THE DEVELOPMENT OF INQUIRY BASED-INTEGRATED FIELDTRIP PROGRAM TO ENHANCE SCIENTIFIC ATTITUDE AMONG STUDENTS OF BIOLOGY EDUCATION

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Abstract. This study aims to find a form of integrated fieldtrip program which is effective to develop problem solving ability, scientific attitude and concept mastery among students in Ecology, Invertebrate Zoology, Cryptogamae Botany and Phanerogamae Botany courses. The subjects of this study are some students of Biology Education study program semester VII in a LPTK in Bandung City. This developed integrated fieldtrip integrate some courses among others are: Ecology, Invertebrate Zoology, Cryptogamae Botany, and Phanerogamae Botany courses. In this integrated fieldtrip program, students are equipped with inquiry learning experience. To facilitate it, researcher develop Student Activity Sheet which can guide and direct students to do inquiry in fieldtrip activity. The effectiveness of inquiry based-integrated fieldtrip is evaluated by using written test, performance observation sheet, scientific attitude assessment peer, student working outcome, and video recording of students activity when doing integrated fieldtrip activity. The study result show that: a) the fieldtrip done so far had not been effective and had not organized well, so the aim of fieldtrip had not achieved completely; b) inquiry-based integrated fieldtrip can enhance students' scientific attitude which is seen from indicator score mean of 80.22 which is in high category; Based on the study result above, inquiry based-integrated fieldtrip can enhance problem solving ability, scientific attitude, and concept mastery, and it is proved that it can enhance the quality of lectures effectively and efficiently.

Keywords: Inquiry based-integrated fieldtrip, problem solving ability, scientific attitude

A. INTRODUCTION

Fieldtrip is basic aspect in scientific learning. Scientific learning demand students to master various forms of science process skill. The study result prove the importance of fieldtrip in providing authentic experience to students in NATURAL SCIENCE learning, direct contact with real object, and can stimulate curiosity. Muse, Chiarelott & Davidman (1982) state that:

"The positive benefits derived from field trip were hands-on, real world experiences; quality of education, positive attitudes to science and motivation towards the subject; improvement of the socialization between students, which would impinge on the classroom, and development of rapport between teachers and students; enabling teachers to utilize other learning strategies such as cooperative learning."

From this statement, a conclusion can be drawn that the benefit of fieldtrip is to give real experience to students, develop positive attitude and high motivation toward science, so it will effected on class in the form of rapport between student and lecturer, between students and students because it can be developed into cooperative learning, and it can enhance learning quality.

Inviting students to do learning inside and outside class is considered as a conditioning process toward learning experience which is broader and better (Dickie & Jay, 2010; Jakubowski, 2003; Lee, McGuiggan & Holland, 2010). With fieldtrip , students will use various methods which are indirectly will prove the theory they receive so far in class, so it will invoke the relation between theory and real world to become better (Donovan, Manzin, Savage & Lee, 2010; Govekar & Rishi, 2007). By matching theory and real world, there will be learning experience which demand students to learn actively in developing and deepening their knowledge through problem solving based on critical and concrete experience, and do reflection on learning experience they receive, to be discussed with their friends, so their inquiry ability become more enhanced (Kohl & Kolb, 2006; Lee et al, 2010).

The inquiry skill and problem solving skill is basic ability to be possessed by students as basic to teach science concepts which is suitable with the essence of science itself. Problem solving ability is integral part of science teaching and learning process, both in school and university (Tao, 2001). The importance of problem solving skill for students had been consistently expressed by Bunce, Gabel and Samuel (1991); Bowen and Gardner in Lee & Fensham (1996). Stollberg in his study toward science educators reported that science education should produce good problem solvers (Russel & Chiappetaa, 1981). The current view from inquiry approach is emerged from National Science Education Standards (NSES) (1996). One area in science teaching standard and professional development standard is the development of inquiry based-learning program and science content learning through inquiry. NSES set science curriculum

which involve students actively in science by using inquiry approach. This approach had changed the focus of science education from concept and fact memorization in subject to become inquiry based-learning, further students try to answer to understand and solve a problem (NRC, 1996; NRC, 1999).

Inquiry skill is key element and it is the initial thing which should be possessed to learn science. It is mentioned in research based-curriculum in many countries (French, Conezio & Boynton, 2000). One of development research conducted inCalifornia (German, Brenneman, Macdonald, & Moises, 2009) described that students acquire scientific experience by continuing inquiry and observation, asking question, planning follow-up inquiry, and finally they obtaining finding to collect and interpret information, proposing explanation, and communicating with public (page 53).

This skill build cognitive and social skill which is basic for students in formal education to enhance problem solving ability which is main aim. As for problem solving ability have some components in it, among others are: has problem solving aim which is clear, capable to face obstacles to achieve the aim, use some strategies to solve the problem, apply relevant knowledge and needed social resources, and evaluate its result (DeLoache, Miller and Pierroutsakos, 1998).

The main factor which make learning process become success is that students learn through inquiry process so they can learn with better spirit and comfortable condition (Zemelman, 1998). Students will learn from what they had done and get experience from that thing (Schelecty, 1997). Here, the main role of teachers among others are as facilitator and to broaden students' viewpoint and make the material is understood easily because it can be seen and felt contextually, so it can support students to have scientific attitude completely (Parnell, 1995).

Scientific attitude is an attitude which is expected to be grown in students after they learn Natural Science. Kaur (2013) stated that scientific science is the most important goal in science learning. Scientific attitude helps an individual to develop vision for better life, to make life meaningful and teaches him to do all works systematically. Scientific attitude is like a foundation for all the fields of life so this must be attended (Radhanpu 2013). Opong (1981) stated that scientific attitude is needed in conducting scientific process. As one aspect contained in the essence of Natural Science, scientific attitude has most important position in Natural Science learning. Scientific attitude become one

competition which is absolutely possessed by students when they learn and conduct Natural Science process. Scientific attitude should be possessed by students and it can be curiousity, responsible, honest, open, objective, hard work, careful, discipline, self confident, positive self concept (has positive thinking toward the failure experienced), and interpret the natural phenomena based on scientific principles. This scientific attitude is important to be possessed by students who is learning science, because scientific attitude quality of a student will influence the quality of discovery process, or the steps of discovery done by students.

Based on preliminary study which had been conducted by researcher in some LPTK which have biology education study program, it is found some obstacles among others are: 1) fieldtrip activity still done separately so students' knowledge about the object of biology study is still partial. It is effected on students' learning outcome which is categorized low. The result of field observation in LPTK where the researcher conducted the study show that fieldtrip activity still done separately, the courses organize fieldtrip individually even though they have similar site or location of fieldtrip. From the questionnaire result distributed to students, it is obtained the information that the fieldtrip which is done so far had not been effective both from learning outcome gained and from the cost expended. From the result of interview with lecturers of the course which organize fieldtrip, it is obtained the information fieldtrip activity is done by doing study and sampling the object of study learned, discuss and make practicum activity report. Problem solving ability, scientific attitude and concept mastery of students are still categorized low. The researcher know it from the result of interview with lecturer of the course which organize fieldtrip and from the result of preliminary study by administering problem solving ability test and observation toward students' scientific attitude by using observation sheet of scientific attitude and peers assessment toward scientific attitude.

Integrated fieldtrip which is undertaken in the beach will give opportunity to students to explore biotic factor and non biotic factor of the beach completely and authentically. Patrick (2010) express that: "Fieldtrip is an outdoor or field work or learning exercise undertaken by teachers and students in certain aspects of subjects particularly biology as to give students the opportunity to acquire knowledge."

Fieldtrip can give many opportunities to students to acquire

much knowledge. Hudak (2003) who state that fieldtrip can develop relation between theory and concept students acquire in class with experience students obtain through fieldtrip. Besides, fieldtrip also can enhance and develop students' knowledge (Hudak, 2003; Kisiel, 2006; Mawdsley, 1999; Michie, 1998; Nadelson & Jordan, 2012; Scarce, 1997; Scribner-MacLean & Kennedy, 2007). Fieldtrip can also harness the ability to do observation and perception by using various senses possessed by students (Nabors et al, 2009). Behrendt and Franklin, (2014) mention that fieldtrip can develop students' communication skill. Hofstein and Orion (1991) also mention that fieldtrip can enhance students' problem solving skill.

Fieldtrip generally undertaken separately regarding biotic factor such as flora and fauna as well as regarding non biotic factor, such as temperature, humidity. pH and sanity so it cannot explore environment completely it is difficult when facing complex problems. The element of integration in fieldtrip can enhance the meaningfulness of learning process, because in essence the sciences in this nature are interdependent. Integrated fieldtrip can enhance students' interest and motivation in learning, because fieldtrip can provide experience and opportunity to students to do verification/proving and doing illustration toward information students learn in class, introduce concept and new experience (Prokop, Tuncer and Kvasnicak, 2007; Rennie & McClafferty, 1995). Meanwhile, Anderson, Kisiel & Storkskieck (2006) state that integrated fieldtrip can create learning experience which is very meaningful, because it give students opportunity to acquire hands on experience and opportunity to do observation with various senses integrally and not separately.

Learning done outside class in general, for example visiting museum, science laboratory, zoo, or many another places undoubtedly give emotional effect regarding the level of care and motivation to be involved in the topic learned, in addition it also influence students to explore furthermore the information faced with more specific knowledge. (Priemer & Pawek, 2014; Schwan, Grajal & Lewalter, 2014). The earlier study even had proved that fieldtrip has potential to increase students' interest in science (Singh, 2015; science center; Dairianathan & Subramaniam, 2011; Jarvis & Pell, 2005; university: Gibson & Chase, 2002; Seybold, Braunbeck & Randler, 2014). metacognitive involvement (amusing park/physics: Nielsen. Nashon & Anderson, 2009) and reasoning (Wormald & Pegram. 2015).

Fieldtrip give emotional benefit among others are to increase happiness and joy (Rennie & McClafferty, 1995; Pluth, Boettcher, Nazin, Greenaway & Hartle, 2015), decrease angriness, anxiety, and boredom (Outdoor; Randler, Ilg & Kern 2015); and the enhancement of care attitude (reptile: Wunschmann, Wust-Ackermann, Randler, Vollmer & Itzek-Greulich, 2016). So far science learning did not give enough opportunity for students to do direct contact or "hands-on" with science (Abraham & Reiss, 2012; Blachard et al, 2010; Hart, Mulhall, Berry, Loughran & Gunstone, 2000; Hofstein, Navon, Kipnis & Mamlok-Naaman, 2005). even though "hands-on" has many benefits and will increase students' interest (Swaraf, Ortony & Revelle, 2012). Many researches show that fieldtrip activity still limited to visiting certain objects and only as an enrichment, so the goal of learning which want to be achieved through that activity will become limited, whereas there are many things students obtain from fieldtrip if that activity is managed effectively. There are only few studies on how to undertake integrated fieldtrip in the beach. Besides, this fieldtrip still limited ton verify theory without accompanied by activity in searching relation and integration between one living creature with another living creature and living creature and non living factor existed in their natural habitat.

Based on the problem mentioned in earlier paragraph, then the researcher feel that there is need of development and improvement toward the fieldtrip which has done so far. To improve it, then it needs to develop the inquiry based-integrated fieldtrip which can develop scientific attitude skill among students of biology education.

B. RESEARCH METHOD

This study aims to obtain product in the form of inquiry based-integrated fieldtrip which can enhance scientific attitude in students of biology education. Fieldtrip program is build on the need in field and curriculum analysis in LPTK where the study was conducted. To get the design of fieldtrip program, then the design of fieldtrip program is based on some activities of earlier study. In initial stage, it was done literature study, survey result analysis of problem condition faced by students of biology study program and the demand of competence on students of biology study program. Then for the sake of this study, research and development (R&D) method is used (Brog & Gall, 1998).

This research and development method has four main steps comprising; preliminary study, program draft arrangement, program

development, and program validation. The explanation of four steps is as follow: 1) preliminary study comprising; literature study and field survey; 2) program draft arrangement; formulate the goal of program, set program objective and program components based on the steps of preliminary study; 3) program pilot and development; consider program draft, program pilot, and program draft revision until hypothesis program is obtained; and 4) program validation; program testing among other is in the form of program implementation.

The study is conducted in Department of Biology Education, FKIP, Pasundan University Bandung and for implementation of integrated fieldtrip is located in Karaprak Pangandaran Beach, Ciamis, West Java. The subjects of study are students of Biology Education study program who had finished and who were in Semester VII and had enrolled in Cryptogamae Botany, Phanerogamae Botany, Invertebrate Zoology, and Ecology in Department of Biology Education, FKIP, Pasundan University Bandung. Stage 1 pilot is conducted toward students of even semester, academic year of 2013/2014. As for stage 2 pilot is conducted toward students of odd semester, academic year of 2014/2015 and implementation is conducted in even semester, academic year of 2015/2016.

C. DISCUSSION

Scientific attitude ability is measured through observation sheet of scientific attitude during students undertake integrated fieldtrip. The observation sheet result of students' scientific attitude can be seen in the graphic below:

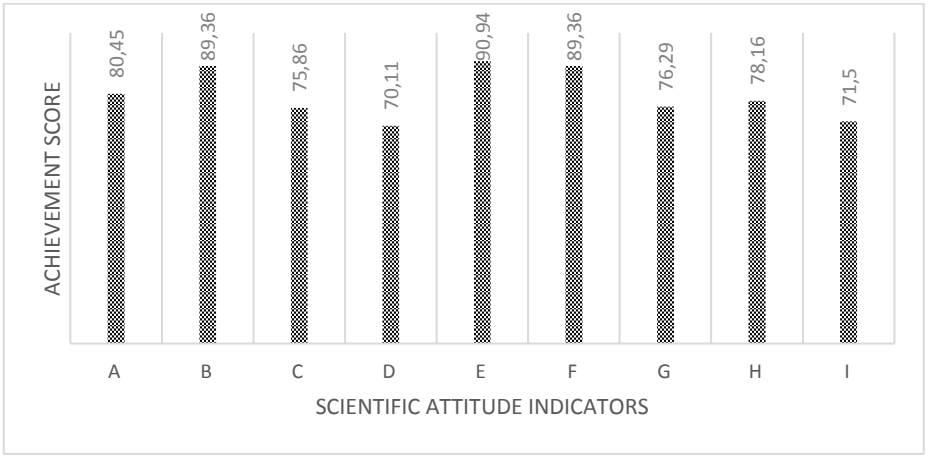

Figure 1. Graphic of Students' Scientific Attitude in Each Indicator

Annotation: A) Curiosity, B) Critical and creative thinking , C) Perseverance attitude, D) Appreciate the proof, E) Honest, F) Objective, G) Willing to change opinion and H) Open minded and capable to cooperate

Curiosity has indicator mean score of 80.45. That score is in high category and it is in accord with result study of Archibald that fieldtrip can increase students' curiosity. (Archibald, 2008; Battiste, 2013; Donald, 2014) and it is supported by result study of Hilmi Demirkaya (2010) who state similar thing, and it is supported also by result study of Farmer et al who state that field research can stimulate students' curiosity, so students are actively to pose question, discuss observation, consider past experience they encounter, or only contemplate the topic which is being learned (Farmer, Knapp & Benton, 2007b; NRC, 2009).

Critical and creative thinking has indicator mean score of 89.36. That score is in high category in which learning with fieldtrip develop toward learning process which is focused on critical thinking, so it will harness students' ability to analyze information received to make right decision. Therefore, developing learning process in order that students have critical thinking ability is very important. Student's new knowledge is not acquired from teacher's narration or old memory, but learning from science method is refer to process that students should search, explore and conduct research with all the things existed surrounding them. It will make students understand and feel the knowledge with its meaningful implication, then students can build their own knowledge resource and keep it in old memory (Yindeesuk and Dachakupt, 2005).

Perseverance has indicator mean score of 75. 86. That score is in high category and it is supported by the opinion of (Dewey, 1973) who state that direct practice based-learning will make praxis pedagogy based-learning which contain reflective inherent activity. It become one form of constructivist learning model so it maximize learning process in depth and collaborative, support building knowledge in learning community in class and functioned as social experience, so their position become more stable and not easily broken.

Appreciating the proof has indicator score mean of 70.11. That score is in medium category. By doing analysis activity in fieldtrip, students' knowledge will be increase and it can enhance achievement and broader experience, so it will invoke the feeling to appreciate the proof which can be proved empirically.

(Hausamann, 2012; Pawek, 2012). Therefore, they will be more interest to learn natural science and the process of inventing that science (Veenville, Rennie, Hanbury & Longnecker, 2013). Thus, they have opportunity to be involved in scientific experiment and with direct involvement they will present authentic activity which will give them high motivation to learn and feeling to appreciate the proof even though it is different from knowledge in general.

Honesty has indicator score mean of 90.94. That score is in high category. The implementation of inquiry learning approach contained in fieldtrip had been very advocated in several last decade (Sanger, 2009) and had been verified that it is suitable to be used inside and outside class in all contexts of study, such as elementary school (Sanger, 2007), secondary school (Lati, Supasorn & Promarak, 2012; Patrick & Urhievwejire, 2012; Pholdee & Supasorn, 2011; Roehrig & Luft, 2004) and university (Green, Elliot & Cummins, 2004). It can enhance students' potency to develop science process skill and higher order cognitive skill which in turn enhance their conceptual understanding and learning achievement. It is not only support students to understand the science concept but also describe how to build their own knowledge through inquiry learning cycle. In addition, fieldtrip is effective to change students to improve their alternative conception than learning which emphasize oriented book, but students' alternative conception and the existing knowledge before learning should be explored. This information can be used in designing inquiry activity which support students to change their alternative conception, which in turn will train their honesty to set forth the concepts which are not suitable between in the book and with what they encounter in field (Balcil, Cakiroglu & Tekkaya, 2006).

Objectivity has indicator score mean of 89.36. That value is in high category. According to Nezvalova (2005) that objectivity score can be developed by fieldtrip because this model create new experience based on earlier experience and reciprocal interaction with environment. It will grow the scheme which enable understanding and new reality which enter their thinking compared with earlier structure. The main base of that statement is that fieldtrip can develop the following: 1) Knowledge is build actively by individual who is learning; 2) Learning can be done individually or socially because sometimes in group and sometimes individually; 3) Learning is auto-regulative process in which each

individual learn with different way and according to its possibility bearing in mind the external condition they encounter; 4) Learning is operation process which enable individual to understand the world. From constructivist view, equilibrium direct to stability and consistency from cognition knowledge system which function to regulate their experience world, which is derived from objective reality. The goal of this learning is to understand the world through their own experience; 5) The reality represent interpretation. The pieces of information absorbed by individual is through their own interpretation and not as the truth about the world completely. The truth they encounter about the world is created by the individual him/herself and it build their own instinct; 6) Learning is social-contextual activity which is developed in environment which stimulate them to learn (Vasutova, 2001).

Wiling to change opinion has indicator score mean of 76.29. That score is in high category. In learning experience, students always set the goal of learning for themselves from their interest and concern, and try to achieve the goal when interacting with their surrounding environment. In fieldtrip including inquiry about the beach, for example, students will set the goal to visit the places, its marine biota, various buffer environment, and various things which influence that marine ecosystem. Besides, this goal is not static during the process of experiential learning, but it can be dynamically lengthened with new thing which is brought by interaction with its surrounding environment, open extension such as learning goal which often encountered in learning/problem solving in daily life they encounter. Before starting fieldtrip, students are expected to set the goal they want to achieve and to decide some places they want to visit to achieve the goal. Then they will make trip planning including the route to visit a place and decide it. During in the trip, students are expected to follow the plan and to visit and interact with the things they encounter and to inquire it they will take a picture and take a note to represent the things they inquire, which shows experience knowledge acquired in the location of fieldtrip. After the trip, they are also expected to present their experience knowledge (Donovan et al, 2010; Jackson, 2014; Webb et al, 2009). Those steps will give stimulus to them about the opinion they believe during that time, because the truth of their opinion they believe had not been proved empirically, so by fieldtrip and empirical proof, they will more

believe the things they encounter and they feel directly.

Open minded and cooperate has indicator score mean of 78.16. That score is in high category; it is positive experience in the case of group work and relation with peers. Students' perception on open- ended question such as question: Please give information about Your relation with local people, various living creatures you encounter during fieldtrip, and another open-ended question, it is analyzed to show the variety of answers. There are some who aware that on one side some students state that local people had showed sincere and friendly behavior, and they had answered interview questions enthusiastically; on the other side, another students state that local people feel ashamed and do not answer the questions directly, because when they conduct observation in the beach, they should also conduct interview with people who are around the beach who familiar with that beach in their daily life. Those activities can increase their self confident, interpersonal skill, and ability to communicate openly and honestly (Donovan et al, 2010; Jackson, 2014; Webb et al, 2009).

Questioning attitude has indicator score mean of 71.5. That score is in medium category. The study conducted by Muralidharan & Sundararaman (2015) state that today, one main goal of education is to develop critical, reflective and creative thinking to give students the abilities they need to become active and autonomous citizen and long life learner. This competence can be achieved through active learning stimulation which involve students, so it invoke various questions. (Zuckerman, Chudinova, and Khavkin, 1998). So far there are very few questions resulted from depth, critical and reflective thinking. It is possible happen because the lack of modeling which involve students to do that thinking. (Galton, Hargreves, Comber, Wall & Pell, 1999). The fieldtrip will invoke thinking which finally resulted in gap between the knowledge they acquire with the reality existed in field, so their curiosity ability will be emerged (Chinn, O'Donnell & Jinks, 2000). According to Zuckerman et al, Galton et al & Chinn et al, fieldtrip will invoke challenging cognitive question, and there is no response which show repetition of what had been stated by teacher before.

From the graphic above, the information is obtained that in general students have scientific attitude after undertaking integrated fieldtrip which is showed by achievement of each scientific attitude indicator measured. From that result study, it can be concluded that integrated fieldtrip followed by students can create

learning experience which can give positive influence to students' scientific attitude. Shakil et al (2011) mention that fieldtrip activity can give positive influence to students' attitude toward science and can increase students' motivation to learn biology object. Kern & Carpenter (1984) say that when students interact with biology object in fieldtrip then it will influence their attitude toward their environment. Fieldtrip is learning activity which can give positive influence to students' affective domain (Patrick, 2010). "Educational fieldtrip are also very helpful in developing the esthetic sense and spiritual satisfaction in students" (Shakil et al). Student interaction with object of biology study when implementing fieldtrip activity will increase students attention to that object moreover that object is the object of students' research. Students attention to that object certainly will influence students' attitude when they learn or handle that object of study.

Students interaction with the object of biology study researched will also influence students' scientific attitude directly and indirectly. Through fieldtrip activity. students' curiosity, creative thinking ability, perseverance, honesty and ability to cooperate will be trained, so it will give positive influence to quality of students' scientific attitude. As for integrative content in fieldtrip will give positive influence to student' scientific attitude. One indicator that students possess scientific attitude is creative thinking ability. The relation between concept of one course with concept in another course in integrated fieldtrip make students easier to pose alternative solutions to a problem faced. Sa'ud and Rukmana (2006) state that integrated learning can develop students' creativity. The integrative content in integrated fieldtrip directly and indirectly influence on another indicator of scientific attitude.

D. CONCLUSION

Integrated fieldtrip program integrate Ecology, Invertebrate Zoology, Cryptogamae Botany, and Phanerogamae Botany courses. The integration of these courses is described from indicator developed. Indicator is developed by paying attention to integration of study content among the integrated courses. This indicator become the basic in developing learning experience in fieldtrip. Fieldtrip experience also developed by integrating inquiry experience. It is intended in order that learning experience can develop some competences needed by students.

Based on the study result, it can be concluded that Inquiry based-integrated fieldtrip can enhance students' scientific attitude which is

seen from indicator score mean of 80.22 which is in high category. Based on the result study above, inquiry based-integrated fieldtrip can enhance students' scientific attitude.

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