Implementation of inquiry-based field trip method to improve critical thinking and problem solving skills of students on plantae topic

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Abstract. This study aims to analyze the implementation of inquiry-based field trip method in improving the critical thinking and problem solving skills of students on plantae topic. The research method is a pre-experiment, with the research design the one-group pretest-posttest design. The implementation of the study involved 30 students in one of the high schools in Bandung. The research instrument used was observation sheet of the implementation process of inquiry-based field trip method, critical thinking and problem solving skills test instrument, student response questionnaire. Data were analyzed using Microsoft Excel program. The results of the implementation show that inquiry-based field trip method contributes in improving the critical thinking and problem solving skills. The result showed that there was a difference in the scores of the pretest and the posttest of critical thinking and problem solving skills of students. The average N-gain for critical thinking skills included medium category, and for problem solving skills included high category. The average percentage of the implementation process of inquiry-based field trip method included very good category, and the students gave very good responses to the implementation of inquiry-based field trip method.

1. Introduction

Life in the 21st century demands a variety of skills that must be mastered a person, so that education is expected to prepare students to master these skills in order to become a successful person in life [1]. Essential skills in the 21st century are still relevant to the four pillars of life that include learning to know, learning to do, learning to be and learning to live together [2]. The four principles each contain specific skills that need to be empowered in learning activities, such as critical thinking skills, problem solving, and other skills. The various skills of the 21st century should be explicitly taught [1]. The main factor causing the low quality of Indonesian education is the quality of educators who are associated with pedagogic, professional, personality and social competence [3]. Teachers are considered not able to implement an effective learning process for students, because learning is still dominated by conventional learning and tend to be teacher center so that students become passive [4]. Lack of qualified teachers, lack of facilities and poor teaching methods are the factors causing the lack of student performance on science subjects, this is because not many teachers are using the environment as a learning resource [5]. In the learning process, teachers use less environment by inviting students to observe directly to the object to be studied, whereas in science learning including biology requires direct observation of the object of learning in order to develop various skills or abilities in students such as observing, classifying, formulating questions, doing experiments, and so on [6].
Overcoming these problems, teachers can be implementation inquiry-based field trip method. The benefits of field trips are to provide direct experience, encourage higher attention to the subject matter, study visits can bridge between classroom learning and the circumstances of the community that are the source of the study, and so on [6]. Critical thinking skills are skills that need to be trained and developed from a young age, especially when in school. The rapidly growing world conditions require young people to develop critical thinking skills to respond to global challenges and not to be swept away by globalisation [7]. Critical thinking is the essential foundation for education because it is the essential foundation for adaptation to the everyday personal, social and professional demands of the 21st century and thereafter [8]. Problem solving has been identified as a key component in promoting and improving self-determination [9]. Enabling individuals to acquire problem-solving skills and training individuals who can resolve the problems encountered during their real life are the priority objectives and key goals of today's education [10]. Critical thinking skills, problem solving is one of the high-level thinking skills considered important in the 21st century [11].

Critical thinking skills and problem solving can be learned through various investigation activities and problem-solving activities [12]. Inquiry comes from English which can be interpreted as a process of asking and finding answers to the scientific questions posed [13]. Inquiry learning can develop intellectual skills, critical thinking, and be able to solve problems scientifically [14]. Teachers find it difficult to maintain student interest in plants, but interesting learning has the potential to increase students interest and appreciation of plants. For example, teachers should use actual plant specimens in learning [15]. Based on the above statement, inquiry-based field trip method can be implemented on plantae topic because it utilizes the environment as a learning resource through inquiry process so that it can improve students skills in addition to attract students interest on plantae topic.

2. Method

The research method used is the weak experiment method with the research design the one-group pretest-posttest design. Subjects in the study were 30 students of class X at one school in the city of Bandung. The inquiry-based field trip method is divided into three stages. The first stage is the preparation stage. Activities in the preparation stage include observation to the school, determining the research participants, preparing the proposal and then seminars, preparing instruments and research instruments, perform judgment tools and research instruments to expert lecturers, and test the research instrument. The second stage is the implementation stage. Activities in the implementation stage include preparing students in studying inquiry-based field trip method and preparing field trip activities carefully and then implementation of inquiry-based field trip method for 4 x meetings (12 hours lessons). The third stage is the stage of data processing and reporting. At this stage includes pretest and posttest data processing of critical thinking and problem solving skills of students, processing of student response data on the implementation of inquiry-based field trip method. In the reporting stage includes the discussion of research results, then draw conclusions. The research instrument used was observation sheet of the implementation process of inquiry-based field trip method, critical thinking and problem solving skills test instrument, student response questionnaire. Data were analyzed using Microsoft Excel program.

3. Result and Discussion

Statistical data show pretest, posttest, and mean value of n-gain critical thinking skills of student after implementation of inquiry-based field trip method can be seen in Table 1.

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
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<tbody>
<tr>
<td>average</td>
<td>51,37</td>
<td>85,03</td>
</tr>
<tr>
<td>at least</td>
<td>15,63</td>
<td>55,97</td>
</tr>
<tr>
<td>maximum</td>
<td>81,63</td>
<td>89,97</td>
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</tbody>
</table>

Table 1. Data statistics critical thinking skills

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Based on Table 1, shows an increase in the average critical thinking skills of 33.66 after implementation of inquiry-based field trip method. Once analyzed, the average N-gain shows a value of 0.66 in the range of $0.30 \leq N\text{-}gain \leq 0.70$ with medium category interpretation. Achieving the improvement of critical thinking skills caused during implementation of inquiry-based field trip method, students receive information, then they will think, prioritize problems and seek their own correlation, before looking for reasons to support and summarize a new knowledge. Besides that the inquiry process can improve critical thinking skill [16]. In addition to improving critical thinking skills, inquiry can also improve problem solving skills. Statistical data show pretest, posttest, and mean value of n-gain problem solving skills of student after implementation of inquiry-based field trip method can be seen in Table 2.

Table 2. Data statistics problem solving skills

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Value</th>
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<tbody>
<tr>
<td></td>
<td>Pretest</td>
</tr>
<tr>
<td>average</td>
<td>14.67</td>
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<tr>
<td>at least</td>
<td>4.67</td>
</tr>
<tr>
<td>maximum</td>
<td>29.67</td>
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</tbody>
</table>

Based on Table 2, shows an increase in the average problem solving skills of 71.56 after implementation of inquiry-based field trip method. Once analyzed, the average N-gain shows a value of 0.84 in the range of $N\text{-}gain > 0.70$ with high category interpretation. Achieving the improvement of problem solving skills caused during implementation of inquiry-based field trip method, in searching for solutions to a problem, students seek themselves either from the cause, the factors that influence until the students find themselves the solution of the problem.

The observation sheet and rubric of the implementation process of inquiry-based field trip method starting from the presentation of phenomena, planning, implementation until the reflection of field trip results. The observation sheets used in this study are 1-4. Assessment criteria can be seen in the rubric of the implementation process of inquiry-based field trip method. The assessment results can be seen in Figure 1.

Figure 1. Percentage of the implementation process of inquiry-based field trip method
Figure 1 shows the percentage value of the implementation process of inquiry-based field trip method for teachers and students. Based on the criteria of the implementation process, it can be stated that the inquiry-based field trip method on teachers and students is done very good [17].

The students response value to the implementation of inquiry-based field trip method is obtained from the questionnaire value of 14 "Yes" and "No" statements. This value is converted into a percentage value to find out how well the student receives the field based on inquiry method applied to the plantae topic. The results of his assessment can be seen in Figure 2.

![Pie chart showing percentage of students response](image)

**Figure 2. Percentage of students response to the implementation of inquiry-based field trip method**

Figure 2 shows the percentage of students response to the implementation of inquiry-based field trip method. Based on the criteria of the students response, it can be stated that the inquiry-based field trip method is received at a very good level [17].

### 4. Conclusion

Based on the above explanation, it can be concluded that the improvement of critical thinking and problem solving skills is caused by the implementation of appropriate method. Through the implementation of inquiry-based field trip method, students can improve their critical thinking skills and problem solving. In addition the implementation process of inquiry-based field trip method is done very good, and the students gave very good responses to the implementation of inquiry-based field trip method.

### 5. Acknowledgments

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### 6. References


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