



THE INFLUENCE OF FIELD TRIP ON JUNIOR HIGH SCHOOL STUDENTS' NATURALISTIC INTELLIGENCE AND PROBLEM-SOLVING SKILLS IN ECOSYSTEM SUBJECT**Y. H. Adisendjaja*¹, M. M. K. Abdi², Amprasto³, I. Fardhani⁴**^{1,2,3}Biology Department Education, Faculty of Mathematics and Natural Science Education, Indonesia University of Education⁴Department of Sustainable Resources Science, Graduate School of Bioresources, Mie University Japan**DOI: 10.15294/jpii.v8i3.19532**Accepted: May 18th, 2019. Approved: September 28th, 2019. Published: September 30th, 2019**ABSTRACT**

Naturalistic intelligence is a part of multiple intelligences, while problem-solving skills are part of higher-order thinking. Both are learning outcomes required to be developed and improved since these competences were considered poor in Indonesia. Field trip is a learning method that can encourage students to interact directly with the real object in nature. That learning method is expected to improve students' naturalistic intelligence and problem-solving skills. In this case, this research was conducted to discover the influence of field trip on students' naturalistic intelligence and problem-solving skills. This research was an experimental research using pre-test and post-test design. The eighth-graders of Islamic school (Madrasah Tsanawiyah) Pameungpeuk, Garut, year of 2017/2018 were employed as the respondents. The obtained data were analysed using the average comparison tests, which were t-test (for parametric data) and Wilcoxon test (for nonparametric data) with α value of 0.05. Based on the analysis, there was a significant difference of students' natural intelligence with the sign value of 00,05. These results were supported by the percentage of the affective aspect questionnaire in naturalistic intelligence. In problem-solving skills analysis, the test score revealed a significant difference with sign value of 0.025 even though the results of the questionnaire only showed a slight difference. Therefore, it was concluded that field trip influenced students' naturalistic intelligence, however, it had no influence on the affective aspect of problem-solving skills, and conversely it influenced the cognitive aspect of problem-solving skills. Field trip is potential to be an alternative method for teacher in junior high school to improve naturalistic intelligence and problem-solving skills applied in ecosystem subject.

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Keywords: field trip, naturalistic intelligence, problem-solving skills

INTRODUCTION

Learning is a process of establishing concept in order to create a complete understanding and a positive mind-set (Sukaesih & Alimah, 2012). In this case, the objective of learning is to achieve positive outcomes. The expected out-

comes can be achieved by improving students' intelligence. Not only verbal, logical, and mathematical, naturalistic intelligence is also important to be nurtured (Lavie & Tal, 2017). The naturalistic intelligence is developed, encouraged and utilized in approaches that related to nature (Pearson, 2011). The previous studies on naturalistic intelligence of kindergarten and primary students have been conducted (Juniarti, 2015; Yunisari et

***Correspondence Address**

E-mail: e-mail: ayusufhilmilmi@upi.edu

al., 2016, and Rochmah, 2016) and also on junior high school students (Emiyati, 2014). Those studies are also related to field trip topics. However, most results showed that naturalistic was in poor category. In this research, field trip is an independent variable for naturalistic intelligence. Gardner (2006) stated that “people are born with a certain amount of intelligence”, which means that a child born with a particular potency to be developed. Children have chances to improve their intelligence in many aspects. It was further explained that intelligence develops according to each individual environment (Ali, 2015). Therefore, learning as an environment needs to develop students’ various potencies for intelligence.

Naturalistic intelligence is one of the most important multiple intelligences that have to be developed, but in reality, its development is still lacking and not measured adequately in the learning process (Tirri et al., 2013). This phenomenon also occurs in Indonesia where naturalistic intelligence is poor (Emmiyati et al., 2014; Juniarti, 2015, Yunisari et al., 2016) Although many studies were conducted to find the method to improve it most of them were only examining the students of kindergarten and primary school (Juniarti (2015), Yunisari et al.(2016), and Rocmah (2016)). There were very few studies investigating naturalistic intelligence of junior high school students. Besides, Emmiyati *et al.*(2014) proved that junior high school students’ naturalistic intelligence were still low by comparing to other type of intelligences. In addition, only 10% of the sample showed high naturalistic intelligence (Emmiyati et al., 2014) despite this type of intelligence has an important role for the brain, which is reinforcing the development of left and right brain and other activities that require intelligence (Fleer & Van Oers, 2017). The low naturalistic intelligence level was caused by the Indonesian education system that generalized all students’ intelligence with only mathematical logic as the parameter (Chatib, 2011). Moreover, it was also caused by learning about nature was solely from textbooks (Uno, 2008).

In addition to naturalistic intelligence, the problem-solving skills are also important to master. This is a high-level skill in science, but in Indonesian students’ case, this skill is still considered unimportant and lacking. It was proven by The Third International Mathematics and Science Study (TIMSS) in 2015 that Indonesia was in the 44 positions from 47 countries (Martin et al., 2012). It was further explained that it was caused by the lack of problem-solving skills. This reality has to be improved as it is important, not only for

education, but also for students to solve the problem that they face in everyday life. Students were necessary to be trained to solve learning problem in order that they can also solve everyday problems (Aka et al., 2010).

By considering the type of skills that were studied, ecosystem was chosen as the right subject to observe the influence of the skills. The ecosystem is a subject that has a strong relationship with nature as it discusses the interaction between living beings and its environment and discusses the balance of nature (Zaragoza & Fraser, 2015). Based on the standard competition (KD, *Kompetensi Dasar*) implemented by the government, ecosystem subject is relevant with the objectives of the learning as stated by KD 3.18, “analyzing the balance of nature theories” and KD 4.18, “coming up with a solution to solve environmental problems based on ecological balance principle” (Mendikbud, 2016). There were potencies to improve naturalistic intelligence and problem-solving skills to solve environmental problems based on ecological balance principle.

According to the discussion above, we need a method that offers students’ chances to interact directly with nature in order to improve their naturalistic intelligence and problem-solving skills. A method that may accommodate these necessities is field trip.

Field trip is activity-based learning which offers opportunity for students to get first-hand information on things in order to concretize their learning experience (Estawul et al., 2016). This is a flexible method as it can take a wide range of configurations, which may include mixtures of venues, pedagogical approaches, and learning goals (National Research Council, 2009). This method was regarded as an important features of the United States’ education system (Whitesell, 2016). In this case, the field trip was deemed as the right method to improve the aspects of naturalistic intelligence and problem-solving skills. Research in this topic, thus, was necessary to observe its influence on junior high school students’ naturalistic intelligence and problem-solving skills. Through field trip, students will get the first-hand experience and find the real problem in nature. Nature provides many information that help students to find and problems to solve. Field trip improve naturalistic intelligence by detailed observation to see pattern, to identify category and to collect information so these competencies will support problem-solving skills (Fleer & Van Oers, 2017). One who has ability in field trip will get high observation competency and in the end will master problem-solving skills (Lavie & Tal,

2017). Therefore, this research aimed to find out the influence of field trip on junior high school students’ naturalistic intelligence and problem-solving skills in ecosystem concept.

METHODS

The researcher employed quasi-experimental method since both control and experimental groups were not chosen entirely randomly (Creswell, 2010). The research object consisted of two groups, which were the first group (group a) as the experimental group and the second group (group b) as the control group where each group consisted of 15 students. The experimental group experienced a field trip as the learning method while control group experienced discussion as the learning method. In addition, this research also adopted pre-test and post-test group design (Creswell, 2010) where several instruments were used, including question items, questionnaire, and students’ observation sheet. The multiple choice and essay tests were taken to assess students’ understanding of ecosystem.

The questionnaire was intended to observe students’ naturalistic intelligence and problem-solving skills with affective aspect before and after giving the treatment. On the other hand, the written test was given to investigate students’ naturalistic intelligence and problem-solving skills with cognitive aspect before and after giving the treatment. After obtaining the answers, pre-test and post-test result with the observation sheet were acquired. The data from each of the instrument was analyzed differently.

Test Instrument

Pre-test and post-test results were calculated to obtain students’ score using the following formula:

$$\text{Student's score} = \frac{\text{Obtained score}}{\text{Maximum score}} \times 100$$

Then, the results were tested statistically to reveal the mean differences. Before comparing the means, the prerequisite test was taken beforehand. This test was conducted to determine whether the test would be taken parametric or non-parametric in the form of normality and homogeneity tests (Sheskin, 2003, Ginns et al., 2019). Normality test was taken to observe the data distribution (normal or not). On the other hand, the homogeneity test was taken to observe the similarity between the distributed data variances. After the prerequisite test, it was conducted a hypothesis test to examine the differences bet-

ween naturalistic intelligence and problem-solving skills between the experimental group and the control group on the ecosystem subject after giving the treatment. Based on the prerequisite test, to compare both groups, one of the following comparison tests was taken, i.e., Parametric test for normal and homogenous data (t-test). This test is used to compare the means between those groups. On the other hand, the non-parametric test is used to test non homogenous data and unusual data (Wilcoxon test). It is used to compare the median of both groups to observe the differences.

Questionnaire

Questionnaire result was tabulated from each of the items and it was compared using a particular calculation, resulting in percentage data. Then, the data of both groups were compared (Sullivan & Artino, 2013). In accordance with the questionnaire type, Edwards (1957) suggested Likert’s scale to be used. The calculation was elaborated in “A Technique For The Measurement Of Attitudes” book by Likert (1932).

Students’ Observation Sheet

During the learning activity, observable activities related to naturalistic intelligence and problem solving were recorded. In addition, the related data were also obtained to support or to disapprove a statement, supported by scientific research (if any).

RESULTS AND DISCUSSION

Naturalistic Intelligence

Naturalistic intelligence in affective aspect was measured by a questionnaire with 12 question items. The results of both groups were compared where the pre-test and post-test calculation results can be seen in Table 1.

Table 1. Questionnaire Data Recapitulation of Naturalistic Intelligence

Question- naire Result	Pre-test		Post-test	
	Experi- mental	Con- trol	Experi- mental	Con- trol
VH	25%	42%	83%	67%
H	67%	58%	16%	33%
L	8%	0%	0%	0%
VL	0%	0%	0%	0%

Information

VH : Very High, H : High, L : Low, VL: Very Low

The table above shows the pre-test result where 25% of the experimental group was categorized very high, 67% of the experimental group was high, and 8% of the experimental group was low while 42% of the control group was very high and 58% of the control group was high. After giving the treatment, the result shows that 83% of the experimental group was categorized very high and 16% of the experimental group was high while only 67% of the control group was categorized very high and 32% of the control group was high. The finding revealed that both groups experienced significant change.

Thus, based on the findings, it can be summarized that in the affective aspect, field trip could improve students' naturalistic intelligence. It was due to the field trip provided students with chances to experience various events. During the activities, students were offered a new environment that cannot be found in a classroom which more motivated them in learning. According to Habiby & Wangid (2013), motivation in an internal factor driving students to be ready and to enjoy a thorough learning process. If students enjoy the field trip, they will be motivated to learn more and it will also develop sensitivity to know more about a learning topic, in this case, the ecosystem. Not only knowledge, but field trip also reached their awareness as it had been implemented by the second-graders of Pameungpeuk Islamic school (MT, *Madrasah Tsanawiyah*). If the awareness was being guided toward the environment, students would develop a good attitude toward nature in the form of awareness to preserve nature. The field trip also stimulated students' awareness regarding degraded environment. If they understood about its negativity, students would be more aware and care about such condition (Syaputri, 2018). Field trip was effective as it situated learning and facilitated knowledge transfer, thereby influencing students learning attitude, interest, and motivation (Nadelson & Jordan, 2012).

Unfamiliarity could be minimized by habituation to be active in the field. These students at the age of 9 - 14 should be enthusiastic to be active outside the classroom. Good characteristics also influenced students to enjoy and to get used to nature. Moreover, learning by having great experience would help them to remember it since students could connect their understanding directly with the phenomenon in the field (Harefa, 2013). Also, perceptions of interconnection to nature derived from a field trip may last at least 1 year.

In addition to affective aspect, naturalistic intelligence was also measured in cognitive as-

pect. Pre-test and post-test were used to measure the naturalistic intelligence of both groups. The result can be seen in Table 2.

Table 2. Naturalistic Intelligence Problem Data Recapitulation

Data	Mean	Significance	Information
Experimental	38,26	0,618	No significant difference found
Control Group Pre-test	37,28		
Experimental Group Post-test	66.07	0.012	Significant difference found
Control group post-test	46.75		

Based on the tests, it was found a significant (with level of significance is 0,05) mean difference. The pre-test showed $0.618 > 0,05$ indicating that there was no significant difference between the groups. On the other hand, the post-test result showed $0.012 < 0,05$ indicating there was significant difference between the groups.

In addition, during the learning process, the observation was conducted to obtain additional data showing behaviours that support their naturalistic intelligence development.

Based on the research findings, it can be concluded that students' concept understanding improvement influenced their naturalistic intelligence to improve if the right phenomenon was given and properly guided. The field trip was designed to stimulate students to observe nature phenomenon directly in order for them to find and elaborate the object in real life. In addition, field trip also granted students with a real-life environment, thus they could observe more comprehensively and understand more clearly, which helped their naturalistic intelligence development. This finding was in line with Syaputri (2018), Gandile et al. (2015) and Darmawan & Fadjarajani (2016) who found a similar thing. It can be interpreted that knowledge about the ecosystem, its condition, and the importance of the ecosystem could stimulate students' naturalistic intelligence growth. It is due to by understand something, students' would be bolstered to develop a sense of caring and belonging so that they would be appealed to preserve nature. Showing the phenomenon would encourage students to observe in detail, to make categorization, and to see how nature works in a system. This understanding is one of the methods to develop naturalistic intelligence cognitively. This finding was supported by Prasetyo & Andriani (2009)

and Fleer & Van Oers (2017) who presented similar findings. Based on the description of the affective and cognitive aspects above, naturalistic intelligence was improved significantly. The process that happened in both aspects also had been described above. Thus, it can be concluded that the field trip could improve students' naturalistic intelligence. This finding is similar to Yulianti & Martuti (2014) who found that field trip could improve concern for nature. On the contrary, Japar (2017) argued that there was no significant difference found in the implication of a field trip. He suggested that longer time and better planning were necessary in order to implement the model on the subject with many concepts. It means that better planning could optimize the implementation of a field trip.

A field trip that could improve naturalistic intelligence was the one with good planning and implementation as it was explained by Myers & Jones (2018) who suggested that there were three important phases in a field trip, which were pre-field trip (administration, and instruction), field trip (the role of participants and organizers), and post-field trip (discussion and implementation), and monitoring. The difficulties such as planning and students' management could be handled if it had been thoroughly prepared to mitigate the obstacles (Tal & Morag, 2009). In short, it can be concluded that direct interaction can stimulate the senses of caring and sensitivity and also can improve understanding about the object in detail, which can improve naturalistic intelligence.

Problem-Solving skills

In the investigation of problem-solving skills in the affective domain, the instrument of 18 questionnaire items was distributed. The questionnaire results of both groups were compared and the results of the post-test and pre-test can be seen in Table 3.

Table 3. Affective Questionnaire of Problem Solving Skill Recapitulation

Results	Pre-test		Post-test	
	Experimental	Control	Experimental	Control
VH	0%	0%	16%	0%
H	100%	100%	84%	100%
L	0%	0%	0%	0%
VL	0%	0%	0%	0%

Information:
VH : Very High, H : High, L : Low, VL : Very Low

The results in table 3 obtained from the percentage calculation of students' answers to the questionnaire. Table 3 reveals that control and experimental groups pre-test results were categorized high. After the treatment, 16% of the experimental group categorized very high, while other respondents were still in the high category. However, 100% of the control group was in the high category, yet this case showed that there was no significant change between both groups. There was no significant change between both group, high and very high category, it happened because the students' life was close to nature, and they usually directly interact with nature so they can collect and categorize matter and idea (Siphai et al., 2017). Moreover, Armstrong (2009) stated that the habituation to interact with nature could improve the affective domain and naturalistic intelligence.

Based on the result, the majority of the aspects were not significantly changed. This phenomenon happened because students' skill to reconstruct their way of thinking using the process stated in the instrument. Also, another aspect was the error of the field trip implementation. It happened because the field trip offered various analysis results, which did not stimulate them to analyze the best solution to the problem. This finding is similar to (Amprasto, 2017) who also conducted a field trip research by adopting a problem solving as its primary approach, the field trip can increase the skills of problem-solving. In improving problem-solving skills, students should be habituated to do an activity out of class. They can enjoy learning, interact with others, and become closer to nature. As a result, they will gain more information from the environment.

In addition to the practical aspect, the field trip can improve problem-solving skills. Pre-test and post-test were used to measure both groups — the result presented in Table 4.

Table 4. Problem Solving Skill Data Recapitulation

Data	Mean	Significance	Information
Experimental Group Pre-test	54,36	0.935	No significant difference found
Control Group Pre-test	53,85		
Experimental Group Post-test	70,26	0,025	Significant difference found
Control group post-test	62,05		

There is a significant mean difference based on the test result analysis. The pre-test shows 0.935, indicating that there was no significant difference between the groups; the mean of the experimental group and control group in the pre-test nearly equal were 54,36 and 53,85. On the other hand, the post-test result shows 0.025, indicating there was a significant difference between control and experimental groups. Moreover, students' activity result revealed problem solving-related activity, which supports the result.

Based on the finding, the cognitive aspect was improved significantly. It happened by the fact that students' had a detailed description regarding the matter because they found a subject matter directly and know how to solve it during the field trip. It means that students were more than just observing the object; they also examine the environment. Also, students' causal reasoning skill would also be nurtured by observing a phenomenon directly. This finding is supported by Syaputri (2018) who studied the function of knowledge on polluted environment. More than that, Sunal & Haas (2008) also argued that in a field trip, direct observation of the problem in nature could improve the problem-solving skills. It was assumed because one could perceive the description of the problem clearer, and it was similar to the activity that students were involved in during the field trip.

Based on the analysis of both instruments, it can be concluded that in the cognitive aspect, field trip could improve students' naturalistic intelligence, which was proven by the instrument showing a significant result. During the field trip, students can observe the environment directly so that they could take real pictures, which helped them in improving their understanding of the problems, the causality, and the analysis. Dourado&Leite (2013) also found a similar finding, stated that field trip could improve problem-solving skills. This finding based on a case study of the field trip, which is more real, providing students' with more detailed observation and helped them to be better in concluding. It is supported by Whimbey et al. (2013) who studied the advantages and disadvantages of a field trip. The conclusion of the study was a field trip could improve problem-solving skills, which similar to the case study.

It was found that the effective aspect did not show any influence. It may be caused by the treatments that were not stimulating enough for them. Besides, the change in the cognitive aspect may also be influenced. Thus, it can be concluded that longer and continuous treatment might be

necessary in order to improve students' behavior because it is harder than improving their cognitive aspect. Mulyanti & Fachrurrozi (2017) also discovered a similar finding. It was found that in order to influence something, cognitive aspect needs to be changed first and followed by effective aspect because effective aspect was harder to change.

CONCLUSION

In this case, it was revealed that there was no significant change between both groups. In conclusion, the field trip influenced students' naturalistic intelligence. Also, the field trip influenced students' problem-solving skills in the cognitive aspect. In the end, a field trip can become an alternative method for the teacher in junior high school to improve students' naturalistic intelligence and problem-solving skills in ecosystem subject.

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