

Development of Student Worksheet based on Outdoor Activities to Increase Critical Thinking Skills

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Abstract. One of learning tool that can be used by educators and learners to add information about the concepts learned through learning activities in a systematic way is the worksheet. The use of students worksheets based outdoor activities is needed by educators and learners who are expected to improve the ability to think critically. This study aims to produce a worksheets based outdoor activity, to test the feasibility and effectiveness of worksheets to improve critical thinking skills. The method in this study was Research and Development refers to the steps developed by Borg and Gall. The field trial subjects of this research was student learning worksheet based on outdoor activity on ecosystem material with respondents 12 students. The research instrument used the worksheet assessment sheets, the assessment sheet of the learning implementation plan, the students' response questionnaire to the worksheet, the questionnaire, the interview and the documentation. The results show that this student worksheet is suitable for use as a biology learning media in schools (overall validation of material experts and learning experts obtained very good quality, that is 4.34 and validation of Practitioner obtained very good quality, that is 4,26) and effectively used to improve the critical thinking skills of learners. This is supported by the results of data showing a significant increase in critical thinking skills in learners who use the student worksheet and the results of the questionnaire responders who achieve high percentage.

Keywords: development of student worksheet, outdoor activity, critical thinking skills

INTRODUCTION

The learning process takes place in a system consisting of many components, one of them is media learning. Media learning is a tool that can be manipulated and can be used to influence the thoughts, feelings, attention and attitudes of learners to facilitate the learning process. Student Learning Worksheet is a learning media that can be used by educators and learners to add information about the concepts they are learning. . The educator's way to do the learning process is very influential for the meaning of experience for all the students. Based on the Law of the Republic of Indonesia on Tourism states that the field of tourism that favor nature potential in every country has grown rapidly in recent decades. The attractions in each region allow the educator to show off the variety of environmental phenomena according to the conditions and materials. All the environments around us can be used as media learning. Raines (2016)¹ says that over a thousand people have the opportunity to recreate, learn natural history and culture. It is revealed tha outdoor activities are activities that are considered important and much in demand by some people in the world. Monteros (2002: 1539)² states that ecotourism can help environmental conservation activities in La Paz Bay, Baja California Sur, Mexico. The development of ecotourism in the

mountains of Kure, Turkey is also increase environmental awareness and provide benefits to local communities (Gunes & Hens, 2007: 281)³. Redmond says that Outdoor Activity is a learning system through real objects that make the environment as a learning resource for learners so that they gain experience directly.

According to Arends (2008: 43)⁴, thinking is a process that involves mental operations (such as induction, classification and reasoning) to symbolically represent (through languages) various Objects and real events that use symbolic representations to find Object principles and events. Critical thinking is very useful for improving the ability to understand, construct and make decisions and liberate a person from dogma and prejudice. This opinion emphasizes the importance of critical thinking skills in a person in the future.

The worksheet is very flexible and can be designed to meet any learning objectives on a wide range of topics in every discipline. It is important to remember that all worksheets consist of well-written questions that stimulate the mind, encourage critical and creative thinking, and improve problem-solving skills. Worksheets can also identify misconceptions of student concepts and allow for clarification of such misconceptions (Maharaj & Sharma, 2014)⁵. . Ernawati (2016)⁶ states that Student Learning worksheet based on local potentials developed effectively used in the learning process. Response of learners more than 80% give positive response to student learning worksheet developed and interested to follow the learning. The result of Andriani's (2017)⁷ study of critical skills-based learning modules indicate that the module is effective for use in the learning process for student in grade 10th of biology class. From these researches it can be taken conclusion that the use of worksheets and outdoor activities can improve the learning outcomes of learners . The experience of learning through outdoor activity on certain materials is necessary for learners to connect between conceptual elements with the real objects they observe, so that they can build arguments with reliable and logical evidence. Media learning in the form of outdoor activity-based student learning worksheet is very effective used to develop critical thinking ability of learners in learning process.

METHODS AND MATERIALS

There were learning tools which was developed, such us: syllabus, learning implementation plan and student learning worksheet. The product which was developed was student learning worksheet based on outdoor activity to improve critical thinking ability. According to Borg & Gall (2002: 783-795)⁸, the research and development (R and D) approached in education included ten steps. The overall of research design used R and D model, then modified so that the procedures include: (1) preliminary study stage, (2) research design stage, (3) product design stage, (4) validation, (5) testing and product revision phase, and (6) final stage. This is due to limited resources to conduct further research. The data type in this research was qualitative and quantitative data with the following details: (a) data validation result in the form of suggestion and comment from expert judgment to student learning worksheet based on outdoor activity was qualitative data, while data of product assessment result was quantitative data; (b) the data of the technical evaluation of the implementation of the limited trial of the use of student learning worksheet was qualitative data. The data assessment instrument used the student learning worksheet assessment sheets, syllabus and learning implementation plan assessment sheets, student learner questionnaire response to student learning worksheet, pretest and post test papers, interviews and documentation. The target of this research was student learning worksheet based on outdoor activity on ecosystem material with respondents 12 students of Senior High School 1 Grobogan.

The data in this research was obtained through several techniques such as through validation. Validation was done by assessing the developed student learning worksheet. This assessment was done by expert lecturers and practitioners using the validation sheet instrument. Student learning worksheet can be considered if the percentage $\geq 71\%$. The properly percentage is then calculated by the following formula:

$$value = \frac{\text{average result validation score}}{\text{maximum score}} \times 100\%$$

RESULTS AND DISCUSSION

A. Initial Product Development Results

The student learning worksheet based outdoor activity development included 5 modified development stages of 10 research and development phases by Borg & Gall. In detail, the development stages were described as follows:

1. Research and Gather Information

- a. field study. Field studies were conducted in October 2017 as a form of needs analysis. Data obtained from biology teacher and learner in Senior High School 1 Grobogan. Based on the results of the needs analysis, it is known that the learning in schools often use the manual of student learning worksheet. However, on learning materials submitted full text of the text then there are some questions where students are asked to work on the basis of literature studies of books or materials that already exist in student learning worksheet. Student learning worksheet used still using student learning worksheet that has not been in accordance with the object to be observed. Students can not see directly the object of learning, while there are objects that can represent learning about the ecosystem. So that the need for activities that can make students able to apply 5M through learning media in the form of student learning worksheet and understand the concept of the material and see the object of learning directly. Other information obtained is the knowledge of teachers about the attractions that are in the school environment is still limited, so it has not made some places as a source of learning ecosystem.
- b. Study of literature. This stage is done to collect theories related to the preparation of student learning worksheet, the steps in outdoor activity and information about the object of tourism used for the learning process.

2. Planning

This stage consists of:

- a. Establishing the subject matter developed
 The main material developed in this research is the material about the ecosystem
- b. Conduct learning analysis
 Includes learning objectives, formulates the basic competencies to be achieved and critical thinking indicators of thinking.
- c. Determine the evaluation instrument
 Instruments used are instruments of pretest and post-test. The ability to think critically can be measured by using instruments developed through critical thinking and thinking aspects in the form of multiple choice questions.

3. Initial Product Development

- a. Collect information from the field and references related to the ecosystem as material to be incorporated into student learning worksheet.
- b. The preparation of student learning worksheet based outdoor activity with student learning worksheet format refers to guidance in BSNP

4. Validation results by Expert Judgments

TABLE 1. Validation results by Expert Judgments

No.	Indicator	average	category	appropriateness (%)
1	Material aspect / substance	4,38	Very feasible	87,6
2	Construction Aspects	4,28	Very feasible	85,6
3	Aspects of Language	4,38	Very feasible	87,6
Total among the three aspects		4,34	Very feasible	86,8

TABLE 2. Conversion Score Assessment of students worksheet to scale five

Value	Score Interval	Category
5	>4,20	Very feasible
4	3,41- 4,20	Feasible
3	2,61-3,40	Enough
2	1,81-2,60	Less
1	< 1,80	Very less

Validation by material experts and learning is done with the aim to know the feasibility of student learning worksheet from the aspect of material quality and suitability of all stages in learning. Expert judgments also validates critical measurement tools, pretest and post-test. Based on the table 1. it can be seen that the average student learning worksheet feasibility by the material and learning experts get an overall score of 4.34. This score is highly categorized based on the specified interpretation criteria. Expert judgment also performs instrument validation of pretest and post-test questions. The suggestions for improvements by Expert judgment related to the instrument of pretest and post-test include:

- The indicators on the lattice and the pretest and post-test of critical thinking skills are taken into account again.
- The sentence in each question is adjusted to the rules of Indonesia spelling.
- Choice of pretest number 3 less homogeny. After a revision based on the suggested improvement, the student learning worksheet based outdoor activity as well as the pretest and post-test questions are declared ready for trial.

5. Validation by Practitioner (Biology Teacher)

TABLE 3. Validation by Practitioner (Biology Teacher)

No.	Indicator	average	category	appropriateness (%)
1	Material aspect / substance	4,33	Very feasible	86,6
2	Construction Aspects	4,21	Very feasible	85
3	Aspects of Language	4,25	Very feasible	85
Total among the three aspects		4,26	Very feasible	85,5

TABLE 4. Conversion score assessment of students worksheet to scale five

Value	Score Interval	Category
5	>4,20	Very feasible
4	3,41- 4,20	Feasible
3	2,61-3,40	Enough
2	1,81-2,60	Less
1	< 1,80	Very less

Validation of student learning worksheet based on outdoor activity by practitioners was done by 2 biology teachers. There are 3 aspects considered in the validation conducted, each aspect has an indicator that describes the aspects assessed. Based on the table 3. it can be seen that the average student learning worksheet feasibility by biology teachers get the overall score 4.26. This score is highly categorized based on the specified interpretation criteria. The advice obtained from practitioners (biology teacher), among others:

- a. On 5th Activity, time allocations are still lacking, for the delivery of materials, group discussions and conclusions acceptable to learners.
 - b. On 5th Activity, between the objectives and discussion questions less to hit.
- After a revision based on the suggested improvement, the student learning worksheet based outdoor activity as well as the pretest and post-test questions are ready for trial.

B. Product Trial Results

Trial of product implemented in Senior High school 1 Grobogan with number of respondents 12 learners who have complete the main subject of ecosystem. A limited trial was conducted by taking a randomly selected XI Mathematic and Science class sample of 12 students. Quantitative data in the form of learner assessment of student learning worksheet based on early product activity, pretest value and post-test of critical thinking ability. *N-Gain* calculations were obtained from the pretest and post-test scores of the learners. Increasing of the competence that occurs before and after learning is calculated by the formula g-factor (*N-Gain*) with the formula according to Meltzer (2002) are as follows:

$$g = \frac{\text{post test score} - \text{pretest score}}{\text{ideal score} - \text{pretest score}}$$

Interpretation of N-Gain according to Hake (in Meltzer: 2002) presented in the following table:

Table Classification of N-Gain Interpretation

TABLE 5. N-Gain Interpretation	
Great percentage	Interpretation
>0,7	Height
0,3 > G > 0,7	Medium
<0,3	Low

The data of the results of the assessment of learners against student learning worksheet developed can be categorized as the following table:

TABLE 6. Results of the assessment of learners					
No.	Name	Value			Category
		Pretest	Post-test	Gain	
1	A	48	85	0,71	Height
2	B	45	87	0,76	Height
3	C	50	88	1,32	Height
4	D	52	88	0,75	Height
5	E	44	78	1,65	Height
6	F	43	78	0,61	Medium
7	G	60	90	0,75	Height
8	H	55	85	0,67	Medium
9	I	40	80	0,67	Medium
10	J	55	88	0,73	Height
11	K	54	89	0,76	Height
12	L	40	78	0,63	Medium
Average		48,83	83,33	0,83	Height

Based on pretest and post-test data it is known that there is an increase in the value of critical thinking ability. The total of 33.3% of the limited trial subjects had a moderate gain score. However, the average gain value of

critical thinking ability is generally greater than 0.70 is 0.83. The level of critical thinking skills are in the high category or has a great ability changes. This means that the use of student learning worksheet based outdoor activity can improve the critical thinking ability of learners.

According to the Outdoor Foundation report, an American organization that mobilizes its community in outdoor activity, says that by 2016, 48.6% of Americans (from age 9 years and over) have been doing outdoor activities. Start from 2016, the National Park Service, the United States has been working with the Outdoor Foundation in launching Environmental Education Program or outdoor learning for learners. There, the students, especially the fourth grade is invited to the national park and water attractions, namely lakes and rivers. The tour is meant to introduce children to the history of nature and culture. The organization works with other countries to help preserve local potential and create recreational areas not far from where they live.

The results of this study in accordance with the results of previous studies by Indah Wardaniyati in 2017 which states that student learning worksheet based outdoor activity can develop critical thinking skills. Critical thinking is the activity of analyzing ideas or ideas in a more specific way, distinguishing them sharply, choosing, identifying, studying and developing them in a more perfect direction (Wijaya, 2010: 72)⁹. Tanyong & Sharafuddin (2016)¹⁰ conducts periodic research on the development of instructional media on environmental education of the national Tourism and Hospitality students in St. Petersburg. International College in Thailand, in the Journal of Education and Practice with the results of students can control their individual independence and very enthusiastic about using social media to look for and find relevant information during the independent learning phase. Learners are not just required to memorize or understand it, but also can determine the problems that occur in the environment according to the concept learned. The ability to think critically can increase through the use of student learning worksheet in the learning process.

CONCLUSION

1. Student learning worksheet based on outdoor activity of ecosystem material to develop critical thinking ability of learners deserve to be used as biology learning media in school based on expert material judgment, learning expert, subject teacher and learner.
2. Student learning worksheet based on outdoor activity is very effective used to develop critical thinking ability of learners in teaching and learning process based on limited test to 12 students Senior High School 1 Grobogan

SUGGESTION

1. Learning biology should be implemented and adapted to the learning materials so that biology learning becomes more meaningful
2. Student learning worksheet based outdoor activity is expected to be the guide of students and teachers to implement learning independently, active and develop critical thinking skills

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