’ response to the implementation of EE model in learning is highly reliable with the reliability coefficients of $R = 1$. It means that this aspect is eligible in terms of validity and reliability. Therefore, the aspect of students’ response to the implementation of EE model in learning can be used.

- Test of students’ worksheet is highly reliable with the reliability coefficients of $R = 1$. It means that this aspect is eligible in terms of validity and reliability. Therefore, this aspect can be used.

- Test of the mastery learning outcome is highly reliable with the reliability coefficients of $R = 1$. It means that this aspect is eligible in terms of validity and reliability. Therefore, this aspect can be used. Table 1 shows the summary of validation of the instruments.

**Analysis of the practicability of Environmental Education (EE) model**

**Tryout I**: The results of observation for tryout I are based on the same components of feasibility.

- **Component of syntax**: Two observers have agreed that in the component of syntax for EE component, reliability Percentage of Agreement (PA) R is 94.11%. The average of observations in the learning process is 1.68. It means that the component of syntax was carried out entirely.

- **Component of the social system**: Two observers have agreed that reliability Percentage of Agreement (PA) R is 94.11% in social systems for EE model. The average of observations in the learning process is 1.75. It means that the component of the social system for EE model was carried out entirely.

- **Component of the reaction principle**: Two observers have agreed that reliability Percentage of Agreement (PA) R is 100% for the component of reaction principle. The average of observations in the learning process is 1.85. It means that the component of reaction principle was carried out entirely.

**Tryout II**: The results of observation for tryout II are based on the same components of feasibility.

- **Component of syntax**: Four observers have agreed that reliability Percentage of Agreement (PA) R is 93.37% for the component of syntax. The average of observations in the learning process is 1.84. It means that the component of syntax was carried out entirely.

- **Component of the social system**: Four observers have agreed that reliability Percentage of Agreement (PA) R is 95.0% for the component of the social system. The average of observations in the learning process is 1.87. It means that the component of the social system for EE model was carried out entirely.

- **Component of the reaction principle**: Four observers have agreed that reliability Percentage of Agreement (PA) R is 95.0% for the component of reaction principle. The average of observations in the learning process is 1.86. It means that the component of reaction principle was carried out entirely.

- **Component of support system**: Four observers have agreed that reliability Percentage of Agreement (PA) R is 100% for the component of support system. The average of observations in the learning process is 2.0. It means that the component of support system was carried out entirely.

**Analysis of the effectiveness of environmental education model**

**Tryout I**: The observations in the learning management for EE model in tryout I show that score analysis is 3.78. It means that the teacher in the classroom management using environmental education model is still good from the category of the ideal score 4 (very good).
Fig. 2(a-b): Analysis of the practicability of environmental education model, (a) Tryout I and (b) Tryout II

- **Students’ activities**: The results of the observation, for students’ activities during the learning activities in tryout I show that there are only four activities that have been met with eight types of activities of students. The first is the effectiveness of students on independent study, initiative and creative in using computer. The second is responding the teacher explanation. The third is concluding the learning outcomes. The fourth is doing students worksheet. The rest, there are four students activities that have not been fulfilled. The first is doing the register/login. The second is reading the material online. The third understands the problem presentation based on what happened in the field. The fourth is opening the students’ worksheet online.

  Figure 3a shows the analysis of tryout I for students activity in learning of environmental education model.

- **Students’ learning outcomes**: Based on student learning outcomes at tryout I, there are only nine students who do not pass the test and there are 44 students who pass the test. Therefore, the percentage number of graduation is 83.01%. If it is confirmed by minimum standard mastery with criteria is 85%, the result of completeness of learning outcome is not reached.

  Figure 4a shows the analysis results of the tryout I for a minimum standard mastery in students’ learning outcome.

**Tryout II:**

- The observations in the learning management for EE model on tryout II show that score analysis is 3.78. It means that the teacher in the classroom management using environmental education model is in a good category although there was an increase in the score that approximates the ideal score 4 (very good).

- **Students’ activities**: Based on the results of the observation in tryout II, eight types of activities students are already being met from predetermined time ideal for student activity.
Figure 3(a-b). Four students’ activity in learning of environmental education model, (a) Truoyt I and (b) Trycut II

Figure 3b shows the result of the analysis in tryout II about students’ learning activities for environmental education model.

- **Students’ learning outcomes:** Based on student learning outcomes at tryout II, there are only three students who do not pass the test and there are 32 students who pass the test. The tryout is conducted with different class. Therefore, the percentage number of graduation is 91.4%. If it is confirmed by minimum standard mastery with criteria is 85%, the result of mastery of learning outcome is reached. Based on the results of statistical performed by
Cubukcu (2010), teachers’ thoughts in terms of their evaluation of student-centered learning environments based on the dimensions in the study, teachers’ evaluations of their own classes regarding the following dimensions of student-centered education were considered: Psycho-social, the school’s social atmosphere, infrastructure and equipment, place, time. In order to get a general approximate idea of the participant teachers’ evaluations regarding student-centered learning environments, the arithmetical averages and standard deviations of the scores received on the scale have been calculated. Figure 4b shows the analysis results for tryout II for a minimum standard mastery in students’ learning outcome.

**DISCUSSION**

**Validity of the instrument of learning:** The results of analysis instrument used prove that all aspects have been eligible in terms of validity based on the assessment of experts and practitioners using these aspects of component that is stated in the environmental education models. Implementation of this model uses computer media with two ways. They are local hosting and online. For local hosting, the learning process is still teacher oriented. Therefore, there is a limitation in the learning process. Online learning allows teachers and students to access learning material without limitation of the implementation. It depends on the student’s desires and opportunities to learn when it is supported by the network of the internet. According to Kanuka (2010), contends, in the learning needs supporting student learning is not only the sum of the services and learning opportunities provided. It is also essentially about and ethos. So the student learns depends on the time and the will to learn if supported by the network of the internet. Online learning in the form of tutorial provides many benefits felt by the students. First, they learn individually so that they are accustomed to working on their own. They are not affected by the system. Second, they learn to compete. They learn by overburdened, so that they are vying for focus. Third, they learn to work together to achieve success.

**Practicability of the instrument of learning:** Practicability can be measured by two approaches. The first is a theoretical approach. The results of the experts and practitioners assessment of online learning for environmental education model is eligible to be used in school classrooms, computer laboratory and outside of the classroom. According to Joyce et al. (2004), models of teacher are really models of learning as we help students acquire information, ideas, skills, values, ways of thinking and means of expressing themselves, teachers are also teaching them how to learn. The second is an empirical approach. The results of the tryout I prove that this model already qualified practicability. However, there is still improvement and record from the observers. Furthermore, the results of tryout II show that there are some aspects that still need to be improved. The first is a component of syntax on phase 2 and phase 4. Phase 2 is the phase of delivery of information about learning strategies using a problem-solving approach. Phase 4 is the phase of exercises to check understanding of the material, inferences and feedbacks. The second is the component of the social system on phase 2 and phase 3. Phase 2 is the students’ activity in the following presentation materials online, by opening a website to read the material on the monitor. Phase 3 is the activity of students in analyzing environment problem-solving through the provision of training. The third is the component of reaction principle. The fifth item in this component has not done well. It is giving positive and negative reinforcement to the students.

**Effectiveness of the instrument of learning:** The results of the effectiveness are found through tryout I of four components used, namely: Aspects of ability of teachers in manage teaching and learning activities and students’ response aspect of the environmental education models online. However, there are still two aspects of effectiveness that have not been met, namely: Aspects of the activity of the students and the success of learning. Both these aspects have linkages between the aspects of the activity of the students and implementation of the learning process in relation to the mastery of the material and the difficulties of working on students’ worksheet online, test of evaluation study online. Aspects which have not been fulfilled on tryout I are improved in tryout II as follows:

- When teachers teach, students were given a motivation, morale and encouragement so that they still have the concentration using media computers in the learning process.
Teachers give emphasis to reading material carefully before the students work on the worksheet online with full accuracy.

Through improvements in the tryout II, there are four aspects of the effectiveness of this model as a whole that have met the criteria. Therefore, it can be stated that environmental education model online can be useful.

CONCLUSION

The validity of the environmental education model online refers to a theoretical assessment by experts and practitioners. In addition, it relates to the empirical implementation through tryouts of environmental education model. Therefore, the result is that the learning device and instruments used are qualified in terms of validity so that environmental education model is eligible to be used.

Through the process of tryout I, the assessment results of observers in the process of learning proves that environmental education model is practical. However, there are some important notes from observers who still need to look for improvements to the practicality of the model. For example, this model uses computer technology online. Teachers and students are not accustomed to doing it. Environmental education model based on the assessment criteria have not been adequate, because of the standard of learning outcomes is still smaller (≤85%). Likewise, there are some categories of learning activity whose results have not been good as expected. However, the ability of teachers in the learning process management is on good category. Meanwhile, the students give positive responses to the study in the range of 70-80% in the tryouts for the two classes.

Furthermore, environmental education model online in tryout II is practical. It is proved in all aspects of environmental education model components that are carried out well thoroughly. In addition, environmental education model online is useful because the percentage of the overall learning outcomes standard is 91.4%. All categories of the learning activities are achieved as expected. In addition, the positive response of students to the study of environmental education model online rises. It is 94.28%.

REFERENCES


