

# The Effectiveness of Application of Field Study Method Innovation with Real Time Report Assisted with Mind Mapping on Ecosystem Materials on Student Learning Outcomes of Prospective Science Teachers

Getrudis Kerans<sup>1,2\*</sup>

<sup>1</sup>Sekolah Pascasarjana, Program Studi Pendidikan IPA S3, Universitas Pendidikan Indonesia, Indonesia

<sup>2</sup>Program Studi Pendidikan IPA, STKIP Weetebula, Indonesia

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**Abstract:** Effectiveness generally refers to how far a predetermined goal can be achieved. In order for the goal to be achieved, we must be able to provide the right innovation in a learning process. Learning innovation itself is an interaction between a complex set of practices, methods and designs that are part of the efforts made in higher education to improve the quality of teaching and learning. In this study, researchers applied the Real Time Report innovation to the implementation of the Mind Mapping-assisted Field Study. The aims of this method innovation are; Through Real Time Report Innovation in Field Study, students can report their observations directly and get input at the same time so that the process in the field is more focused. Through Mind Mapping, students can connect the images from the field study with the concepts they have correctly. Furthermore, knowing the effectiveness of the application of the method innovation that is applied to the learning outcomes of prospective teacher students. This study uses quasi-experimental research with one group pretest-posttest design. The results show that the application of the Field Study method with innovation in the form of Real time reports assisted by Mind Mapping is effective in teaching Ecosystems.

**Keywords:** Effectiveness; Method innovation; Field study; Real time report; Mind mapping.

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## Introduction

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state (Regulation). Government of the Republic of Indonesia No. 57 of 2021). Law Number 12 of 2012 states that the purpose of higher education is to develop the potential of students to become human beings who have faith and piety, have noble character, are knowledgeable, capable, creative, independent, skilled, competent, and cultured, as well

as produce graduates who master science and technology branches. obtained through a series of learning processes. The learning process is an interaction that has normative value, which is carried out consciously and purposefully and will be said to be successful if the results are able to bring changes in knowledge, understanding, skills and values in students (Djamarah, 2000). Learning is an effort made to influence a person's emotions, intellectuals, and spirituals to want to learn at their own will (Abuddin, 2009) or an activity to organize or regulate the environment as well as possible and connect it with students so that the learning process occurs. The Learning Process is a planning or design as an effort to teach students (Uno, 2008). The

\* Corresponding Author: [getrudiskerans@gmail.com](mailto:getrudiskerans@gmail.com)

learning process held at each university must be student-centred so that the process is able to encourage and accommodate a variety of student learning activities to gain varied knowledge and experiences.

Universities as providers of skilled workers must be able to create an effective learning process not only emphasizing understanding concepts and theories but more than that, learning in higher education must equip various skills that guide the 21st century. The basic skills that must be prepared by higher education include critical thinking, creative, problem solving, communication and collaboration skills (Goldberg, 2012). Effectiveness generally refers to how far a predetermined goal can be achieved. Sudjana, (1990) defines effectiveness as an act of student success in achieving certain goals that can bring maximum learning outcomes.

In this study, the expected effectiveness is the achievement of student learning outcomes according to the learning objectives and to equip students with the various skills needed, educators in this case lecturers must be able to design and provide appropriate innovations in the learning process. The innovation that is applied must be able to see all the obstacles faced in the learning process so that the learning process carried out gives good results and achieves the desired goals. In the learning process, innovation can be given to the method that will be applied to the learning.

The learning method is a set of components that have been combined optimally for the quality of learning (Riyanto, 2002). Optimal combination means that in a learning process in order to form a good relationship it must use a combination of several learning methods. Choosing the right method is a skill that must be possessed by a teacher because the combination of the right method will have an impact on the achievement of learning objectives.

In learning Basic Biology 2, prospective science teacher students learn about Ecosystems. Studying an Ecosystem means learning about its components, the interactions that occur in it, the Energy Flows that occur and the positive and negative impacts of these interactions. The best way to study ecosystems is to provide direct experience to students so that they can find knowledge and hone their skills and characters in the process of direct experience and then be able to present it in a simple form so that other students can understand it.

To teach Ecosystem material, researchers will use a field study method assisted by the Mind Mapping Method. The field study method aims to give students direct experience to be able to see the object to be studied. Observing directly, taking notes and asking questions directly will provide a different experience for students where they can observe real objects directly, their interest will increase and provide opportunities for

students to combine what they get in class with what they get in their environment.

Field study is a process of activity in the learning process by directly seeing the conditions of the surrounding environment to be observed so as to provide more flexibility for students to be involved in the learning process and be able to increase mastery of the competencies to be achieved. One of the most effective ways is to invite students to look directly at the location (study visit) according to the theme of the subject they are studying at that time in order to increase students' insight and knowledge of the object. Thus, the activity is expected to increase the ability of students to be able to master the subject matter they are learning.

Field study aims to enable the distribution of information and experience from parties who are more capable or competent to study visit participants, so that the abilities and mindset of students who take part in study visits will increase. Bevan & Sharon, (2009), describe field study or field study as a learning method that is carried out through direct data collection by observing, interviewing, taking notes, or asking questions. During the learning process, students are directly in the field. Field Study provides opportunities for students to gain direct experience of the object or environment to be observed, train students to be able to solve problems encountered in the learning process.

Suprijanto, (2009), mentions some of the benefits of Field Study, including providing opportunities to be able to collect new experiences and information, Objects can be observed in their original form, Three-dimensional, natural colors, and movements can be observed, Interest and accuracy of observations of members can be grown, opportunities can be given to participants to learn while working, procedures can be observed, which can later be applied by participants and provide opportunities for participants to combine lessons learned at school with those obtained in the environment. Easton & Andre, (2014), found that Field Study can improve achievement and improve cognitive learning in undergraduate biology students. They suggest that learning in the field provides significant benefits for student achievement.

While Mind Mapping is a creative and effective way of taking notes, an easy way of entering and removing information in the brain, mind mapping uses colors, symbols, words, curved lines and images that match the way the brain works (Buzan, 2005). Windura, (2008) explains Mind mapping is a graphical technique that allows us to explore all of our brain's abilities for the purposes of thinking and learning.

In the application of Field Study which is carried out without direct supervision, it often causes problems, among others, students do not take the right steps or do not even do so and the report which is then given is not from the results of the field study but from search results

on the Internet. To overcome these problems, an innovation in the field study method is needed to make it more effective.

The innovation that was then given by the researchers was innovation by requiring Real Time Reports on the implementation of the Field Study with the aim that what students observed in the field could be controlled and the implementation actually went well under the control of a powerful lecturer. Another innovation provided in this learning is in making reports on the results of field studies, students are asked to make concept maps with images that have been reported in real time reports.

Concept maps describe the relationship between one concept and other concepts where the more relationships between concepts, the more complex the concept map shows that the person's scientific knowledge is broad and deep (Widodo, 2021). To represent the interrelationships between concepts possessed by someone who has studied, a concept map can be used (Novak & Gowin, 1984).

Based on the description above, the researcher will carry out the learning process of Basic Biology 1 material on Ecosystems by using Real Time Report innovation in the implementation of Mind Mapping-assisted Field Study. The purpose of this method innovation is (1) Through Real Time Report Innovation in Field Study, students can report their observations directly and get input at the same time so that the process in the field is more focused; (2) Through Mind Mapping, students can relate the images from the field study with the concepts they have correctly; (3) determine the effectiveness of the application of the method innovation that is applied to the learning outcomes of prospective teacher students.

**Method**

This research is quasi-experimental research with one group pretest-posttest design. The design of this research can be seen in Table 1.

**Table 1.** One Group Pretest-Posttest design

Pretest	Treatment	Posttest
O <sub>1</sub>	X	O <sub>2</sub>

(Sugiyono, 2018)

This study involved students who contracted the Basic Biology 2 course with a total of 44 students. This study looks at the effectiveness of the application of field study innovation methods with real time reports assisted by mind mapping on ecosystem material on the learning outcomes of prospective science teacher students taken from student pretest and posttest data which are then analyzed using the Normalized N-Gain Test which can be calculated using the equation 1, (Meltzer, 2002).

$$N - Gain = \frac{Posttest\ Score - Pretest\ Score}{Maximum\ Score - Pretest\ Score} \dots\dots\dots (1)$$

Then the N-gain value is interpreted according to the Meltzer (2002) category as shown in Table 1.

**Table 1.** Normalized gain category

Normalized gain	Upgrade criteria
$g < 0.30$	Low
$0.30 \leq g \leq 0.70$	Medium
$g > 0.70$	High

Categories according to Hake (2002) using percentages according to Table 2.

**Table 2.** Gain categories

Presentation Gain	Upgrade criteria
< 40	Ineffective
40 - 55	Less effective
56-75	Effective
>76	Very effective

After the treatment, students also filled out a student response questionnaire on the implementation of the method innovation implemented.

**Result and Discussion**

This research was conducted to overcome some of the problems found in the application of the Field Study method by applying innovations in the form of Real time reports assisted by mind mapping. Real Time Report on the Field Study Method aims to enable students to report their observations directly and get input at the same time so that the process in the field is more focused. The results of the application of this small innovation are very meaningful and provide its own meaning for students. Students are more focused in activities in the field and more serious in planning what to do because they have to report the results observed at that time to the teacher. Field Study in Ecosystem learning also helps mind mapping with the aim that students can connect the images they have sent in real time with the right concepts and direct the arrows or lines of relationships that match the concepts in the pictures. The results of the application of the innovation field study method with real time reports assisted by mind mapping can be seen in Table 3.

**Table 3.** Results of Pretest, Posttest and Gain Uji Test

Pretest Average	Posttest Average	N-Gain Average	N-Gain Average Presentation (%)
61.57	88.68	0.71	70.55

Based on Table 3, we can see that the average posttest result is higher than the average pretest which indicates that student learning outcomes have increased after the introduction of method innovation. The

average obtained is then carried out by the N-Gain test and the average result of the N-Gain test is 0.71 which if viewed from the normalized N-Gain category in table 1, the average N-Gain obtained from the pretest and posttest is in the high category or if the results are presented the results are 70.55% which means the application of the Field Study method with innovation in the form of Real time reports assisted by "Effective" Mind Mapping in improving student learning outcomes on Ecosystem material.

After the learning process, students were asked to fill out a response questionnaire to the method applied. Student responses are filled in online via a google form containing random positive and negative statements. This response questionnaire wants to see how students respond to the application of this method. Of the 44 students involved, there were 30 students who filled out the response questionnaire (73% female and 26% male) and the results are presented in Table 4.

Based on the data presented in table 5, on average positive statements above 60% of students answered agree that the application of the Field Study method with innovation in the form of Real time reports assisted by Mind Mapping had a positive impact on them and this statement was then supported by data that 60% students disagreed with the negative statement which stated that the method used was boring and confusing. This response is very positive so that the Field Study method with innovation in the form of Real time reports with the help of Mind Mapping can be applied in

Ecosystem learning. In addition to the responses presented in Table 4. Students were also asked to write short answers regarding their comments on the application of this method and the responses given included. The method used makes students give more ideas. It is hoped that this method can be continued because it can help students understand the material better. In group work, there are still some who are less active. Mind mapping makes students express more ideas.

From the responses given, it can be seen that the students gave a positive response. From the results described above, we can see that innovation is a step that we can take so that the learning process becomes more interesting and can achieve the expected goals. Kim & Maloney, (2020) explained that learning innovation itself is an interaction between a complex set of practices, methods and designs that are part of the efforts made in higher education to improve the quality of teaching and learning. Zhang et al., (2008) have explained that making teacher decisions according to principles, making reflective interpretations and discretionary judgments and developing specific designs and actions to achieve desired outcomes is an innovation in learning. The purpose of learning innovation is not only to improve student learning outcomes but more than that, learning innovations must be able to improve the teaching experience as an opportunity to develop transferal skills.

**Table 4.** Student Responses

Statement	Percentage (%)			
	TA	A	D	SD
I enjoy participating in Ecosystem learning using the field study method with Real Time Reports with the help of mind mapping	40.0	60.0		
Learning with Field Study with Real Time Report Innovation makes me more serious and focused in carrying out Field Studies.	36.7	63.3		
Learning with the field study method with Real Time Reports helps boring mind mapping.		6.6	66.7	26.7
Field Study Reporting using Mind Mapping makes it easier for me.	33.3	66.7		
Reporting Field Study using Mind Mapping makes it difficult for me		3.3	76.7	20.0
Through this lesson, I can understand the concept of ecosystem better	30.0	70		
Through this lesson, I feel confused about the material to be studied		13.3	63.3	23.3
I am motivated to look for more supporting sources that support me to be able to make Mind Maps	23.3	76.7		
Through the Field Study Method, I learn to organize activities that I will do in the field with other people	30.0	70.0		
I am able to work with groups to complete Field Study and make Mind Maps	20.0	76.7	3.3	
Through field study learning with the help of mind maps, it made me realize how to respect other people's ideas and ideas	26.7	73.3		
I enjoy togetherness and cooperation in completing the entire learning process.	36.7	63.3		

Description:

TA: totally agree

A: agree

D: Disagree

SD: Strongly Disagree

Sudjana, (1990) argues that learning is neither memorizing nor remembering. Learning is a process

marked by a change in a person. Changes as a result of the learning process can be shown in various forms such

as changing knowledge, understanding, attitudes and behavior, skills, abilities and abilities, reaction power, acceptance power, and other aspects that exist in individuals. Meanwhile, teaching and learning or it can be said that the learning process is an interaction that has normative value. Teaching and learning is a conscious and purposeful process. The teaching and learning process will be successful if the results are able to bring about changes in knowledge, understanding, skills and values in students (Djamarah, 2000).

Learning can simply be interpreted as an attempt to influence a person's emotions, intellectuals, and spirituals to want to learn at their own will (Abuddin, 2009). Through learning there will be a process of developing religious morals, activities, and creativity of students through various interactions and learning experiences. In principle, learning is not the same as teaching. Learning emphasizes the activities of students, while teaching emphasizes the activities of educators, according to Nasution "learning is an activity to organize or manage the environment as well as possible and connect it with students so that the learning process occurs. Uno (2008) suggests that the essence of learning is planning or design as an effort to teach students.

According to Gagne, learning is a series of activities designed to enable the learning process to occur in students. Learning refers to all activities that directly affect the student's learning process and learning must produce learning.

The learning method is a distinctive way or pattern in utilizing various basic principles of education. Learning methods are also various techniques and other related resources that are used so that a learning process occurs in learners (Aqib, 2013). Riyanto (2002) mentions the learning method is a set of components that have been combined optimally to achieve a learning quality. So that learning objectives can be achieved optimally, teachers should have the ability to choose the right method and be able to relate several methods to be more effective in the learning process. Suyanto & Asep, (2013) stated that the learning method is a way of teaching or how to deliver subject matter to students who are learning.

In teaching the Ecosystem the learning method chosen and deemed appropriate is Field study because Field study is a process of activity in the learning process by directly seeing the conditions of the surrounding environment to be observed so as to provide more flexibility for students to be involved in the learning process and be able to increase mastery of competencies. to be achieved. One of the most effective ways is to invite students to look directly at the location (study visit) according to the theme of the subject they are studying at that time in order to increase students' insight and knowledge of the object. Thus, the activity is expected to

increase students' ability to master the subject matter they are learning (Bevan & Sharon, 2009).

In the field study process, control must still be given, but the limitations of the instructor to be able to be directly involved in the field will be something that has a major influence on the success of the applied field study method. The innovation provided in the form of real time reports is one way of controlling the implementation of activities in the field so that with real time reports students feel that they are continuously monitored and can carry out work in the field according to the planned steps. To be more effective, the field study method was then added to the mind mapping method to make it easier for students to report the results of the field study.

Mind Mapping is a creative and effective way of taking notes, an easy way of entering and removing information in the brain, mind mapping using colors, symbols, words, curved lines and images that match the way the brain works (Buzan, 2005). Windura, (2008) explains Mind mapping is a graphical technique that allows us to explore all of our brain's abilities for the purposes of thinking and learning. By connecting the images that have been sent via real time reports with the right concepts, students will then produce a meaningful mind map and make it easier for them to understand the material they want to learn in Ecosystem material.

Mind Mapping is a way to put information into the brain and retrieve it back out of the brain. The form of mind mapping is like a map of a street in a city that has many branches. Like a roadmap we can make a comprehensive view of the subject matter in a very wide area. With a map we can plan a route that is fastest and precise and know where we are going and where we are. Mind mapping, called mind mapping or mind maps, is a way of recording subject matter that makes it easier for students to learn. Mind mapping can be used to help students understand, organize and visualize the material and learning activities creatively and attractively.

Silberman, (2009) explains the mind map procedure, namely: Choose a topic for mind mapping. Some possibilities include: The problem or issue about the action ideas that you want to create the action ideas for; The concept or skill you just taught; Research to be planned by students. Construct for the class a simple mind map using color, imagination, or symbols. Provide paper, pens, and other resources that you think will help students create colorful and beautiful mind maps. Give students plenty of time to develop their mind maps. Instruct students to share their mind maps with each other.

The results of mind mapping done by students can be seen in Figure 1. Easton & Andre, (2014), found that Field Study can improve achievement and improve cognitive learning in undergraduate biology students.

They suggest that learning in the field provides significant benefits for student achievement. Li et al., (2020) in his research stated that group study is necessary because 1) students can complete all programs on their own 2) students have limited knowledge of science and 3) together can solve difficulties so that forming a study group in field studies will have a big impact for students. To be able to work in groups well, the discussion method can be a good forum.

Prokop et al, (2007) in their research also found that in learning ecology about food webs, they found that the learning outcomes and understanding of students who studied in field studies were higher than those who studied the same theme in class. Learning in the field provides several advantages for students not only in the cognitive domain but also in the affective and psychomotor domains.

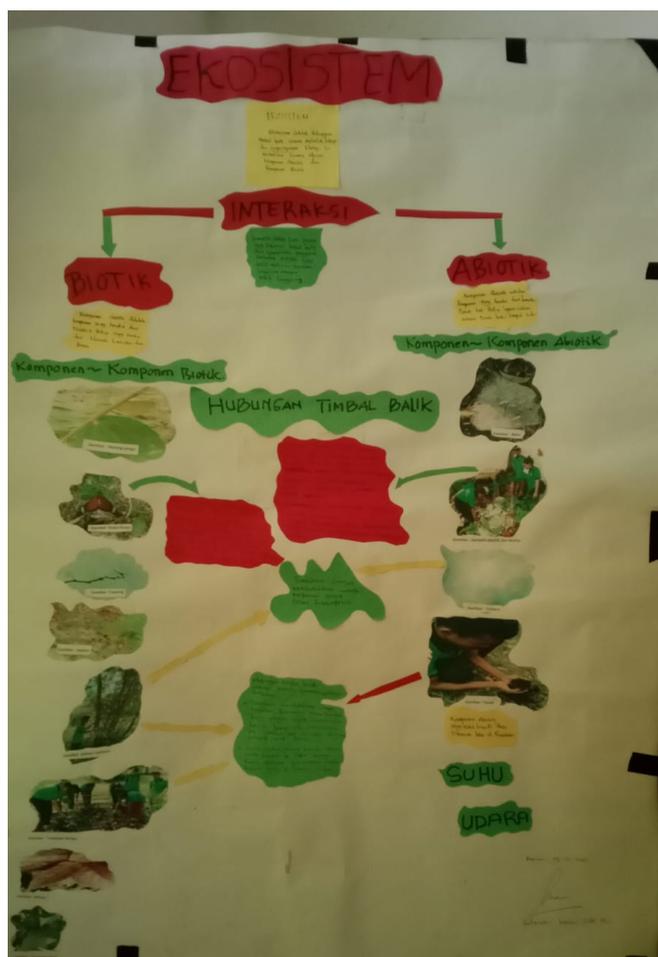


Figure 1. Field study report in the form of mind mapping

### Conclusion

Based on the results of this study, it can be concluded that the application of the Field Study method with innovation in the form of Real time reports assisted by Mind Mapping is effective in learning Ecosystems.

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