❐   255

Increasing ecoliteracy and student creativity in waste utilization

Sekarsari Sunaryo Putri, Muhammad Japar, Riana Bagaskorowati
Elementary Education Department, Universitas Negeri Jakarta, Indonesia

Article Info	ABSTRACT
	This study aimed to determine the increase in ecoliteracy and creativity in waste utilization by using a project-based-learning (PBL) model in social studies learning. This research was a classroom action research (Action Research). This research was conducted in the fifth grade (V) of Primary Schools. Observation sheet, interview, documentation, and field notes instruments were used to collect data. The results of this study showed that there was an increase in ecoliteracy ability. In addition, students become more active in the learning process and more courageous in expressing their opinions. This shows that the ecoliteracy and creativity of students can be improved through the project-based-learning model.

Corresponding Author:

Riana Bagaskorowati,
Elementary Education Department,
Universitas Negeri Jakarta,
Rawa Mangun Muka Street, RT.11/RW.14, Rawamangun, Pulo Gadung, East Jakarta City,
Jakarta Special Capital Region, 13220.
Email: riana.bagaskorowati@unj.ac.id

1. INTRODUCTION

Increasing the caring attitude that is instilled by teachers to students is very important for environmental sustainability as well as in the opinion of Fritjof Capra who calls ecoliteracy as a condition where people have understood ecological principles and lived according to environmental principles in managing life together with humanity on earth [1]. Gadgil and Barkes, stated the same thing that local wisdom cannot be separated from elements of local rules, local traditions, and customs or cultural values [2].

Action research is called Classroom Action Research (CAR). This research is an examination of learning activities in the form of an action, which is deliberately raised and occurs in a class together [3]. The action is given by the teacher carried out by students. This action aims to improve the quality of learning practices.

Classroom Action Research was developed by several experts; the most famous are five models:
a.   Kurt Lewin's

Model Kurt Lewin's model is a model that has been a basic reference or basis for various models of *action research*, especially Classroom Action Research (CAR).
b.   Elliot

Model this model was developed by Elliot and Edelman. They develop from the Kemmis Model, which is made more detailed at each level. This detailed development has the main objective, to make it easier for researchers to carry out research actions. The process that has been carried out at all these levels is then used to compile the research report.

c.   McKernan Model

In the McKernan model, general ideas have been made more detailed, namely by identifying problems, limiting problems and objectives, evaluating the needs of the subject, and expressing hypotheses or temporary answers to problems in each level or cycle [4].

d.   The Ebbut

Model this model was inspired by the thoughts of Kemmis and Elliot. In its development, Ebbut disagreed with Elliot's interpretation of Kemmis's work. Ebbut's disagreement was caused by Kemmis likening his research to fact findings. While in reality, Kemmis clearly shows that research consists of discussion, negotiation, investigating, and examining existing constraints. Classroom Action Research Model Ebbut is based on initial ideas, researchers try to find out what actions should be taken to solve them and then develop a general design that will be implemented. During the implementation process, monitoring is carried out to see the effect arising from the actions of researchers. From the results of monitoring, an explanation of the various failures has been arranged. This explanation will be an input in the revision of the general plan which subsequently gives birth to the plan for implementing the second cycle. This is explained in Table 1 Ebbut model actions.

Table 1. Ebbut model actions

Level 1	Level 2	Level 3
Initial ideas, identifying problems, goals and benefits. Steps for monitoring action effects	Revision of general plans Action steps monitoring the effects of actions to enter the third level	Revision of general ideas Improved plans Action steps monitoring the effects of actions as an evaluation of research objectives

Table 1 describes the steps of the Ebbut model action research in each cycle. At the first level, the initial idea is developed into the first step of action, then the first action is monitored the implementation of its influence on the subject under study. The monitoring record serves as a material for revising the second phase of the general plan. At the second level, the revised general plan is made again the steps of the action, carried out, monitored the effect of the action in detail and used as entry material at level three. At each level documentation of the effects ofcarried out.

e.   The Kemmis and McTaggart

Models isThis model is a development of the basic concepts introduced by Kurt Lewin, except thatcomponents are *acting* and *observing* integrated because they are inseparable actions occurring at the same time [5, 6] The research model consisted of initial idea determination, pre-survey or initial findings, diagnosis of planning, implementation of actions, observation, reflection, and preparation of classroom action research reports.

Project Based Learning or what is known as project-based learning is a learning model that empowers students to gain new knowledge and understanding based on their experiences through various presentations [7, 8]. Model Project based learning is a learning approach that gives freedom to students to plan learning activities, implement projects collaboratively, and ultimately produce work products that can be presented to others [9].

Project based learning (PPA) is an innovative learning method or approach, which emphasizes contextual learning through complex activities such as giving students the freedom to explore planning learning activities and finally students are given the opportunity to make a product [10]. Project-based learning is a learning model that uses problems as a first step in gathering and integrating new knowledge based on experience of actual activities.

Project-based learning, students plan and carry out investigations on a number of topics or themes that use cross subjects or cross-material [11]. Project-Based Learning Model provides students with exploration, assessment, interpretation, synthesis, and information to produce various forms of learning outcomes [12]. Project-based learning is a learning method that uses problems as a first step in gathering and integrating new knowledge based on their experience in actual activities [13]. Through project-based learning, the inquiry process begins by raising a guiding question and guiding students in a collaborative project that integrates various subjects (material) in the curriculum [14].

The Project Based Learning model is a learning model that involves students actively in designing learning objectives to produce tangible products or projects [15]. Learning that uses a project or activity as a means of learning to achieve competency attitudes, knowledge, and skills [16]. Project Based Learning model involves a project in the learning process so that learning that focuses on the main principles and

concepts of a discipline, involves students in solving problems and other meaningful tasks, encourages students to work independently to build learning and ultimately produce real work [17].

Characteristics of the Project Based Learning Model is students investigate important ideas and ask questions, students find understanding in the process of investigating, according to their needs and interests, produce products and think creatively, critically and skillfully investigate, infer material, and connect with real-world, authentic issues and issues [18]. While Majid & Rochman characteristics of the Project Based Learning Model, namely: a) Students make decisions about a framework. b) There are problems or challenges that are submitted to students. c) Learners design a process to determine the solution to the problem or challenge proposed. d) Students are collaboratively responsible for accessing and managing information to solve problems. e) The evaluation process is carried out continuously. f) Students regularly reflect on the activities that have been carried out. g) The final product of learning activities will be evaluated qualitatively. h) Learning situations are very tolerant of mistakes and changes [19].

Ecoliteracy stands for ecological literacy, also known as ecological literacy, environmental literacy, ecological literacy and *environmental literacy.* In simple terms Ecoliteracy can be defined as understanding, understanding and practicing ecological values that are useful in addressing environmental problems [20].

One other means of continuing to improve the level of Ecoliteracy is monitoring the performance of the "defense" environment [21]. Ecoliteracy or often called ecological intelligence is intelligence based on cognitive aspects or understanding of how life supports the lives of all living things [22]. Ecoliteracy is complex which is supported by intellectual, social, emotional and spiritual intelligence. The existence of knowledge, awareness and life skills that are in harmony with the preservation of nature are also increasingly supporting the success of *ecoliteracy* [23].

Today's dictionaries (eg Merriam Webster, Oxford English Dictionary) generally provide two definitions of literacy: *(1) the ability to read and write, and (2) knowledge or capability in a particular field or fields.* Now the widespread understanding and application of literacy has emerged essentially from the last interpretation [24]. In the narrow sense this word describes the condition of people who are no longer illiterate, people who already know to read and write. Whereas in broad terms literacy means a situation where people already understand or know something. In line with this, McBride, Brewer, Berkowitz, & Borrie states as follows:

"The concept of literacy has evolved considerably from its origin in the ability to read and write. Especially over the last 50 years, expectations for literacy citizen have been extended to include ability to understand, make informed decisions, and act with respect to complex topics and issues facing society today. "The term literacy has also been extended to such knowledge and capabilities in many different discourses (eg, computer literacy, mathematics literacy, cultural literacy, arts literacy) " [25].

In the United States ecoliteracy relates to environmental education as revealed by McBeth & Volk as follows *"when we approach the discussion of environmental literacy in the United States, it is helpful to provide a context by stepping back to look at the development of environmental education"* [26]. Furthermore, Orr defines *ecological literacy* as follows:

"A broad understanding of how people and societies relate to each other's natural systems, and how to do so sustainably. The ability to answer 'What then?' 'Questions, requirements for the interrelatedness of life are grounded in the study of natural history, ecology, and thermodynamics. An understanding of the speed of the environmental crisis upon us. A comprehension of the ideas of controlling the nature and ways in which people and whole societies have become so destructive. Broad familiarity with the development of ecological consciousness. Participation in sustainability: prudence, stewardship, and celebration of Creation "[27].

Initially *ecoliteracy was* better known as *ecological awareness,* or ecological awareness. By using the word *ecoliteracy*, it means not only raising awareness to care about the environment, but also understanding the workings of ecological principles in sustainable shared life on this planet earth. *Ecoliteracy* can empower a person or group in dealing with environmental problems as stated by Pe'er, Goldman, & Yavetz thatdevelop

"One purpose is toenvironmental literacy is to empower people with a belief in their ability to contribute to environmental solutions through personal behavior, either as an individual or part of a group" [28].

Furthermore, ecological principles are the direction for the creation of sustainable development-based learning communities. Thus, 'ecological literacy' is the first stage of the development of sustainable communities. The second stage is what is called ecodesign, or ecological patterned design [29-31]. Ecodesign can be applied in almost all fields. We know it in phrases that are beginning to become common lately, such as ecoeconomy, ecocity, ecofarming, ecotechnology, to ecopsychology. The third stage of this process is the formation of sustainable communities that awaken themselves to ecological principles [32-34].

Goleman points out five points for developing an ecolithic attitude, namely as follows:

a) *Develop Empathy For All Forms of Life* Learning must focus towards awareness, attitude (empathy) about the environment to students. Basically, every child has empathy for his environment. This attitude can be seen when students feel sorry for living things when hurt. This empathy attitude must be developed by the teacher in the classroom, so that the students' empathy becomes stronger. Through this sustainable practice, children can assess and reflect on what they do well or bad for the environment.

b) *Embrace Sustainability as A Community Practice* Learning in groups needs to be done by students, so students can ask questions with their group friends. In addition, practical learning in groups can foster their own enjoyment in students and can foster a sense of responsibility towards the task and other group members. Students will understand how environmental sustainability is the responsibility of every individual, including students.

c) *Make the invisible visible* Real learning is needed by students. Students will be closer and animating each learning process. They carefully follow the steps and procedures in the activity. So they will feel what the purpose of learning is. This will make learning more meaningful. Students can feel firsthand how learning takes care of the environment.

d) *Anticipate Unintended Consequences.* This stage will teach students to take full responsibility for their work. There will be consequences that occur when students underestimate their duties in the learning process. Misconceptions that occur in the activities or processes of teaching and learning teach students the need for cooperation and consistency in their duties. Mismatch expectations with reality become things that will be found by students, so students can evaluate how good and right activities should be [35].

John Dewey is the main character who formed the field of educational psychology. John Dewey is a driver in the practical application of psychology. John Dewey founded the first major psychology education laboratory in the United States, precisely at the University of Chicago in 1894. Many of the ideas put forward by John Dewey include (1) Children as active learners better learning is done by practice, not only with theories, because direct learning through practice will provide experience so that learning will enter and absorb in the lives of children. (2) Education must focus on children, so that children can solve the problems being faced, children must be directed broadly to be able to think and adapt to the outside world, so that children can face any problems that are inside or outside the school environment. (3) All children have the right to receive appropriate and competent education, because at that time education was only enjoyed by a handful of children who had a good economy [36].

The term creativity can be used in two ways, first is creativity as a mental ability to think creatively. Second is creativity as the energy that works in our minds. When someone develops new business ideas, creates songs, paints, or designs something new and innovative, it can be seen that energy [37, 38].

According to Johnson (2002) creative thinking requires perseverance, self-discipline and full attention which includes several mental activities, including the following: 1) Dare to ask questions. 2) Consider new information and unusual ideas with an open mind. 3) Establish linkages, especially between different things. 4) Connect various things freely. 5) Applying imagination to every situation to produce new and different things. 6) Listen to intuition.

Munandar said that the development of creativity is influenced by two factors, namely:

a. Internal factors

According to Munandar internal factors are factors that originate from or are present in the individual concerned. This factor affects the speed or slow development of one's creativity. So that the potential for creativity can be raised, but the driving forces needed from the outside are based on the potential in the individual itself. Therefore the creative power in oneself is a basic ability that is owned and must be fostered for its development.

b. External

Factors External factors are factors that originate outside the individual concerned. These factors include security and psychological freedom of means and psychological freedom. The appreciation of creative people will greatly encourage the development of one's creativity.

In addition, the encouragement of certain parties to carry out various experiments and creative activities is also very helpful in creating someone's creative power. In other forms it is in the form of appreciation and apresisiasi. Environment that can influence individual creativity can be in the form of family, school, and community environment [39].

According to Wycoff some characteristics of creative people include: (1) Courage, Dare to face new challenges and be willing to face the risk of failure. (2) Expressive, Not afraid to express his thoughts and feelings. (3) Humor, Humor is related to creativity combining things in such a way that they become different, unpredictable and unusual. 4) Intuition, Receiving intuition as a natural aspect of his personality [40].

Creativity is essentially the discovery of something new, and not the accumulation of skills or knowledge obtained from textbooks, creativity can also arise spontaneously and imaginatively. Creativity is the ability of a person to give birth to a new idea in the form of a real work idea both in aptitude and non aptitude traits, both in new works and in combination with what has been there before [41]. Furthermore, it is said that creativity is the result of interaction between individuals and the environment.

Social science is an integrated study of the social sciences and is an integration of several scientific disciplines namely social, historical, sociological, political science social psychology, philosophy, anthropology, and economics. Social Sciences is part of the elementary school curriculum that describes the contents of subject matter from social science, history, sociology, political science, social psychology, philosophy, anthropology, and economics. Someone who understands the patterns of Social Sciences will see an integral and integrated ecological issue so as to be able to find solutions to the surrounding social problems [42].

2.   METHOD

Classroom Action Research is research conducted by teachers in the classroom through self-reflection, aiming to improve their performance as teachers, so that student learning outcomes increase [43]. Action research is an independent inquiry carried out by participants in social situations including education with a view to increasing the rationality of (a) social and educational practices, (b) understanding of these practices, and (c) the situation in implementing practice - learning practices. Action research is a comprehensive cyclical activity, consisting of analysis, fact finding, conceptualization, planning, implementation, finding additional facts and evaluating.

Action research is carried out in order to collect data to be able to improve the *Ecoliteracy* and creativity of students. Collaborative participatory action research that can be interpreted, is participatory because the researcher is directly involved in the research carried out in learning, and is collaborative because it involves other parties such as students and all who are in the school. Thus the executor of the action or researcher is expected to know things that can give positive or negative things in the research process so that repairs or changes can be made in order to achieve the objectives of this study to improve and improve the quality of learning outcomes.

Before conducting research, researchers and collaborators carry out pre-observation activities. This activity is carried out to gather facts in the field to ensure there are problems regarding the lack of ability of students to maintain their environment. Field facts are carried out by using field notes techniques (interviews, observation and documentation. For then the facts are analyzed, reflected and documented.

Data analysis techniques look for and systematically compile data obtained from the results of interviews conducted. Qualitative data analysis is analyzing data that occurs in the learning process through handicraft activities from the implementation of initial observations to the implementation of the cycle with the implementation procedures which include planning, implementation, observation and reflection. Analysis of qualitative data was obtained through the results of performance, field notes, observation sheets and documentation about the implementation process through handicraft activities. Analysis of qualitative data is inductive based on the data obtained, developed with a certain pattern of relationships or hypotheses which are then searched for data repeatedly, after which conclusions can be drawn. Data that appear in qualitative research are in the form of words rather than numbers.

3.   RESULTS AND DISCUSSION

The results of teacher observation at the first meeting in the initial activity, the teacher checks the student readiness for learning.The indicators that have been achieved are greeting and asking students to pray first and check the presence of students.The teacher has not paid attention to the cleanliness and tidiness of the student's blackboard and clothes as well as preparing learning tools to begin the learning process.

Implementation plan for learning that has been made Core activities, there are still shortcomings in the implementation of learning.

Including teachers have not directed students to capture messages in the material provided, the learning process has not been able to encourage students to comment on their opinions, at the first meeting the teacher has not discussed worksheets that have been carried out by students, as long as students make a project to find out the benefits of used goods that can still be utilized, the teacher does not direct students to carry out project tasks properly. After carrying out the discussion there are follow up activities for learning but there are indicators that have not been implemented by the teacher, namely giving positive suggestions and input and conveying various findings when learning is ongoing. In these core activities the teacher must carry out learning in accordance with the material to be discussed. In the last activity, the teacher has carried out reflection on learning by involving students to conclude the material discussed.

The second meeting of learning implementation learning in the initial activities of the teacher has prepared learning tools in advance so that the learning process is more conducive. The core activity is still exactly the same as the first activity of the teacher lacking in active participatory activities in the core activities, the teacher does not actively grow participatory in the process of learning activities and still does not provide positive input and convey findings when learning takes place at the end of the activity and closing the learning process, researchers at the time of the implementation of the meeting meeting with researchers with sufficient criteria.

The third meeting, there are several indicators that have increased like the initial activity. The teacher has implemented the readiness of students to learn. In this activity the teacher has also experienced an increase when the teacher gives instructions to students to make a tissue holder from used shoe boxes, but the teacher is also still having difficulty directing students to be actively involved in classroom learning. In the final activity the teacher concludes learning and closes the learning so the researcher in the implementation of the learning gets enough criteria.

In the fourth meeting, the teacher corrects deficiencies at the previous meeting and at this meeting the teacher carries out an evaluation of learning. The researcher gets good criteria.

From the results of research on the implementation of the above research will have an impact on increasing the *ecoliteracy* and creativity of students in the utilization of waste, apart from the knowledge of teachers must also pay attention to attitudes to students, with the learning that has been implemented is expected to increase students' knowledge and insights about the environment student behavior in caring for and maintaining the environment around them.

The teacher also observes the attitudes and character of students in the teaching and learning process. The indicators observed, namely the attitude of guarding and being able to utilize objects that are not used. Students' curiosity will appear when students see a video with a picture of the environment, after which students know and can distinguish between a healthy environment and a dirty environment. The attitude of utilizing objects begins to appear when students no longer combine organic and organic waste. Full data can be seen as shown in the Table 2. Comparison of acquiring scores *pretest* and cycle tests 1 on indicator 1, Table 3. Comparison of score scores *pretest* and cycle test 1 on the 2nd indicator, Table 4. Comparison of achieving score *pretest* and cycle test 1 on the 3rd indicator, and Table 5. Comparison of the acquisition of score *pretest* and cycle test 1 on the 4th indicator.

Table 2. Comparison of acquiring scores *pretest* and cycle tests 1 on indicator 1

Research Subject (SP)	Pretest	Cycle Test 1
1	2	5
2	3	4
3	2	3
4	3	5
5	3	1
6	3	1
Maximum score		6

Table 3. Comparison of score scores *pretest* and cycle test 1 on the 2nd indicator

Research Subject (SP)	Pretest	Cycle Test 1
1	2	3
2	1	2
3	2	1
4	3	5
5	2	2
6	3	1
Maximum score		6

Table 4. Comparison of achieving score *pretest* and cycle test 1 on the 3rd indicator

Research Subject (SP)	Pretest	Cycle Test 1
1	4	5
2	1	4
3	2	3
4	1	2
5	2	1
6	3	1
Maximum score		6

Table 5. Comparison of the acquisition of score *pretest* and cycle test 1 on the 4th indicator

Research Subject (SP)	Pretest	Cycle Test 1
1	2	2
2	2	2
3	2	3
4	3	5
5	4	3
6	3	1
Maximum score		6

In general, the implementation of cycle 1 is in accordance with action planning. Although there are still some things that do not go according to plan. Based on the results of these observations, it is necessary to have some improvements to the actions that need to be carried out for improvement in the second cycle. The extinction includes:

a.　The teacher changes the sitting position of students in each group.
b.　The teacher increase their activities on aspects that are felt to be lacking, by giving motivation to students to be better biased in following the learning process in the classroom.
c.　The teacher reiterated the importance of using tools as a tool in answering the questions given.
d.　The teacher conveyed the importance of using teaching aids in each lesson.
e.　The teacher gives advice to students who still don't understand.
f.　The teacher explains the steps in the learning process again.
g.　Students must remember that the questions given must be done collaboratively.
h.　The teacher helps students to draw conclusions and help students to present their work in front of the class.
i.　The teacher hopes that students have higher reasoning in *increasing the ecoliteracy* and creativity of students in the utilization of waste.
j.　Students need to be given solutions, advice, praise, awards so that they can increase learning activities.

From the results of the analysis of the learning activities in the Table 6, the observer gives advice so that improvements are carried out by researchers on deficiencies in the learning process. Findings in the form of excess or things that are considered good to be maintained, while failures need to be corrected. The successes and failures in the first cycle are shown in the Table 7.

Table 6. Recapitulation of outcomes indicators

No	Indicators	Cause of	Solutions
1	Explain how to respect the activities of others in an effort to strengthen unity and unity	There are students who chat that disturb the concentration of other students who are attending the lesson	Teacher guides the learning process of students
2	Types of economic businesses that are self-managed or group	There are students who have not been able to distinguish between types of economic businesses that are managed by themselves or groups.	The teacher guides the learning process of students
3	Identifies objects that can be reused (recycled)	There are students who have not been able to distinguish objects that can be reused or not.	The teacher guides the learning process of students.

Table 7. Successes and failures in the first cycle

Observed indicators	Successful	Failure of	Solutions
Teacher performance	Delivering and explaining learning using thelearning model *Project Based Learning* Directing students to discuss and group heterogeneously Cultivating the enthusiasm and courage of students Reflection on each learning	Directing all students to be actively involved in the learning process. Do not discuss the results of student worksheets lacking the application of the PPA learning model used	The teacher will make student worksheets more interesting. Teachers will assess and discuss the results of student worksheet. Teachers should be able to adjust the learning model PPA in accordance with the learning process
The students Activities	Able to pay attention to the explanationteacher taskin accordance with the procedures Students interested in the use of instructional video media	Is not yet active Students give opinions? Students have not been able to capture the message contained in the reading material. Students have not been able to fully pay attention when the friend presents in front of the class.	The teacher gives a stimulus to students so that students want to be more active in giving opinions. The teacher must use many ways so that student attention is centered back on the ongoing learning. The teacher pays attention to and directs students to pay more attention to the ongoing presentation activities.
Results	From the results of the tests, students were declared to have achieved KKM or completed as many as 16 students with a percentage of 55.54%.	From the results of the tests, students have not been declared to have reached KKM or completed as many as 14 students with a percentage of 55.52%.	Teachers and students must be more serious in each learning process in order to achieve the specified KKM.

Based on the final test value of the first cycle all class V students can be shown in the Table 8. Value of the final cycle i test

Table 8. Value of the final cycle i test

Value of	Number of Students	Percentage	Category
80-100	0	0%	High
60-79	14	43.75%	High Enough
40-59	11	34.37 %	Less High
0-39	17	5.44%	Low
Total	32	100%	

Based on the Table 8, it can be known that the most obtained value obtained by students in the range 60-79 is as many as 14 students categorically quite high. Students who are able to reach the less high category or at the acquisition of 40-59 there are 11 stude nts, while for the non-high category or in the acquisition of indigo 0-39 there are around 7 students. However, no student is capable of achieving grades in the range of 80-100. This shows the indicator of success that has been determined that is 80% of the total students able to reach 80 have not been fulfilled well.

The ability of students' ecoliteracy and creativity has begun to emerge and increased, compared to the pre-study (pretest*)*. However it has not been reached the determined success indicator. In addition to analyzing the things that happened during the learning process and the final test of the first cycle, the teacher also analyzed the results of the interview. The results of interviews to be able to find out the response of students to social studies learning using thelearning model Project Based Learning.

4.   CONCLUSION

Based on the results of research and discussions that have been conducted, it can be concluded that the ecoliteracy and creativity of students in the use of waste in social studies learning in class V of Telajung 02 Cikarang West SDN can be increased by using project based learning model. In this learning, the teacher acts as a facilitator and motivator. So, the main role in the learning process is the students themselves. The teacher must be able to explore students' abilities so that they will see the talents and abilities of students in the learning process.

REFERENCES

[1]   Vargas-Madrazo, E., "Contemplative dialogue as the basis for a transdisciplinary attitude: Ecoliteracy toward an education for human sustainability,"*World Futures*, pp. 1-22, Retrieved form https://doi.org/10.1080/02604027.2018.1444833, 2018.

[2]   Zhang, Z., Hansen, C. T., & Andersen, M. A., "Teaching Power Electronics With a Design-Oriented, Project-Based Learning Method at the Technical University of Denmark," *IEEE Trans. Education*, vol. 59(1), pp. 32-38, Retrieved from http://doi.org/10.1109/ TE.2015.2426674, 2016.

[3]   Asrori, M., "Classroom action research. Bandung," *CV Wacana Prima*, 2012.

[4]   Darmadi, H., "Educational Research Methods. Bandung," *Alfabeta*, 2011.

[5]   Ekawarna, "Classroom action research," *Gaung Persada*, Jakarta, 2011.

[6]   Kemmis, S., & McTaggart, R., "Participatory action research: Communicative action and the public sphere," *Sage Publications Ltd*, 2005.

[7]   Joel L Klein et.al, "Models Of Teaching," *Allyn and Bacon*, Boston, 2016.

[8]   Jones, Ray, Jennifer Petrie, and Audrey Murrell. "Measuring Impact While Making a Difference: A Financial Literacy Service-Learning Project as Participatory Action Research," *Journal of Service-Learning in Higher Education*," vol. 8, 2018.

[9]   Morales, D. P., Castillo, E., Parrilla, L., García, A., & Otín, A., "Towards project-based learning applied to the electronic engineering studies," In Design of Circuits and Integrated Systems (DCIS), 2015 Conference on, pp. 1-5,. *IEEE*, November 2015.

[10] Muliana, A., Maryani, E., & Somantri, L., "Ecoliteracy Level of Student Teachers (Study toward Students of Universitas Syiah Kuala Banda Aceh)," In IOP Conference Series: Earth and Environmental Science, vol. 145(1), pp. 012061, *IOP Publishing*, Retrieved from https://doi.org/10.1088/1755-1315/145/1/012061, April 2018.

[11]   Sari, K. A., Prasetyo, Z. K., & Wibowo, W. S., "Development of science student worksheet based on project based learning model to improve collaboration and communication skills of junior high school student," *Journal of Science Education Research*, vol. 1(1), 2017.

[12] Baş, G., & Beyhab, Ö., "Effects of multiple intelligences supported project-based learning on students' achievement levels and attitudes towards English lesson," *International Electronic Journal of Elementary Education*," vol. 2(3), pp. 365-386, Retrieved from https://www.iejee.com/index.php/IEJEE/article/view/245, 2017.

[13] Alharbi, N. M., Athauda, R. I., & Chiong, R., "Empowering collaboration in project-based learning using a scripted environment: lessons learned from analysing instructors' needs," *Technology, Pedagogy and Education*, vol. 27(3), pp. 381-397, Retrieved from https://doi.org/10.1080/1475939X.2018.1473289 2018.

[14] Alafouzou, A., Lamprinou, D., & Paraskeva, F., "Gamified Project Based Learning Environment for Motivation Improvement," In ECEL 2018 17th European Conference on e-Learning, pp. 10. *Academic Conferences and publishing limited*, November 2018.

[15] Han, S., Capraro, R., & Capraro, M. M., "How science, technology, engineering, and mathematics (STEM) project-based learning (PBL) affects high, middle, and low achievers differently: The impact of student factors on achievement," *International Journal of Science and Mathematics Education*, vol. 13(5), pp. 1089-1113, Retrieved from https://doi.org/10.1007/s10763-014-9526-0, 2015.

[16] Duffield, S., & Whitty, S. J., "Developing a systemic lessons learned knowledge model for organisational learning through projects," *International journal of project management*, vol. 33(2), pp. 311-324. https://doi.org/10.1016/j.ijproman.2014.07.004, 2015.

[17] Craft, A. M., & Capraro, R. M., "Science, Technology, Engineering, and Mathematics Project-Based Learning: Merging Rigor and Relevance to Increase Student Engagement," *Electronic International Journal of Education, Arts, and Science (EIJEAS)*, vol. 3(6), Retrieved from http://www.eijeas.com/index.php/EIJEAS/article/view/110/108, 2017.

[18] Mutmainah, R., "The Effect of Project Based Learning on the Achievement of Basic Sewing Technology Competencies at SMK N 6 Yogyakarta," *E-Journal of Clothing Engineering Education -s1*, vol. 5(3), 2016.

[19] Rochman, C., & Majid, A., "Scientific Approach in Curriculum Implementation 2013," *Bandung: Rosda karya*, 2014.

[20] Desfandi, M., & Maryani, E., "Building Ecoliteracy Through Adiwiyata Program (Study at Adiwiyata School in Banda Aceh)," *The Indonesian Journal of Geography*, vol. 49(1), pp. 51, 2017.

[21] Kahn, R., & Kahn, R. V.,"Critical pedagogy, ecoliteracy, & planetary crisis: The ecopedagogy movement," vol. 359, *Peter Lang*, 2010.

[22] Vargas-Madrazo, E.,"Contemplative dialogue as the basis for a transdisciplinary attitude: Ecoliteracy toward an education for human sustainability," *World Futures*, pp. 1-22, retrieved from https://doi.org/10.1080/02604027.2018.1444833, 2018.

[23] Muliana, A., Maryani, E., & Somantri, L., "Ecoliteracy Level of Student Teachers (Study toward Students of Universitas Syiah Kuala Banda Aceh)," In IOP Conference Series: Earth and Environmental Science, vol. 145(1), pp. 012061, *IOP Publishing*, https://doi.org/10.1088/1755-1315/145/1/012061, April 2018.

[24] Roth,C.E., (2012). Environmental Literacy: Its Roots, Evolution and Directions in the 1990s. Columbus, OH: ERIC Clearinghouse for Science, Mathematics and Environmental Education

[25] McBride, B. B., Brewer, C. A., Berkowitz, A. R., & Borrie, W. T., "Environmental literacy, ecological literacy, ecoliteracy: What do we mean and how did we get here?," *Ecosphere*, vol. 4(5), pp. 1-20. https://doi.org/10.1890/ES13-00075.1, 2013.

[26] McBeth, W., & Volk, T. L., "The national environmental literacy project: A baseline study of middle grade students in the United States, "*The Journal of Environmental Education*," vol. 41(1), pp. 55-67. https://doi.org/10.1080/00958960903210031, 2010.

[27] Orr, D. W., "Ecological literacy: Education and the transition to a postmodern world," *Suny Press Orr* 1992, 2012.

[28] Pe'er, S., Goldman, D., & Yavetz, B., "Environmental literacy in teacher training: Attitudes, knowledge, and environmental behavior of beginning students," *The Journal of Environmental Education*," vol. 39(1), pp. 45-59, Retrieved from https://doi.org/10.3200/JOEE.39.1.45-59, 2007.

[29] Pilgrim, S., Smith, D., & Pretty, J., "A cross-regional assessment of the factors affecting ecoliteracy: implications for policy and practice," *Ecological Applications*," vol. 17(6), pp. 1742-1751, Retrieved from https://doi.org/10.1890/06-1358.1

[30] Pitman, S. D., Daniels, C. B., & Sutton, P. C., "Characteristics associated with high and low levels of ecological literacy in a western society," *International Journal of Sustainable Development & World Ecology*," vol. 25(3), pp. 227-237. https://doi.org/10.1080/13504509.2017.1384412, 2018.

[31] Surata, S. P. K., Vipriyanti, N. U., & Falk, I., "Social network analysis for assessing social capital in biosecurity ecoliteracy," *Jurnal Ilmu Pendidikan Universitas Negeri Malang*, vol. 17(3), 2016.

[32] Goleman, D., Bennett, L., & Barlow, Z., "Ecoliterate: How educators are cultivating emotional, social, and ecological intelligence," *John Wiley & Sons*, 2012.

[33] Santrock, J. W., "Essentials of life-span development," *McGraw-Hill*, 2014.

[34] Tynan, J., & New, C., "Creativity and Conflict: How theory and practice shape student identities in design education," *Arts and Humanities in Higher Education*, vol. 8(3), pp. 295-308. https://doi.org/10.1177/1474022209339959, 2009.

[35] Meng, H., Cheng, Z. C., & Guo, T. C., "Positive team atmosphere mediates the impact of authentic leadership on subordinate creativity," *Social Behavior and Personality: an international journal*," vol. 44(3), pp. 355-368. https://doi.org/10.2224/sbp.2016.44.3.355, 2016.

[36] Munandar, U.," Creativity and giftedness," Jakarta: *Gramedia Pustaka Utama Munandar*, 2012.

[37] Wycoff, J., "Become Super creative with Mind Mapping,". Bandung: *Kaifa*, 2012.

[38] Akbar, R., Hawadi, R. S. D. W., & Mardi, W., "Creativity," Jakarta: *Grasindo*, 2011.

[39] Liu, D., Gong, Y., Zhou, J., & Huang, J. C., "Human resource systems, employee creativity, and firm innovation: The moderating role of firm ownership," *Academy of Management Journal*, vol. 60(3), pp. 1164-1188, 2017.

[40] Setyowati, R., & Fimansyah, W., "Efforts to Improve the Meaning of Social Studies Learning in Indonesia," *PIPSI Journal (Journal of Indonesian IPS Education)*, vol. 3(1), pp. 14-17. 2018.

[41] Speklé, R. F., van Elten, H. J., & Widener, S. K., "Creativity and Control: A Paradox-Evidence from the Levers of Control Framework," *Behavioral Research in Accounting*, vol. 29(2), pp. 73-96, https://doi.org/10.2308/bria-51759, 2017

[42] Stone, M. K., "Ecoliteracy and Schooling for Sustainability," In *EarthEd*, pp. 35-47. Island Press, https://doi.org/10.5822/978-1-61091-843-5_3, Washington DC, 2017.

[43] Wardani. I.G.A.K; Wihardit.K; & Nasoetion, N., "Classroom action research," *Pusat Penerbitan Universitas Terbuka*, 2002.