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Conceptualization of Ecology Basic Concept by the Application of Outdoor Learning – School Ground

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***Abstract*—This study was intended to identify student conceptualization about basic concept of ecology by outdoor learning with school ground as media This was conducted by mix method that included to quantitative experiment and qualitative by analyzing student answers. The sample encompassed 63tenth grade students of SMA N 1 Wampu. T test, rubrics and worksheet was employed to analyze student answers. Based on t-test of essay question, student who nurtured with outdoor learning – school ground was significantly different in conceptualization ability compared with direct instruction class. The concepts of ecology; interaction between abiotic and biotic factor & environmental knowledge is better learned by outdoor learning; the possibility of misconception less considered in symbiotic interaction and student interaction that are better observed in outdoor learning class than in another class**

Keywords - outdoor learning, ecology, student conceptualization

I. INTRODUCTION

Ecology has been recognized as one of the most important and difficult to learn the concepts in biology curriculum [8]. Ecology is a complex learning matter included to individual organism, physical environment and interaction among organism and between organism and environment. An empirical study that revealed even after instruction, student showed difficulties in learning important concept of ecology [9].

Ecology learning with ecosystem matter in rural school generally learned conventionally that teacher instructed the concept, administered assignment and ended by test as evaluation. This learning activity was obviously ineffective to facilitate student in developing their thinking and building the concept particularly ecology.[1] argued that assignment was less effective for student in employing their scientific idea to comprehend their activity and reflect the data that had been gathered. Beside teacher centered learning, student was also depended on text book so much as the one and only learning resource. While student posed by a question about vary of ecosystem formation, they responded by mentioning tropical rain forest, tundra, savanna and etc as an information repetition. This an example occurrence revealed that student had weak conceptualization about ecology. Unfortunately, having students transfer such as making concept what they have learned to new scenarios that draw on the same principles has proven surprisingly difficult to achieve [6]. Thus, an appropriate methodology and enrich resource that bring student to the real observation with real object was suggested to improve their ecosystem conceptualization

Some observation in a rural school has adequate biodiversity included to wild vegetations. This spot is potential for natural media in learning ecology. Besides, school ground is much popular and every day visited by student. [4]stated the learning process will be more effective if student was not participated in novice place for visit and related with daily living. A research by [5] suggests that learning biology in an outdoor environment has a positive cognitive impact. [12]discovered that student effectively learned about general concept of ecology by making an exploration on watersheds and daily living related with. So, integrating real life resource will make the learning become easier.

School ground is an example of real ecosystem where student able to develop their conceptualization about ecology. Nowadays, environmental knowledge was very integrated with ecology learning. Nevertheless, some concepts of basic ecology learned by outdoor learning were less concerned, while it was very particular to construct sophisticated understanding about more difficult concept of ecology and environmental knowledge in higher level of school. More, the effect of outdoor learning on student conceptualization was less discussed. The findings will benefit teacher to determine concepts of

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ecology that fit with outdoor learning and suggest vary ways in delivering ecology especially in rural school.

II. METHODOLOGY

A. Setting and Participant

This study was conducted in SMA Negeri 1 Wampu that situated on Langkat District of North Sumatera Indonesia. The location was surrounded by palm oil and rubber agricultural enterprises. Besides, it has naked space in behind of the schoolthat somehow neglected because of yet inbuilt where wild shrubs and herbs well growth. This study took five lessons implementation. The population was entire (100 students) of grade ten. Research samples included to X-1 consisted of 31 pupils (16 boys and 15 girls) for experiment class and X-2 encompassed 32 pupils (15 boys and 17 girls) for control one. Purposive sampling was taken based on learning capability that was classically similar.

B. Design and Procedure

This study is mix research included to quantitative and qualitative investigation [10],[3]. Quantitative measurement consisted of two variables experimental study which is place based outdoor learning with school ground as experiment class and directed instruction as control one as dependent variable; and student conceptualization of ecology as independent variable. Qualitative measured by worksheet to investigate student capability in construct concept on their answer of essay posttest. Basic concepts of ecology extended into learning indicators.

Fig. 1 introduced the phases of research. In common, this step consisted of planning, implementation and discussion. Planning phase used

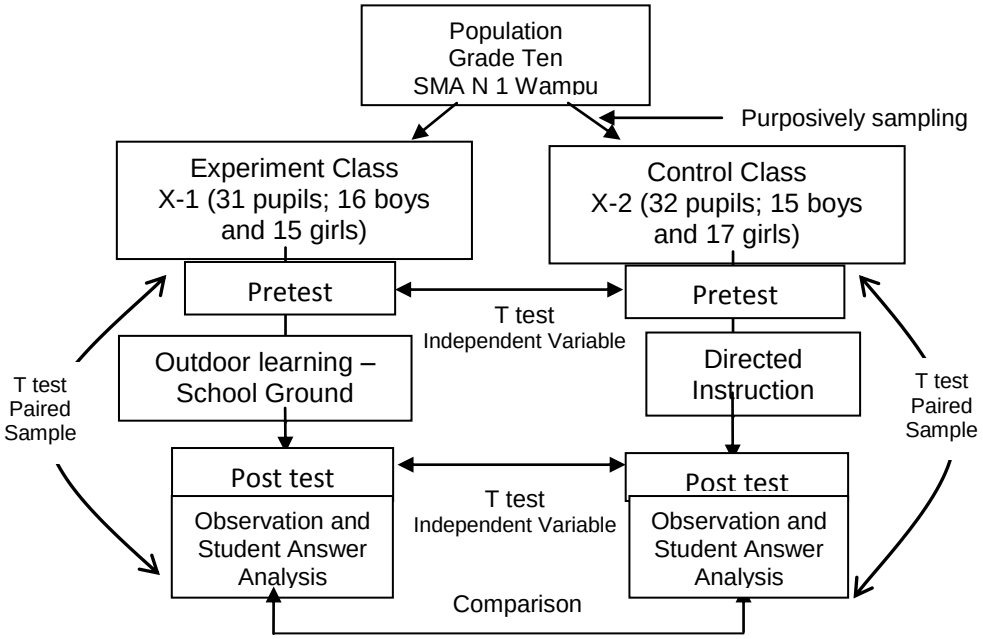

Fig 1. Research Design

to class identification for sampling. It was followed by implementation of learning with outdoor activities and directed instruction. The discussion was begun by data collecting either quantitative or qualitative before analyzing and generating conclusion. Control class implemented by directed learning while another was outdoor learning – school ground

C. Data Collecting

Essay of ecology basic concept with five validated question was employed. They are expanded into tropical level function on food chain [3], mutual biotic interaction and interrelationship between abiotic and biotic factor [2], matter cycle and the fundamental understanding of environment [3]. It was administered in the beginning and the end of the lesson with similar randomized questions of each consisted of Tropical level on food web; Mutual interrelationship between abiotic and biotic factor; Mutual biotic interaction; Carbon cycle and Fundamental understanding of environment. Student conceptualization was evaluated by worksheet based on learning indicators. Affective was grade by affective rubric (observation sheet). Guided inquiry learning was integrated with outdoor learning and school ground ecosystem as the media. Learning tools, poster and work report also applied for student while text book and student note book used to direct the instruction in class.

D. Data Analysis

Quantitative data encompassed analysis of each essay question answer in pretest and posttest. T test applied to identify the significance differentiation of student conceptualization about ecology before and after nurtured for each treatment. SPSS Statistics 17.0 assisted statistical analysis.

III. RESULT

A. Student Ecology Conceptualization(Achievement)

T test (table 2) introduced that student capability of both class was initially insignificantly different (t_{Pre} = 0.352 > α = 0.05) with acceptance area 1.767 and t = -0.938. In contrary, posttest student who learned in outdoor was significantly different with indoor that t_{post}=0.045 < α =0.05, acceptance area was 0.714 and t = - 2,043. Control class mean was 8.38±3.791 and 10.29±3.644 for another class. It actually described student learn basic ecology with outdoor learning – school ground better than classroom directed learning.

Table 2. The comparison of student achievement before and after nurtured by both learning

	F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Pretest	1.767	.189	-.938	61	.352 (a)	-.691	.736
			-.939	60.80	.351	-.691	.735
Posttest	.714	.401	-2.043	61	.045 (b)	-1.915	.937
			-2.045	60.997	.045	-1.915	.937

In general, t paired-test revealed student conceptualization before and after learned by either directed instruction or outdoor learning were significantly different with $t_0 = t_1 = 0.000 < \alpha = 0.05$. The concept of tropical level on food web and biotic interrelationship was significantly improved after treatment with $t_0 = t_1 = 0.000 < \alpha = 0.05$. Matter cycle concept also significantly increased with t_0=0.044<α = 0.05 for directed instruction classroom and insignificantly improved for another class with t_1= 0.071 > α = 0.05. Either mutual interaction between biotic and abiotic factor or the fundamental of environmental knowledge were not significantly different in control class with t_0 = 0.292 > α = 0.05 and t_0 = 0.103 > α = 0.05 respectively. In another hand, they were better achieved by experiment class as t_1= 0.001 < α = 0.05 of each. Fig. 2 describes the comparison of student capability in two classes. Some concept was not significantly different in two class including to tropical level on food web, mutual biotic interaction and matter cycle as t_{Post-1} = 0.710 > α = 0.05, t_{post-3} = 0.498 > α = 0.05) and t_{Post-4} = 0.243 > α = 0.05. However, the rest two concept was actually significant in difference with t_{post-2} =0.005 < α = 0.05 for interaction betweenabiotic and biotic factors and t_{post-5} = 0.002 < α = 0.05 for environmental knowledge.

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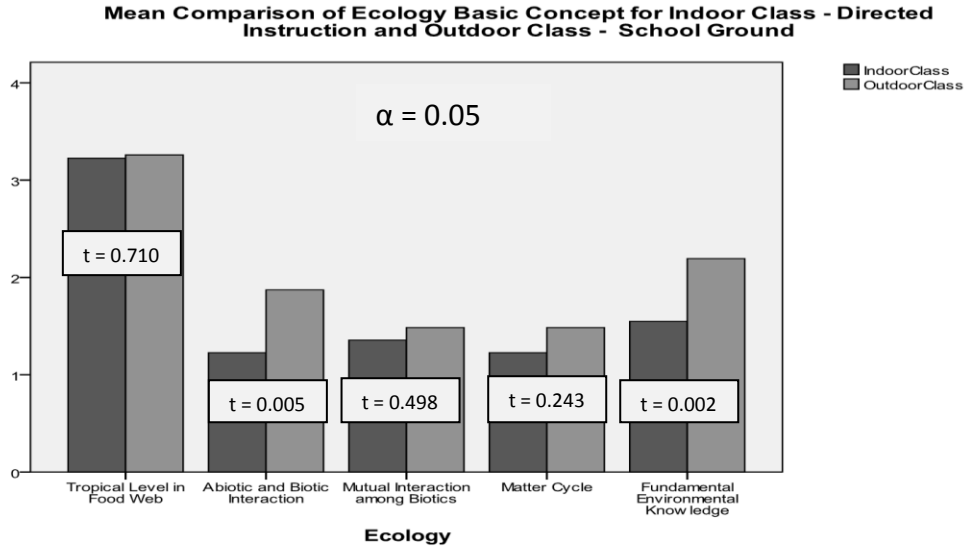

Fig 2. Student achievement after nurturing for both classes

The concept of tropical level on food web was statistically described insignificantly different between both classes. In other words, this concept was well achieved by two classes. It was obviously that most of student classified plants into procedures, herbivores to primer consumers and carnivores to secondary consumers. Next, mutual interaction between biotic and abiotic factor was one of two concepts better learned by outdoor learning. Student integrated the role sunlight as abiotic factor for photosynthesis of plants as procedures for increasing the number

IV. DISCUSSION

The main finding in this study is the student capability in generating conceptualization about basic ecology by enrolled in outdoor learning with school ground in rural. Constructing graph in determining species density of school ground ecosystem proved that outdoor learning provided mathematical basic skill development [5]besides observation skill that was particular for inquiry of biological learning.They also related a concept to others by designing their own product of comprehending process e.g. capability in food chain design based on real observation and with real live animal observed and was distinct with indoor student who only repeated the concept from textbook by integrated book famous animal in food chain construction.[11]stated that the indoor studentregardless food webs as meaningful learning to the same extent as the outdoor class, though both classes showed a good understanding of the concept as revealed in their answers to the written question.

Outdoor student developed original ways in constructing the concept based on their visualization particularly for concept mutual interaction of biotic and abiotic factors. They involved outer performance of plants (morphology) as a parametric the interaction which was easily visualized to determine the causal effect of abiotic existence influenced the biotic presence and growth. Student with outdoor learning has better achieved in concept that integrated the role of abiotic factors or environmental issues. Both the interaction between biotic and abiotic factors and fundamental knowledge of environment concepts better learned rather than another class. Though biotic interaction was classically well done by directed instruction class, they did more misconception in the end of learning. Some particular concepts of symbiosis mutualism, parasitism and commensalism as well as decomposition were misunderstood by indoor students. Integrating ecosystem roles as particular solution of environmental problem initiated student awareness about their environment by previously understood the function of each component and the effect of ecosystem absence in an area thought it need to be proven by further studies. These occurrences strengthened [7] note that outdoor activity assists student to clarify ecology concept and direct participation in forming vary of attitude in determining ecosystem.

Concept formation or simply as conceptualization defined as one of transfer ways of learning except to knowledge representation, analogical reasoning, generalization and embodied cognition [4]. Outdoor learning facilitated student conceptualization of basic ecology concept included to graphing species density qualitatively, generating real food chain, describing either biotic and abiotic interaction or mutual biotic interaction (symbiosis) and creating potential solution for environmental problem. It also enrolled student in mastery those concepts encompassed to tropical level on food webs, abiotic and biotic interaction, mutual biotic interaction and fundamental knowledge of environment. Nevertheless, matter cycle was probably difficult concept to learn by outdoor learning. Student figured out it was not easy to imagine the matter cycle that probably occurred in real ecosystem. Student of indoor had more gained score in mastery the concept of matter cycle. Considering developed media and longer term student integration in outdoor learning are probably potential to followed concerns.

V. CONCLUSION

Outdoor learning with school ground enhanced student conceptualization about basic concept ecology particularly for food webs, abiotic and biotic interaction, mutual biotic interaction and fundamental knowledge of environment concept. Further, it also minimized misidentification particularly for biotic symbiosis interaction and had more learning interaction in gathering data with real object observed. Either tropical level on food web or mutual biotic interrelationship concept adequately learned by indoor but outdoor student has better experienced process of learning. Matter cycle need to improve by other innovation of learning by considering developed media and longer term student integration in outdoor learning are probably potential to followed concerns. Outdoor learning with school ground application is worth to implement in particularly rural school that has “naked space” and minimum learning facilities especially for ecology. Outdoor class built student conception in biotic and abiotic interaction and environmental knowledge concept better than directed instruction indoor class. It will be initial process for beginning real actualization for environmental awareness in their daily living both in school and homeland.

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