



Field Studies in Ecological Science as Curriculum Development and Their Impacts on the Learning Process Quality: The Case of Higher Students

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Abstract. Ecological studies or science is one subject, and it is part of the biological scope. Thus, a subject is not only theoretical but also needs to be practical, which one is field studies. It is part of the learning process in field studies that aims to collect, reveal, and communicate scientifically, which leads to the discovery of novelty. Hence, it is necessary to modify or change the curriculum or learning process type developed and required to create high-quality goals, primarily in their environment. Field studies, as we know, are part of the steps of data collection, chiefly in research activities to answer scientific questions factually or empirically, then evaluated, and it continues to field report with a panel seminar. Hence, observing in-depth personal or group interviews and valuing activities is part of the method in this research, alongside knowing and understanding the learning process type in the framework to personal or group quality increase. The result of this research shows that each of the high school students is still inventing difficult scientific sentences in order to complete the field report, and it's part of one problem that is confronted by the high school students. Besides, there is a weakness in scientific articulation in seminar panel activities. Therefore, it is necessary to implement a curriculum change that is more flexible, humanistic, and dynamic in the learning process. It would also be possible to cope with ecological disturbance on a local to national scale kindly and factually.

Keywords: Biological scope · Curriculum Design · Ecological studies · Field report · Research activities

1 Introduction

Learning from field studies or field trips has an impact on the high student quality process, particularly in critical thinking. Field data in problem-solving dimensions is one of the programs in forming higher student quality [1], alongside being able to adapt and persuade in the midst of social problems related to ecological disturbance. As a result, understanding to higher students in the field is part of steps to increase their sensitivity to environmental or social community change in their surroundings [2, 3], so

ecological learning or field studies or research has many advantages, which are increased awareness and its capability to detect environmental change dynamically, which would contribute to some solution in repairing environmental hazard. Of course, designing a learning process based on field study or research holds a key role of importance in performing to an university student quality in the science aspect and its contribution to policymaking [4, 5]. Of course, it needs to be a long-time process. Hence, building an attitude as a researcher or leading to the quality of educator or researcher achieved is not easy. It has many challenges, but it's a part of opportunities to give shape to do it.

The learning process is a key role of importance in the development of human capital or quality of personality as an educator or researcher, mainly in higher education [6]. There are so many ways to implement it by various methods, one of which is modifying curriculum and teaching methods or ways in which. As a result, creativity is required in developing steps of teaching or curriculum design, so each higher education institution must evaluate and analyze the process to identify weaknesses and excesses in the curriculum, leading to research method quality and scientific output [7]. Hence, field studies or activities have become one way to do it. There are some benefits that field studies can provide, which are attitude change personality to introduce natural behavior in order to more friendly interact with their environment (harmonic of human-nature related process) and so forth, but the most important benefit to field studies is the ability to motivate or inspire the strongest conservation mindset. The developing higher education institution has to do it. The one thing is curriculum aspects to modify to become dynamic, flexible, and adaptive in the transition era, so each person must have the competency to welcome the modern or globalization era. Preparing human capital resources has to be actualized because it is a primary asset to receive challenge era, so each university must be able to design a curriculum that leads to excellent high school students accepting it. Curriculum is one of the purposes of instruments in accompanying high students' lead to confidence and perceptiveness in the transition era. It's also able to make an assessment of environmental risk or hazard with measuring and analyzing kindly, accurately, and continuously to problem-solving products. Therefore, designing a learning process based on field study or research holds a key role of importance to performing to university student quality in the science aspect. Of course, it needs a long time to complete. Building an attitude as a researcher or leading to quality educators is not easy; it has many challenges, but it is a part of the opportunities to shape it. Creating quality human resources as a researcher or educator in the learning process, which is related to written fluently and well based on science of written standards, takes time.

The ecological studies are part of the research that must be conducted as a studied process in learning, which is expected to result in the development of high students who are more adaptive and sensitive to environmental change dynamically [8]. Field studies have many advantages, one of which is all of increasing student quality as educators or researcher goals, so many ways to formulate curriculum that is more tailored to industrial necessity. As a result, field studies expect students to be highly sensitive to the complexities of environmental problems while in the field collecting data, as well as to sharpen capability in developing critical thinking aspects, which is one way to be critical to something becoming of purpose in the learning process, so the factual of the learning process leads to highly critical and confident students. Theoretically or empirically,

ecological science has many meanings, which are more disposed to empirical studies or field studies [6], which are expected to exercise in understanding of phenomena in their surroundings, then to be written up to report the field of research (field report), alongside it can inspire in curriculum developed that is more adaptive and flexible to respond to change dynamically.

Referring to the above paraphrase, this study would be exploring and analyzing how field studies impact high school students in critical thinking or creative thinking perspective on data collection and its field report process based on field data. This would be presented to a seminar panel in the class room in a framework to evaluate field activities. Those activities as challenges and opportunities in the field studies process for high students, particularly in the development of ecological science practices, which is hopeful for science literacy or science outputs (scientific papers).

2 Methods

In general, higher education institutions have many responsibilities in preparing human capital resources for the transition era, in which high students are expected to build scientific arguments or articulation in seminar events (National or International Seminar). One of the problems in the learning process to products or scientific outputs [7] that each of the high student feels they are unable to realize is the writing up of scientific papers or reports based on field studies. That problem has become a challenge for high students and it is necessary to solve it in a way that is more flexible.

Refers to the description above of how to prepare, implement, and evaluate the learning process, particularly how field studies impact scientific papers or technology products based on field data, so understanding and analyzing the learning process from field data results is required to do it. Ecological science is one focused on field studies or activities as long as, especially in the data collecting process in framework to inventory, identify (analysis), and document the field report based on the field data collected by the stratified random sampling methods, which were 100 mdpl–400 mdpl, in which each of the mdpl had ecosystem characteristic differences, which were 100 mdpl (the river areas type)–200 mdpl (farmland and dwelling areas type)–300 mdpl (farmland and grove areas type)–400 mdpl (forest, farmland, and dwelling areas type). Hence, focus group discussion (FGD) is also used for data collection and its part of analysis, which were the people and some of the communities of people that became the field information sources (key sources) in this research.

All of the field data, including observations, interviews, and other results, has to be documented by each of the groups, then it must be converted to a field report type, so its presentation. As a result, the first to last scientific activities (field studies) mentioned have become part of data analysis in this research and are part of research learning to understand how weak or strong data collection is for field report. As a result, evaluating the end learning process (field studies) would be the best option for repairing the ability of advanced students to write up to a scientific paper.

3 Result and Discussion

Field studies based on ecological sciences are one way to understand the environment (change). This would be part of field data that is used for analysis. This is part of a learning process about ecological studies related to landscape, biotic, and abiotic aspects, as well as a social-ecological approach, so elaborating science is one step to understanding and determining environmental conditions dynamically based on field data. According to field data results, each high school student is to write up a scientific report (field report). On the other hand, it is still inventing to the weakness of scientific articulation or arguments, which is one of all the problems that have not been solved yet in each of the higher students, alongside indirectly to stammer, to rigidity, and not to confidence, which has become one attitude that is shown to each of the higher students when it is presented in the seminar panel process, so this is challenging and an opportunity that must be changed [8]. Hence, understanding of weakness to high students in exploring field data problems was one part of the research focus, because it's one of the research interests in finding the cause of high students' inability to do it fluently and kindly. Hence, this research would be based on ecological science and would explore ecological concepts to field studies dynamic [9], chiefly to improve the learning process to scientific output [7].

3.1 Observing and Documenting for Scientific Narration

Ecological science is part of biological studies, which in the learning process done in outbuildings, field research, or studies types developed. According to design research, it's based on stratified random sampling approach and it's based on ecosystem characteristic differences and its elevation, which is based on both observation and documentation results, which could be looked at Table 1, alongside the individual interview method (Fig. 1) that is used to strengthen in inventories to field data as long as, for example, plant species are documented. Was documented and analyzed based on a social-ecological approach. According to Table 1, each high school student must have the ability to understand and apply this understanding comprehensively and critically. That is part of the learning process done by the high school students in the field. The field data has to be understood and its part of the manuscript scientific, so each of the high school students must have a narrative to write up to scientific output (journals or books) kindly and scientifically. These were among the challenges and opportunities for achieving high-quality goals, as was the ability to improve in determining and predicting ecological processes (ecosystems) based on field data. On the other hand, it is also part of high school students' critical thinking and its lead to scientific output.

3.2 Scientific Results from Field Research Activities

According to [10], ecological science has developed and it's indicated to a pivotal instrument that is able to be used in problem solving based on field data or trends in ecological research paradigm, and [6] also revealed that ecological science is the same as field studies, as which it would be curriculum developed and it's the best based on field data, alongside it's part of the learning process in solving problems really for the higher student

Table 1. Plant Species Based on Elevation (mdpl)

Elevation (mdpl)	Ecosystem Type	Plant Species
100	River areas	<i>Bambusoideae</i>
		<i>Musa</i>
		<i>Hibiscus tiliaceus</i>
		<i>Albizia chinensis</i>
		<i>Cocos nucifera</i>
200	Dwelling areas	<i>Psidium guajava</i>
		<i>Manihot esculenta</i>
300	The Grove areas	<i>Arecaceae</i>
		<i>Areca catechu</i>
		<i>Nephelium lappaceum</i>
		<i>Syzygium aqueum</i>
400	Yard and farmland areas	<i>Artocarpus heterophyllus</i>
		<i>Annona muricata</i>
		<i>Cocos nucifera</i>
		<i>Manihot esculenta</i>
		<i>Mangifera indica</i>

Sources: Data Primary, 2020

[9]. Obtaining quality field data is not easy, which depends on how the higher students are able to understand, to document, and to analyze field data (problems) kindly. Then it would be accountable to the public (scientific society) finely and clearly. Those research activities are not easy to realize when it's necessary to experience and critical thinking aspects in obtaining quality data based on field data. Figure 1, shows the data collection process that was done by the higher students in the field, where they tried to identify and document the field data, which was used for analysis and evaluation together with the one of people that were considered to be personages (Fig. 2), in order to better understand or strengthen the field data collected with depth-discussion, in order to make more valid and responsible research. Figure 1 Research Activities Type in Data Collecting Process in the Field.

Developing a critical thinking dimension except for literature review, would be direct observation and in-depth individual interviews in the field. The one step to increasing thoughts is more critical and intellectual nuance development in the learning process [10]. Hence, modifying or changing curriculum development is needed, which is more flexible and dynamic. As a result, this issue has piqued the interest of all parties, particularly higher education institutions, which have a responsibility to prepare students to be more competitive in the face of era transition (globalization and modernization). Creating to the high student of quality, which refers to Fig. 1, may be illustrating how high



Fig. 1. Discussion activities about field data, while to activities in the field. (B) Direct of field observation activities in the field with together. Source: Doc. Kristiyanto, 2019

students attempt to plan, design, and implement when in the field of data collection process as resources to science paper products. In Fig. 1, to show how high school students do activities research in the field of data collected, each high school student tried to make a note of something that has been considered of importance to analysis and discussion in obtaining some information or strengthening scientific arguments in essays or scientific papers (Journals), so it's necessary to field data by direct observation and in-depth individual interviews with intense focus.

Figure 2 Evaluation Process Based on Field Data with the One of Personage

Drought and land use change (conservation areas to economic areas) have been the two main problems confronting the local people up to this point, and this case is an example of the local people attempting to create water conservation development based on their local knowledge. Local people [11] commented that saving traditional water



Fig. 2. Is the dialogue process with the personage on discussion activities about environmental potential [challenges and opportunities] and its problems in their surroundings (rural areas). Source: Doc. Kristiyanto, 2019

harvesting systems was considered part of one problem solving type in coping with it, alongside the local people able to survive with systems used in aquaculture, growing plants, irrigating paddy fields, and so on. This is one of the ways of finding when to do observation in the field directly, then documenting and analyzing based on field data, so it's part of ecological concepts to empirical studies of the field and critical thinking developed. Alongside it would be science literacy increased for the higher students [12]. As a result, applying the ecological concept to field studies is one of the critical thinking aspects to developing scientific arguments in field report or seminar activities, as illustrated in Fig. 3, where one team research tried to explain to another its related to field data result. Figure 3 Scientific Presentation (Seminar) Activities in the Class Room Based on Field Data of Ecological Science.

Evaluating field studies could be shown through field report and seminar activities in the classroom, which in Fig. 3 is one step to identify and understand weaknesses or excesses in an achievement as long as it is in the field, alongside to know how to deepen science knowledge based on field data with literature review elaborated. As a result, the development of intellectual nuance in higher education based on field studies is part of critical thinking to field problems, which must be realized within the framework of human quality to respond to environmental change dynamically and adaptively. On the other hand, less field studies activities have caused the loss of critical thinking skills in field problems, so it's gradually leading to the loss of academic nuance in higher education, which ought to change civilization to be more educated, critical, and responsive to environmental change in their surroundings dynamically.



Fig. 3. The each of team research tried to explain to another, it's related to field data result that changed to field report (scientific paper). Source: [13]

3.3 The Role of Critical Thinking in Discussing Field Studies of Ecology Aspects

According to [13] numerous studies about critical thinking in higher education, which impact quality education, it is noted that critical thinking is an advantage for higher education because one is able to adapt to change well, so [14] noted that thinking is one of the activities or tools in the learning process. Therefore, increasing critical thinking aspects in the learning process is a pivotal to the higher student of quality and it's one of all the indicators of quality [15], alongside it related to academic achievement [16], to the higher student of quality, especially in increasing intellectual nuance. Has anyone evaluated how the higher quality data collection processes in the field (field studies or research) performed? Then Most of the higher students' complaints were related to duties, which is doing field studies or research activities. This research type presents a problem to the higher students, who choose to do data collection and its documented product (field report), then analysis to make a recommendation based on field data. These activities have stressed the higher students to do it, so many of them complain and surrender. This case would be shown when to do a scientific paper and it's shown to presentation (Fig. 3).

Many of the weaknesses that are detected are so it is necessary to change methods in the learning process to reach the higher students who are more adaptive, flexible, dynamic, and humanistic. Planning to curriculum design (modifying) is one part of steps in realizing to higher students to be more better and adaptive to world change, which the other is a critical thinking aspect to understand field problems, chiefly to scientific argument or articulation, in which hope to better or quality achievement and the other goals [17, 18, 19] so each of the learning processes must do it, in o Refers to seminar activities (Fig. 3) that have been done by the higher students in a framework to convey analysis results based on the field data (Fig. 1) in the classroom, many of whom are not able to depth analysis, which is scientific argumentation, so it's necessary to pay attention to those problems. The building of the higher students' quality is one of all the critical thinking aspects because of its key role in making the learning process successful.

As it is known that the critical thinking aspect has become one of the indicators of intellectual academic aspects, so it would be realized, kindly and sustainably. Therefore, the one way to realize critical thinking aspects is through field studies, which has been considered part of the steps to realize it, but on the other hand, many of the higher students when existing in the field area or research object have confusion related to how data is collected in the field process. Those were the one-case occurrences that were undergone by each of the high school students when in the field, so they could not have optimal and consistent data collection. Those problems are part of the weakness of field studies or activities, which are not able to do it by optimal and comprehensive means. However, that is part of the quality performance of higher education (quality of education) that has to do it in a framework to create intellectual nuance and dynamic.

4 Conclusion

Adding intellectual nuance to higher education is a key role important to the human quality as an educator or researcher, alongside its ability to critical thinking aspects, and one way to realize it is by doing field studies activities with various activity types, such as direct observation, in-depth individual interviews, and so on. Field studies is one of the activities that were considered part of the real learning process in the field, and it would be one strategy to increase critical thinking, so those activities must be implemented in a framework to higher university students. On the other hand, there are still many weaknesses in the field studies activities that the high students did, which were not able to write up field reports, the weaknesses of scientific argumentation or articulation, and the weakness of scientific discussion with others (seminar) based on field data of ecological sciences. This weakness is part of the failure curriculum in higher education, which is not dynamic, humanistic, or flexible enough to welcome world change, so curriculum modification was required.

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