Enhance Environmental Literacy through Problem Based Learning

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Abstract. This study aims to improve environmental literacy elementary school students in Bandung. The design of this study used a classroom action research consisting of four stages, planning, implementation, observation, and reflection. The results showed that there was an increase in the students' environmental literacy. The conclusion of this research is that students' environmental literacy can be improved through classroom learning by applying Problem Based Learning model. Learning planning is important which includes analysis of environmental literacy component and learning model that is used, Problem Based Learning, so that learning can run effectively, efficiently, and get maximum result. Efforts to improve environmental literacy should be sustainable.

1. Introduction
The problem of low environmental concern in elementary school students in one school in Bandung is a problem that must be overcome in order not to cause more complexity of environmental problems [1]. The role of environmental education can be the solution of the problem [2, 3]. Environmental education is a process that helps develop the skills and ethics needed to understand the relationship between humans and the environment [3]. It aims to prepare citizens, including students, to solve and prevent environmental problems [4, 5, 6, 7, 8]. Environmental education is important to gain high attention in building a sustainable environment [9]. The importance of environmental education to students is to solve environmental problems.

Achievement of environmental education is students have environmental literacy [2, 9, 10, 11, 12, 13]. Communities that have environmental literacy will be able to behave in an honorable and environmentally responsible manner [14]. Roth defines environmental literacy as the ability to understand and interpret that relates to the environmental system and take appropriate action to maintain, restore, and improve the system through knowledge, skills and awareness toward environmental problems [15]. Students who have an environment literacy will behave responsibly to the environment through knowledge, skills and awareness of environmental issues.

Research on environmental literacy has been studied by many researchers such as Maulidya, McBeth, Aminrad, and Fah who examine environmental literacy in middle school students, and Igbowke is researching on EcoSchool [1,6,16,17,18]. This study examines the environmental literacy in primary schools that are different from those studies. There is Erdogan's research on elementary school, but the study analyzes the science education objective addressed to the basic components of environmental literacy, as well as Karatekin research that analyzes primary schools of social studies.
textbooks [5, 9]. This study examines how to improve students' environmental literacy through classroom learning. Research on teaching strategies on environmental literacy has also been investigated by Kostova, through interactive didactic strategies [19]. However, in this study the strategy used is the application of Problem Based Learning model.

Problem Based Learning according to Tan is an innovation in learning, because in Problem Based Learning, students' thinking ability is optimized through a systematic group or team work process so that students can empower, sharpen, test, and develop their thinking ability continuously [20]. Problem Based Learning provides issues that prepare learners actively and their curiosity to investigate to find solutions to their problems [21]. In Problem Based Learning there is no right or wrong answer, there is only a reasonable answer, the most sensible solution to solve the given problem [22, 23].

Problem Based Learning can be expressed as an ego process to solve questions, curiosities, doubts, and also uncertainty about the phenomena contained in life [24, 25, 26]. It takes a solution to answer all questions, this is the most important process in Problem Based Learning, that is finding the solution of all problems. In this study, students work in groups to find solutions to existing environmental problems. Students seek and build their own information from something learned so that the learning process is not just an activity of transferring knowledge from teacher to student, but is an activity that awakens activity and allows students to build their own knowledge through a strong connection between concepts and skills [27, 28]. Working in groups will enhance students' communication skills that can make learning fun and motivated students to be more active in learning [29, 30]. According to Stanford University's Center for Teaching and Learning, group work can also improve learning achievement [31]. Empirical research of Problem Based Learning has shown that students who have learned to use Problem Based Learning are better able to apply their knowledge to new problems and also utilize independent learning strategies more effectively than students who have learned from traditional learning [32, 33, 34]. Problem Based Learning are significantly more effective than traditional teaching to train competent and skilled practitioners and to promote long-term retention of the knowledge and skills gained during the learning experience [35]. Using Problem Based Learning model is an alternative to improve the students' environmental literacy.

2. Experimental Method
The design in this study is a classroom action research. The research design used in this research is the spiral model of Kemmis and MC. Taggart. This model is the development of Kurt Lewin model, which consists of four stages of planning, action, observation and reflection. Research subjects were 15 male students and 12 female students. The source of environmental literacy data of the students comes from the document data of the test result of evaluation, questionnaire, skill assessment, observation, and student documentation. Technique of collecting data using test and non test technique. Data analysis uses descriptive analysis which includes quantitative and qualitative data. The variable in this research is the student literacy of the students through the Problem Based Learning model of the students in one of the primary schools in Bandung.

3. Result and Discussion
Learning by applying Problem Based Learning models has shown an improvement in all aspects of environmental literacy that include knowledge, awareness, and skills. The Problem Based Learning model is a learning model that presents a contextual problem that stimulates students to learn [22]. Students work in teams to solve existing environmental problems.

The environmental literacy components studied in this research are the aspects of knowledge, awareness, and skills. The knowledge aspect is a component of environmental literacy [14]. This is also in accordance with the opinion of Maulidya and Iqbal which defines the definition of environmental literacy as knowledge of the mechanisms of the natural environment and how humans should preserve the natural environment, as well as the ability to consider in detail and depth the environmental issues in order to analyze, evaluate, and make decision on environmental issues [1, 36]. And one of the goals of environmental education according to UNESCO is to provide opportunities for everyone to gain the knowledge needed to solve current environmental problems and prevent new problems [3].
The calculation of the scores of the students' environmental literacy knowledge is based on five indicators, 1) Understanding the problem of paper waste in the surrounding environment, 2) Understanding the process of paper making, 3) Analyzing the impact of paper making, 4) Analyzing paper waste problem, and 5) Creating problem solution of waste paper with recycling paper waste. The achievement of the indicator is in line with 21st century skills goals in the Rhode Island Environmental Literacy: 1) To demonstrate knowledge and understanding of the circumstances of the environment and the conditions that affecting it, 2) To demonstrate knowledge and understanding of the impacts that society has on nature, 3) Investigate and analyze environmental issues, and make accurate conclusions regarding effective solutions to overcome them, and, 4) Takes both individual and collective action to address environmental concerns [37]. In addition, the achievement of environmental literacy knowledge is also consistent with the environmental literacy component of the North American Association for Environmental Education (NAAEE) that includes knowledge of environmental issues, an understanding of issues related to environmental issues, and the achievement of cognitive skills, which is capable of identifying, defining, and / or analyzing environmental issues, synthesizing, and evaluating information on environmental issues [4, 7, 9, 38].

Environmental knowledge, based on the Tbilisi Declaration, is very important because it helps acquire a basic understanding of the environment and the problems associated with it [3]. This aspect includes the ecological knowledge and understanding of important concepts in ecology, principles and theories about how the system works and its interaction with the social system environment; as well as cognitive skills, is the ability to analyze, synthesize and evaluate information about environmental issues [2, 5, 9, 12, 19, 36]. The results of such understanding help generate attention among individuals, students, who create a willingness to act on environmental problems [39, 40]. Environmental knowledge affects attitudes that will ultimately improve behavioral intentions [41].

In this research, environmental literacy is not merely a knowledge of environmental and ecological concepts, but is supported by an attitude and concern for the environment which then fosters the motivation of environmental caring behavior [18]. Maulidiya and Ibrahim also revealed that to cultivate environmentally responsible behavior must begin by building environmental awareness [1, 42]. Awareness based on the Tbilisi Declaration, includes awareness and sensitivity to the environment [3]. Such awareness may be illustrated by a tendency towards environmental problems as expressed by Roth [15].

The awareness indicators in this study include beliefs, awareness, and environmental conservation activities on garbage issues in the form of commitments as measured by consciousness questionnaires. Such attitudes, motivations, awareness, and attention will lead to more environmentally responsible behavioral behavior [43, 44, 45]. Environmental dispositions refer to the tendencies of feelings, values and concerns that will motivate them against environmental protection and conservation. Environmental disposition also helps individuals to make decisions in solving environmental problems [39, 43]. The environmental disposition component consists of environmental sensitivity, attitudes and attention as well as motivation and intention to act. Environmental sensitivity refers to a collection of cognitive and affective attributes that are incorporated in individuals acquired through various internal factors (needs, abilities, interests and emotions) and external experience [46]. The environmental attitude consists of a complex perception formed by the values and beliefs of a person that produces verbal commitment, actual commitment, motivation and intent to act in actively participating towards environmental protection and improvement [16, 47].

Environmental literacy, in this study also shown with skills in solving environmental problems [3]. Iozzi reveals that the behavior of individual and community environments, following from the development of knowledge and skills [48]. The opportunity of individuals or groups in participating in solving environmental problems is also the goal of environmental literacy [3]. In this study, students participate actively in solving environmental problems in recycling with skill indicators that include skills in utilizing learning resources to create solutions to existing problems, skills to create relevant solutions to existing problems, and skills in generating work from problems itself. Skills in solving environmental problems can be actions that include active participation in providing solutions to environmental problems, which may include consumption actions, environmental management, legal action, persuasiveness, and political action [2, 5, 9, 12, 19]. These actions can be grouped into physical
and persuasive actions. Physical action is the action of a person by doing an environmentally conscious lifestyle such as recycling and picking up trash. Persuasive action involves directing others to commit to conservation and environmental protection [14].

Based on the description of the three aspects of environmental literacy that have been described, the increasing of environmental literacy can occur because of the good planning before the learning which includes the analysis of each component of environmental literacy which is further elaborated in the indicators as well as analysis of the learning model used to be applied effectively and efficiently to maintain maximum results.

4. Conclusion
Environmental literacy of students can be improved through classroom learning by applying problem based learning model. It takes learning planning which includes analysis of environmental literacy component and learning model that is used, problem based learning, so that learning can run effectively, efficiently, and get maximum result. Efforts to improve environmental literacy should be sustainable.

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