

Development the Sciences Outdoor Learning to Improve Knowledge Competences and Problem Solving Skills of Junior High School Students

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Abstract. The objective of this research is to produce science outdoor learning design oriented that has been validated and qualified to be tested in school. This research used development design (Research and Development) refers to Borg and Gall model. Data collection techniques that were used in this study were the assessment of sciences outdoor learning planning (lesson plan, worksheet, and assessment instruments). The data were analyzed descriptively through qualitative and quantitative. This research succeeded in developing science outdoor learning that had been validated by expert and teacher with a very good category. The science outdoor learning improved the knowledge competence and thinking skills of students.

1. Introduction

The challenge of the education world is getting bigger in an effort to improve the quality of superior human resources. This is in line with the challenges of industrial revolution 4.0, namely the need for changes in the way of learning, thinking patterns and how students act in developing innovations in various fields. Education in the 21st century needs to be oriented towards mastering 21st century skills that develop skills that support competition in the global and digital world that is currently developing. These skills need to be developed in students besides competency in the dimension of knowledge. 21st-century skills are required by students to perform their 21st-century activities in the future skills are beneficial to their lives after graduation[10]. Aspects of thinking skills in the 21st century include creativity, critical thinking, problem solving and metacognition, communication, collaboration, information, and technology literacies are the tools for working[10]. Science learning is oriented towards achieving knowledge and skills competencies. This is in line with the nature of science that science as a way of thinking, a way of investigating, a body of knowledge, and its interaction with technology and society [5]. Science is "both a body of knowledge and a process" [20]. Science develops the dimensions of ways of thinking, how to investigate, building knowledge and its relation to technology and society. This becomes a substance that is fundamental to the importance of learning science which develops the competence of scientific skills to form the mindset of students. Curriculum demands of 2013 require scientific learning. This learning develops process skills, thinking skills, and problem solving skills. 2013 curriculum has achievements not only on the cognitive dimension but also on the dimensions of the process and attitude. Science learning is done by exploring the experiences of students around their environment. The surrounding environment contains objects and symptoms of science. Learning activities that use the surrounding environment and invite students out of class are very potential to be used as a source of learning in science learning. This concept is known as outdoor learning. Outdoor learning is not only learning that is done outside the classroom, but is learning using media learning around the environment. Environment is one source of learning where students can interact directly with the symptoms in it. There are various learning models that have the potential to teach science in outdoor activities, including problem based learning, project learning and

discovery learning. To realize the achievement of knowledge and thinking competencies, learning needs to be designed using several science learning models. This is the urgency to do research that develops learning tools with science outdoor learning that are suitable for use in learning. Based on the identification of the above problems, this study aims to develop science learning tools with outdoor learning that are suitable for use in science learning. The target to be achieved in this study is the production of science outdoor learning devices (lesson plans, worksheet, media, teaching materials and assessment instruments) that have been validated by science experts and teachers. This research research also to know effectiveness of learning devices developed through empirical trials in learning at school.

2. Research Method

The research was conducted using Research and Development [2] and . The instrument used in this research is a product assessment sheet. Data from product model assessment were analyzed qualitatively and quantitatively.

3. Result and Disussion

3.1. Science Instruction

Science as a way of thinking, a way of investigating, a body of knowledge, and its interaction with technology and society. It can be abstracted that in science there are dimensions of the way of thinking, a way of investigation, the building of science and its relation to technology and society. This becomes a substantial substance of the importance of science teaching which develops its scientific process for the formation of the mindset of learners [5]. The word science as "both a body of knowledge and a process". Science is defined as the building of science and process. Furthermore, science is defined to have three important elements of attitude, process, and product.

Science has three major elements: attitudes, processes or methods, and products. Attitudes are certain beliefs, value, opinions, for example, suspending judgment until enough data has been collected relative o the problem. Constantly endeavoring to be objective. Proces or methods are investigating the problem, for example, making hypotheses, designing and carrying out experiments, evaluating data and measuring. Products are facts, principles, laws, theories, for example, the scientific principle: metals, when heated expands [20].

Science has holistic objects and issues so that it needs to be presented holistically. Integrated science presents aspects of physics, chemistry, biology, earth sciences, astronomy and other aspects of the natural sciences. Integrated sciences are presented based on a contextual approach to connecting science with daily life, personal and direct, placing one of the main ideas, containing problem-solving. In its presentation, science is presented with a unified concept [11]. The integrated approach involves the scientific process, organizing principles, organizing the natural integration of scientific knowledge and its application in everyday life. Besides that, in an integrated approach, students are expected to be able to relate to other fields including physics, astronomy, chemistry, geology, biology, technology, environment, and safety healthy[21] .

3.2. Process of developing the product

Developing step was done by validating the product to the expert. The following data generated from the assessment of learning scenarios:

Table 1. Score of each component of learning device

Component of learning scenarios	Score
Expert (Lecturer)	143
Science Teacher	144
Total	143.5
Category	Very good

Based on the quality criteria of learning scenarios that were developed [8], this product has **very good criteria**. The quality criteria of the product was shown below:

Table 2. Quality of Product

Formula	Range	Category
$X > \bar{X}_i + 1,8. S_{bi}$	$X > 121.8$	Very good
$\bar{X}_i + 0,6 S_{bi} < X \leq \bar{X}_i + 1,8.S_{bi}$	$98.59 < X \leq 121.79$	Good
$\bar{X}_i - 0,6 S_{bi} < X \leq \bar{X}_i + 0,6. S_{bi}$	$75.40 < X \leq 98.59$	Enough
$\bar{X}_i - 1,8.S_{bi} < X \leq \bar{X}_i - 0,6.S_{bi}$	$52.20 < X \leq 75.40$	Less
$X \leq \bar{X}_i - 1,8. S_{bi}$	$X \leq 52.20$	Very less

Based on the results of the assessment of experts, suggestions for product improvement include 1). Activities based on the worksheet are clearly referenced, 2). Customize step by topic in the lesson plan with activities in the worksheet, 3). A follow-up plan is also written, 4). Consistency between goals in the lesson plan and those in the worksheet), 5). A Worksheet is titled according to the activities in the lesson plan. The revised product was then tested in class VII C of Godean 2 Junior High School. The feasibility test was conducted with a quasi-experimental design before-after with pretest, use of the developed and posttest device products. The results of the pretest and posttest knowledge competencies are presented as follows:

Tabel 3. Score of Knowledge Domain

Pretest		Posttest	
Average	Standard deviation	Average	Standard deviation
43.5	8.80	82.88	11.31

Tabel 4. Score of Problem Solving Skills

Pretest		Posttest	
Average	Standard deviation	Average	Standard deviation
40.73	6.08	83.3	11.52

3.3. Science Outdoor Learning

According to the data in tabel 3 and tabel 4 can be showed that there are improvement of domain knowledge and problem solving skills. Learning devices that are developed are oriented towards science outdoor learning using SETS (Science, Environment, Technology and Society). Learning uses science outdoor learning. Students conduct an investigation to determine polluted and non-polluted water using water pollution parameters. In addition, students are motivated to discover the effects of water pollutants on organisms and efforts to overcome water pollution. In science outdoor learning, students are guided using student activity sheets that contain issues that are authentic in their daily lives. Furthermore, students solve problems through investigative activities carried out involving objects and symptoms outside the classroom.

Outdoor learning is one of the learning strategies that utilize nature as a learning resource [12]. Outdoor learning is also known as outdoor activities, outdoor study, outdoor learning or field learning. Outdoor activities are defined as activities outside the school that contain activities outside the classroom / school and in other outdoors. Outside classroom activities can be in the

form of games, stories, sports, experiments, competitions, getting to know the cases of the surrounding environment and discussing the transfer of solutions, environmental actions, and roaming the environment [9].

Environments have their own phenomena, uniqueness, and boundaries. With the increasing knowledge about the situation, the place and its overall role in an environment will make students gain new skills and abilities in the real world [9]. The environment provides concrete materials about daily life to be used as lessons. This means that learning through outdoor provides an authentic experience for students. Authentic experience is related to the achievement of learning outcomes[4]. Outdoor learning with inquiry influences learning outcomes in cognitive, psychomotor and affective domains[12].

Science outdoor learning has been developed can improve problem solving skills and knowledge domain Problem solving ability is the ability of a student to use his thought process to solve problems through a systematic stage [19]. Indicators of the ability to solve problems include:1) identifying the problem;2) defining the problem;3) collecting, evaluating and organizing information about the problem;4) creating or selecting a strategy to solve the problem;5) allocating resources to solve the problem;6) monitoring the problem solving process; and 7) evaluating the final solution.[7].

4. Conclusion

The science outdoor learning that has been developed is feasible with very good criteria to improve the domain of knowledge and problem solving skills.

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