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The research based learning approach in Environmental Education

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Abstract. This study was aimed to investigate the effect of research based learning on students' environmental care attitude. The study was conducted on students taking the environmental education program. The change of environmental attitude was carried out by developing research based learning. The method used in the research was quantitative and qualitative mixed methods. Students were given information on concepts and environmental degradation as well as research based learning. Students made groups and compiled the proposal based on the study theme. Students conducted research for collecting the data and information, and they were presented in the form of information both report and scientific article. Research learning was implemented in order to develop students' scientific thinking. The findings indicated that there was no gender difference in environmental care attitude because research based learning had a positive impact. Students showed the increased creativity, knowledge, benefit, and critical thinking through research activity, discussion, and brainstorming. The practice of research based learning was more helpful in describing environmental problems and taking the best solution for students.

1. Introduction

The environment is the place where organism interact each other. Environment also affects the balance of nature and human. Negative balance will have a negative impact on the environmental carrying capacity. The explained that all human activities can affect environmental problems [51]. Education is a key element in preventing and resolving environmental problems [34,45]. Environmental education will help students develop skills and ethics to understand the relationship between humans and environment. The focus of the student's life experience requires generally a high level of participation in environmental education [13]

The contextual problems are needed in building a competency system as the study material in lectures. Integrative teaching was based on philosophy and practicality [. The learning implementation for students generally includes the realm of knowledge, skill, attitude, and value as subject in developing an understanding of ideas about environmental problems [23]. The explained that using integrative learning will provide a holistic understanding to students about the diversity of knowledge and prior experience in real terms [6]. Teaching approach to integration became a real pathway in education this century because it has connected to real life situations [14]. The growth of environmental awareness illustrates the need for effective environmental education scheme that generate the new way of thinking [31]

The development of environmental awareness affects the student character. The attitude of the environmental care is influenced by economic, parent attitude, and residence factors [36]. The implementation of environmental education must provide sustainably an understanding of knowledge,



attitude, and environmental behavior. Environmental education is important for prospective teachers to develop environmental care attitude at all levels of primary and secondary education. Environmental education required elements such as administrative support, budget, time, teacher, community, syllabus, program, cooperative learning, and flexible general learning level [32]. Student involvement was a form of evaluation for the ecological, economic, and social benefits of urban green space changes that affect the environmental carrying capacity of ecosystem [5]. Investigating environmental problems can improve students' understanding of thinking and scientific observation. Implementing thinking skills can improve the learning of science and environmental education [4]. Environmental education program must be prepared for prospective teachers for all fields of science. Caring behavior functions to solve the problems actively and it becomes an important program for prospective educators. Educational experience had a conceptual impact in building mentality to environmental care contextually [39]. Problem-based learning is believed to improve knowledge, attitude, behavior, and environmental insight for prospective teachers [25]. Problems that are solved have no right or wrong answers, but in the reasonable solution can overcome problems [22]. Environmental and climate change problems are important to be solved by students through a research based learning approach in environmental education.

Research based learning is a constructivism approach that requires a class or small group of students to be responsible for their decisions. The constructivism approach provides opportunity for students to connect between science and real-world issues [11]. The research based learning approach provides many lecture system reforms at the university in instilling knowledge and analytical skills for prospective teachers. Improving academic achievement provides the independent learning flexibility in building knowledge [8]. This ability is very important for education in the 21st century [9]. Learning based research is interactive in its implementation by using practice, survey, and independent learning that fosters communication between prospective teacher and lecturers [30]. Research based learning activity is important for the students in understanding the field work methodology, research data, and supporting theories which become the aspects of emotional and intellectual development in the field [18]. The research based learning in Thailand could improve research, knowledge discovery, and work skills that affect achievement, thinking pattern, problem solving skills, critical thinking, attitude, and it becomes the basis of students' research [41].

Research based learning aims to help prospective teachers in obtaining information, knowledge, skills, and attitude for sustainably environmental development. The implementation method of continuing education is important in environmental education. Therefore, this study aims to determine how the research based learning approach can affect the environmental care attitude for prospective teachers sustainably.

2. Methods

This study was used to investigate the effect of research based learning on the attitude of environmental care for prospective teachers using mixed method which includes quantitative and qualitative data as the basis for analyzing study and interpreting data [17, 28, 46]. The explanatory design was used to improve the trial result. Firstly, researchers took quantitative data, and it was improved by using qualitative methods [12]. Quantitative data were collected by using an *Environmental Attitude Scale* (EAS) [7]. The questions about environmental attitudes (EAS) were used for collecting data on students' environmental attitudes. Moreover, the qualitative data were collected through semi-structured interview as the instrument for students. The instrument provided contained three open questions and seven yes or no questions about environmental education. The interview results were used to support quantitative data analysis of the environmental attitude scale (EAS). Environmental attitude covers 21 indicators developed to analyze the students' environmental attitude in this research. The used scale was a Likert scale such as (5) strongly agrees; (4) agree; (3) doubt; (2) disagree; and (1) strongly disagree. The internal consistency of environmental attitude (EAS) that is developed and reported by Berberoglu and Tosunoglu is 0.77. The cronbach alpha value found in this research was 0.82 [7]. The research participants were students who enrolled in environmental education course at Faculty Teaching Training and Education, University of Jember. The investigated number of groups was 39 student groups.

In the lecture implementation, the concept and environmental degradation were given to students on the first 2 weeks with the duration of 2 hours every week. On the 3rd meeting, students

were informed about research based learning which functions to investigate the environmental problems. Furthermore, students were divided into 8 groups. They asked to conduct research and compile reports according to the environmental problems that have been determined. On the implementation of the research phase, students arranged the research plan, time, and report according to the time specified in the syllabus and the plan for environmental education lecture. The implementation stage of research based learning on environmental education is described in table 1. The division of research based learning topics on environmental problems for each student group included:

- (1) Study group: environmental pollution.
- (2) Study group: vegetation and forest damage.
- (3) Study group: land and soil degradations.
- (4) Study group: decrease in the quality of hydrology.
- (5) Study group: climate and weather changes.
- (6) Study group: functional shift of agricultural land to settlements.
- (7) Study group: environmental carrying capacity of rural and urban areas.
- (8) Study group: damage of biodiversity and coastal areas.

Each student group chose one of the environmental problems in accordance with the provision. Students collected information on environmental problems occurring contextually in the neighborhood. Students compiled the proposal and instrument for researching environmental conditions that have been selected and supported by journals and reference books. Collecting research data, students conducted the investigation and interview with people who were competent in their environment. The investigation data result was processed to determine the solution to environmental problems with discussion and brainstorming. The solution found in the research was proposed in the research report compiled by each group. The research result and report were presented to other groups in the class.

Table 1. Lecture Activities of Environmental Education

Week	Activity	Time
Week 1	Concept information about the environment	2 hours
Week 2	Information on environmental degradation problem	2 hours
Week 3	Introduction to research based learning	2 hours
Week 4	Sample research based learning	2 hours
Week 5	Students create research groups	2 hours
Week 6	Determining the theme and making of the RBL proposal	2 hours
Week 7	Research on data and information collection	2 hours
Week 8	Data analysis with brainstorming and group discussion	2 hours
Week 9	Writing the RBL report	2 hours
Week 10	Group Presentation 1 and 2	2 hours
Week 11	Group Presentation 3 and 4	2 hours
Week 12	Group Presentation 5 and 6	2 hours
Week 13	Group Presentation 7 and 8	2 hours
Week 14	Writing scientific article as the RBL report	2 hours
Week 14	Publication of scientific article	2 hours
Week 15	Evaluation	2 hours

Environmental attitude scale was implemented to students through pretest and posttest. Environmental education attitude and question were asked to students with three open questions. All questions about environmental education attitude were asked with yes and no answers. Those questions were delivered before and after carrying out the implementation of research based learning.

3. Results and Discussion

3.1 Quantitative Analysis

The students participated 39 in this lecture. 33.33% was male, and 66.67% was female. All participating students were the 3rd semester student. The students' environmental attitude between male and female was $p = 0,125$). Before the implementation of research based learning, students were given pre-test treatment about learning the environment and caring for the environment. The pre-test result and the percentage distribution of understanding the environment are shown in table 2 below:

Table 2. Students' Attitude and Behavior against the Living Environment

Question	Answer	N	%
Do you know about the knowledge of environment before?	Yes	9	23,07
	No	30	76,93
Have you already known about the dynamics of environmental problems that have occurred contextually?	Yes	5	12,82
	No	34	87,18
Are you interested in the topic of environmental study?	Yes	38	97,44
	No	1	2,56
Have you ever been involved in environmental care organization activities?	Yes	7	17,95
	No	32	82,05
Is environmental education given and become the topics of conversation when you are with your family at home?	Yes	26	66,67
	No	13	33,33
Do you care about the environmental problems that occur around your home?	Yes	37	94,87
	No	2	5,13
Do you believe that students and teachers care about environmental problems?	Yes	39	100
	No	0	0

Table 2 shows that the ratio of the students' environmental education in the classroom was very low. Students discussed the topic of contextual environmental problems with the family having an environmental care attitude. In addition, students emphasized the importance of caring for environmental problems for teachers and prospective teachers.

The result of *t-test* for *Environmental Attitude Scale* (EAS) which was based on the results of the pre-test and post-test on the implementation of students' research based learning for environmental problems can be seen in table 3.

Table 3. The result of the t-test of Environmental Attitudes Scale (EAS) on the Implementation of Research Based Learning

	<i>N</i>	$\bar{X}$	<i>s</i>	<i>Sd</i>	<i>t</i>	<i>p</i>
Pretest	39	61,72	7,621	38	30,107	0,000
Posttest	39	84,23	8,274			

Table 3 shows that research based learning has an impact on students' environmental care attitudes. The average posttest score had a significant increase compared to the average pretest score. The research finding indicated that the implementation of research based learning had a different effect on the instilling environmental care attitudes towards students.

3.2 Qualitative Analysis

To identify the impact of research based learning, students were given open questions about the implementation and the use of research based learning in environmental education lecture. The evaluation results given by students are described below:

Question1: Write down your opinions and views about the implementation of research based learning in environmental education.

Students explained that research activities on the topic of environmental problems provided a lot of information from what was investigated during collecting the data in the field. S1 stated that research based learning was the right method for learning environmental problems. Knowledge and opinions on environmental problems could be for the research studies. However, I did not get much information for research studies outside the topics studied by other groups. Then, S10 added the following statement. The practice of research based learning on environmental education was very helpful in contextual independent learning. The loss received by the group was that they only understood the topics which wereas the focus of the research, so that information for other topics became less informed. Students couldconclude the research result from the results of investigation, discussion, and brainstorming with group members through research based learning. Environmental actions carried out in research activities improved the critical thinking process of each individual. S12argues, "Research based learning provides many benefits and can increase information and critical thinking of students in gaining knowledge".

Most of the students gave opinion that research based learning approaches trained and directed each individual to research. S8 strengthened this finding by stating that research based learning encouraged them to think scientifically through research activities. S15 added, "Research learning activities with topics facilitate the learning process and obtain information. S20 explains the positive impact of research, "the current education process must be more innovative by raising contextual issues, and conventional method needs to be changed which does not provide many benefits for many years, and it is only abstract knowledge. Research based learning provides its own perspective for each individual in assessing and providing solutions. S21 commented "the practice of research based learning provides a learning atmosphere both for discussion and brainstorming, thus it increases our learning motivation. S26 added, "Research learning practice provides complex knowledge about the study topics that are studied. Thus, the concept and knowledge about the topic studied provides new knowledge when it is studied thoroughly.

The comments and arguments above illustrate that research based learning has an impact on students' critical thinking skills in gaining knowledge from research activities. Research learning activities need to be carried out continuously as learning innovations. S18 explains the benefits of research: "We obtained detailed and complex information from the study results. New information is important to be accounted for completing the research. Research based learning activities are more effective and efficient to increase students' activities in contextual learning of environmental problems. "S6 added:" I believe that environmental education will not be interesting if the learning method used is conventional or other methods. The method of research based learning provides more time and benefits; so that it is not boring in developing knowledge about environmental education. "S10 expressed his view that research learning by studying the topic of the problem provided more thinking skills from various perspectives.

Students stated that the practice of research based learning was very challenging and interesting to do. S2 stated that the score of research practice especially in environmental education increased his motivation and interest. S23 added about the assessment. He said that research based learning activities were easier to understand the knowledge information. S28 commented on the positive impact of research based learning: "research activities with the study of environmental problems can be developed in a fun way including developing theory from books and journals, research activities, and discussion and brainstorming. Learning activities become less attractive and ineffective if learning is usedlecture-focused method.

Students also provided a negative opinion about the research based learning approach. They said that research based learning activity was not familiar to students. The implementation of research based learning had never been done before. Students were still familiar with conventional method. Research application was more useful and enjoyable in developing cognitive, affective, and psychomotor knowledge of students.

Question 2: *What difficulties do you feel when implementing research based learning for environmental education ?*

Talking about the difficulties in the implementation of research learning, students stated that the difficulties of research based learning included, understanding research method and technique, writing

suggestion and report, lack of group collaboration, undefined research data information. S7 explained that the difficulty of the research learning activities was to develop the study topic of environmental problems into a research proposal with innovative ideas. S22 added that the biggest problem was that the implementation of research learning has been carried out. "S32 explained the negative aspect that the implementation of research learning activities gave doubt to them to complete the research report, but after the completion of the research report, the results became valuable experience in obtaining knowledge and information.

In addition, students had difficulty in writing groups' suggestion and report. S9 explained the difficulties faced in providing suggestion from the research results that had been prepared. The ideas given from group discussions could not be applied to environmental education sustainably even though it has reached a conclusion. S2 had the same view by adding that, "we have big difficulty in the implementation of research based learning based on the ideas in the report completion. Research based learning activities took intensive time and work. S4 stated about the nature of this approach: "We cannot obtain information as desired easily. This requires a lot of time in information analysis." S23 also added a description that, "We have difficulty in optimizing the time effectively in exploring research information".

Students had problems in group work. S14 stated that group work activities provided difficulties in distributing tasks of research activities from beginning to end ". S29 added, "The group experienced difficulties in gathering to complete the research report. However, group work activities greatly facilitated the collection of complex information from research results.

Students also stated that the difficulties faced during the research were finding the information that was based on the topic of the study group. The policy of the authorities had an impact on the group in solving complex problems. As a result, students could not develop research with the object of a more sustainable study about environmental problems. S28 reported that the problem faced when research was a lack of insight into environmental knowledge. However, the interview result could be in accordance with the topic of research studies.

Question 3: *Can the implementation of research based learning be used for lecture in other fields?*

Students gave positive and negative responses to the question. The students' negative point of view was that the method of research based learning was not suitable for all disciplines. Moreover, the report was only limited to research information; so that, the impact was not all individuals like group work.

On the other hand, students responded positively that research-based learning was very fun, interesting, and providing flexibility in counseling through research based learning activities. Students felt that learning became more active, creative, and influences critical thinking in discussions and brainstorming. S1 stated the opinion that the method of research based learning was very suitable for all subjects. The topic of problem study was the main focus in the research implementation. S16 did not agree and explained, "I believe this method is not suitable for all disciplines". S8 added, "I am not sure this method can be used for all disciplines because it is an exercise that takes a long time. This method can be used for courses that are in accordance with contextual learning because it provides tangible benefits for students. Many comments revealed that research based learning was not appropriate in time efficiency. S23 criticized, "The implementation of research based learning method takes a very long time to prepare proposal, research activities, data processing, and research report making. Therefore, it was not suitable for lectures in courses and other disciplines.

The students responded negatively that conventional learning has been a tradition for many years. Students complained that they have spent much time on intensive research activities. Students gave suggestion that research based learning methods were more developed for more creative research. The S7 stated its approval: "Yes, I like research activities because it trains to think critically, research, write, and think scientifically. S13 added, "The method of research based learning increases student creativity, but each group only focuses on the study of its research problems". S34

commented on the positive impact of research based learning: "The implementation of this method directs students to gather discussions and brainstorming to produce creative and innovative ideas." A clear framework provided flexibility in giving ideas.

Students believed that research based learning provided a very effective learning. S37 stated the importance of this method to be implemented in the course and other disciplines: "I want this method to be used for other subjects and disciplines whose material studies are contextual because this method is effective. S17 added, "Research based learning method is very beneficial because it is collaborative, and it is focused on students. The benefits obtained by students could be used to answer research questions that were being solved from the results of group investigation and analysis.

Students expressed their satisfaction by stating that the implementation of research based learning increased learning to be more active. S9 stated, "The method of research based learning is a student-centered method. I feel this method is in accordance with the study material and the subject of the lecture. This method is fun because it provides easiness in increasing cooperative discussion and brainstorming that can provide competition among groups. I feel this method further strengthens my willingness to learn. "S26 agreed to the praise," Yes, because all students afford independently to solve the problems through research activities to get the best and efficient ideas as well as the solutions. S31 added, "I feel this method can have a positive effect in communicating in the process of analyzing research results. This learning is the best done either in groups or individually. In addition, students must always be ready in the implementation of this method, especially for each individual.

3.3 Discussion

The research results showed that there was no difference in students' environmental care attitude in the gender context. There was no difference in environmental care attitude between men and women [35]. [15, 19, 27, 33, 43] The findings are different who stated that women had better environmental care attitude than men. Moreover, found that environmental education was mostly done by men than women in the school yard [10]. The attitude of environmental care of men had adopted a lot from women's environmental concern. Behavioral changes in each individual were oriented towards sustainably environmental education. The role of humans in exploring ecosystems affected the social ecological system in environmental education [47]. Elements of education are the main keys in continuing education for students to have more environmental care. Teacher readiness had an integrated role in environmental education [16]. The attitude of students' environmental care related to nature was influenced by knowledge and environmental problems that were interconnected [48].

Research based-learning on environmental education attracted students to think critically and innovatively. Research based learning connected research learning activities with the academic environment [52]. The student involvement in research activities enables the development of knowledge variations in various innovative disciplines [20, 21]. Implementation of research based learning methods provides stimulation to students and lecturers [42]. Implementation of research based learning can develop research enthusiasm, critical and creative thinking to students [18]. The Application research based learning trains students' metacognitive skills in critical thinking, making prediction, outlining factors, and presenting constructive argument measured by the components of scientific presentation and report [2]. The advantage of research based learning is needed to be applied continuously for other fields. The expansion of the implementation of research based learning is needed to be applied in many departments in order to implementation research in education and to link research and teaching [38]. As a result of problems in environmental education were influenced by limited teacher training, an underdeveloped curriculum, and slow administration policy [29]. The dynamics occurring in environmental education activities needed sustainability for students. The determined that environmental education had a significant influence on the sustainable awareness, attitude, and behavior of individual [24]

Educational condition, teacher competency, and teaching practice had an important role in environmental education [32]. Student involvement in environmental problems projects had a positive impact on knowledge and attitude of science [1, 26]. Research based learning influences students' attitude in interacting with the environment and society. Caring from each individual to environmental

problems is needed sustainably through education. The relationship between social and ecological problems in sustainable development was influenced by teachers' awareness, confirmation, and collaboration [50]. The teacher had an important influence in educating kids and teenagers to become future leaders for environmental advocacy [16]. The important role of teachers in environmental education is influenced by effective and innovative learning process method according to the contextual problems of life. The implementation of research based learning was influenced by research-based instructional management component, teacher characteristics and student behavior, indicators of teacher outcome and achievement, as well as skills and characteristics needed by students [36]. Effective and active method will automatically give students an environmental care attitude. Sustainable environmental education was needed for students as a transformation process [44]

4. Conclusion

The students' attitude of environmental care is not influenced by gender difference between men and women. Fact and concept help students to integrate environmental care attitude with research based learning approach. The student understanding could be achieved when the lecturer had knowledge of the environment [49]. The aim was to avoid the risk of directing students to environmental problems [40]. A positive attitude towards the environment was obtained after conducting research activities, so that it could examine contextually critical environmental problems through analysis, discussion, and brainstorming. The implementation of research based learning describes the problem and the best solution of the project that will be completed. The Contextual problem provides a change in thinking pattern on the mental attitude of students' environmental care. Students could build intellectual connection practically according to the limits of strong potential from independent learning [3]. The role of teachers is important in learning innovation for students' environmental education. For this reason, teachers need to encourage students' environmental care attitude to be actively sustained into the future according to the dynamics of the science development.

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