

The Development of an Online Guided Inquiry-based Biology Practicum Guide Using the Geschool Application for Students Grade XI

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Abstract – The problem faced in the world of education is the weakness of the learning process, that is, students are not encouraged to develop thinking skills. This affects their understanding and skills in the learning process. Practical activities are laboratory activities that are an integral part of learning biology. The implementation of practicum activities in XI MAN 2 Pesisir Selatan was not optimal. This is due to the unavailability of practical guides and pandemic conditions which have resulted in practicum activities: not being able to be carried out in schools. This research aims to develop an online guided inquiry-based biology practicum guide by using the Geschool Application. The application of guided inquiry in learning allows students to have the opportunity to broaden their knowledge and help develop conceptual understanding. This research is a developmental research using the Plomp model. The object of this research was the students Grade XI MAN 2 Pesisir Selatan. The sample was taken by using a random sampling technique. The material developed was the transport substance and food testing material. The results showed that the practicum guide developed met the criteria of validity, practicality, and effectiveness. Inquiry learning is a learning strategy that emphasizes the development of the cognitive, affective, and psychomotor aspects in a balanced manner.

Keywords – Guided Inquiry Based Learning, Biology Practicum Guide, Geschool

I. INTRODUCTION

The development of science and technology has brought significant changes to various dimensions of life, one of which is in the field of education. The problem faced in the world of education is the weakness of the learning process, that is, students are not encouraged to develop thinking skills. This affects their understanding and skills in the learning process. Practical activities are laboratory activities that are an integral part of learning biology. According to Novana (2014), the purpose of practicum activities is to train skills, integrate knowledge and skills, and to be able to appreciate the knowledge and skills that are possessed.

The coronavirus pandemic (COVID-19) that occurred in Indonesia requires every school to implement an online learning model. One of them is MAN 2 Pesisir Selatan. Learning in these schools is carried out using the Geschool application. Based on the results of observations and interviews with teachers and students, it was known that the students like practicum activities. However, the implementation of practicum activities was not optimal. This is due to the unavailability of practical guides and pandemic conditions which have resulted in practicum activities: not being able to be carried out in schools. One of the biological practicum activities that can be carried out without laboratory equipment is membrane transport and food substance testing material. In this material the equipment needed is available in everyday life.

Practical activities can be optimized by using a practicum guide. Kenengsih (2014) states that the use of practicum guides helps teachers to optimize learning readiness and independence and can direct students to work continuously and directed. One suitable approach from the constraints of practicum implementation is Guided Inquiry. The use of an inquiry approach emphasizes students to find knowledge, ideas, and information through their own efforts by using scientific steps. The Inquiry Approach is essentially a process of finding something scientifically so that inquiry learning is identical to science process skills (Ozdilek (2009).

Based on these problems, the researcher develops a practical guide that can make it easier for teachers to transfer concepts, theories, and practices that need proof. As the result, the biology teacher teaching class XI at MAN 2 Pesisir Selatan will not have any problems in conditioning the students during practicum implementation.

II. METHODOLOGY

A. Subjects and Methods

This type of research was a Plomp model development research which consisted of preliminary research phase, development or prototyping phase, and assessment phase. This research was aimed at producing products an online guided inquiry-based biology practicum guide using the geschool application for membrane transport and food substance testing material subjects. This research was conducted at the Faculty of Mathematics and Natural Sciences (FMIPA) of Universitas Negeri Padang (UNP) and MAN 2 Pesisir Selatan. The data in this research were obtained from the validity, practicality and affectivity test questionnaire. These data were included in the primary data, i.e. the data obtained directly from research subjects. The instruments used included: 1) self-evaluation sheets, 2) validation questionnaires, 3) one to one evaluation questionnaires, 4) small group evaluation questionnaires, 5) practicality questionnaires, and 6) effectiveness questionnaires.

1. Preliminary Research Phase

The preliminary research phase aims to find out the basic problems in learning biology in schools. Activities at this phase were in the form of observation, analytical gathering and defining the problems that occurred in the learning process. This phase began with an analysis of problems and needs in learning, curriculum, students, and teaching subjects used in schools.

2. Development or Prototyping Phase

This phase started after the preliminary research phase was completed. This phase consisted of microscopes that helped in developing and improving products. This phase consisted of several stages of making a prototype as follows.

a. Development of Prototype I

The results of the prototype design in the initial stages are called prototype I. The initial design is done by researchers based on the results of preliminary research that has been done.

b. Development of Prototype II

Prototype II was the development phase by conducting a self-evaluation using a checklist. Self-evaluation (self-evaluation) was revising the biology practicum guide that have been designed. The evaluation method itself carried out was aimed at examining the errors that exist in the biology practicum guide, so it obtained relevant product criteria based on science and consistent with expected.

c. Development Prototype III

Prototype II was then consulted with experts (expert review) and one to one evaluation. Consultation with experts (expert review) was carried out based on expert judgment (validator) from the didactic, construct, and technical aspects. This evaluation was carried out using an expert validation sheet. The data validity was obtained by analyzing the validation questionnaire that has been filled out by the validator. The analysis was carried out with the following steps.

- 1) Give a score of answers to each indicator with criteria based on scale 1-4.
- 2) All items given a score were then tabulated and the percentage was searched using the following formula.

$$\text{Validity} = \frac{\text{Item score obtained}}{\text{Maximum score}} \times 100\%$$

Table 1. The Biology Practicum Guide Validity Criteria

<u>Validity (%)</u>	<u>Category</u>
81 – 100	Very Valid
61 – 80	Valid
41 – 60	Adequate Valid
21 – 40	Less Valid
<u>0 – 20</u>	<u>Invalid</u>

Modified from Riduwan (2009)

d. Development Prototype IV

At the same time one to one evaluations were carried out on three students at grade XI using interview guide sheets. The results of the revised Prototype II are called Prototype III.

Prototype III was evaluated through small group evaluation. At this phase an evaluation of six high school students at grade XI was low, medium, high ability levels; each consisting of two members. This formative evaluation used a student practice questionnaire sheet. The results of the revised Prototype III were called Prototype IV.

3. The Assessment Phase

Field tests or large group trials (field tests) were carried out to see the practicality and effectiveness of the biology practicum guide that have been designed. Practicality is the level of practicality of the biology practicum guide when it is used in the learning process. The research data obtained were analyzed by qualitative and quantitative analysis. Data for the initial investigation, design and construction stages were analyzed qualitatively and presented in descriptive form. The practicality data of the use of the learning biology practicum guide is analyzed by percentage (%), using the following formula.

$$\text{Practicality} = \frac{\text{Item score obtained}}{\text{Maximum score}} \times 100\%$$

After the percentage was obtained, grouping was done according to the following criteria.

Table 2. The Biology Practicum Guide Practicality Criteria

<u>Practicality (%)</u>	<u>Category</u>
81 – 100	Very Practical
61 – 80	Practical
41 – 60	Adequate Practical
21 – 40	Less Practical
<u>0 – 20</u>	<u>Unpractical</u>

Modified from Riduwan (2009)

Effectiveness data obtained in the form of data on learning outcomes on the competence of knowledge, attitudes, and skills of students. Data on knowledge competencies were obtained through lab test results, while data on attitude competencies were obtained from non-test techniques in the form of attitude observation sheets, and skill competencies were also obtained from non-test techniques in the form of observation sheets on practicum activities carried out by students.

III. RESULTS AND DISCUSSION

A. Results

An Online Guided Inquiry-based Biology Practicum Guide by using the *Geschool* Application for the students Grade XI developed through validity, practicality, and effectiveness tests. The validity of the product was assessed by three validators, while the practicality test was assessed by students and teacher. The results of the validity and practicality tests can be seen in Table 1.

Table 1. The validity and practicality Tests of the product

<u>Aspects</u>	<u>Average Value(%)</u>	<u>Criteria</u>
Validity	85.84	Very Valid
Practicality from students	90,15	Very

		Practical
Practicality from teacher	91.15	Very Practical

After passing the validity and practicality tests, the product developed was tested for its effectiveness. The effectiveness test was carried out in two classes, namely the control class (not given a treatment) and the experimental class (given a treatment: using a practicum guide). The results of the effectiveness test can be seen in Table 2.

Table 2. The Effectiveness Test.

Aspects	Control Class	Experimental Class
Knowledge	73,65	83,12
Attitudes	83,82	91,36
Skills	82,54	90,07

B. 2. Discussion

A developmental research consists of three stages: the initial investigation, development and prototyping, and assessment (Nieveen and Plomp. 2013). In this research, the data collection techniques were carried out through observation and interviews. Sugiyono (2012: 137) states that interview is a data collection technique used in a preliminary study to find the problems to be studied. Based on observations and interviews, it was known that the problem in learning is the limitations of learning carried out online and the unavailability of practicum guides. Practical activities are one of the important factors in efforts to improve learning outcomes.

During the Covid-19 pandemic, learning activities were carried out online, so practicum activities must also be carried out at home. Materials that can be practiced at home using the tools and materials available in everyday life included the membrane transport and food substance testing material. In developing a practicum guide on this material, a curriculum analysis was carried out first. This is done because the curriculum is a guideline for organizing teaching and learning activities (Hamalik. 2010: 66). An approach that suits the learning needs of students in developing a practicum guide is a guided inquiry approach.

The application of guided inquiry in learning allows students to have the opportunity to broaden their knowledge and help develop conceptual understanding (Brown. 2010). The developed guided inquiry-based practicum guide was created by using the Microsoft publisher application. The type of font used is Berlin Sans FB, Cambria, and Aharoni with various sizes. The practicum guide used is dominated by white and blue. The white color represents freedom and the blue symbolizes intelligence and conscientiousness (Basuki, 2013).

After the product was developed, the product was assessed for its validity level by three validators. According to Lufri (2017: 113), validity refers to the accuracy, meaning and usefulness of a thing that is made by researchers. The aspects assessed were the appropriateness of the content, the appropriateness of the guided inquiry approach, language, presentation, and graphics. The average result obtained in the validity test was 85.84%. Furthermore, a one-to-one evaluation was carried out.

The results of the one to one evaluation trial showed that a practicum guide can help students do scientific work. In terms of the ease of use, efficiency of study time, and benefits tested in small groups, an average result was 88.92% categorized in the very practical category. Sukardi (2012: 52) states that practicality can be seen from the implementation time which should be short, fast, and precise. Furthermore, the practicality test was carried out on a large scale (field test). The average practicality assessment by students was 90.15%. Meanwhile, the average practicality assessment by biology teachers was 91.15%. This shows that the guided inquiry-based practicum guide is practically used in the biology learning process.

Furthermore, the effectiveness test was carried out on the students' cognitive, affective, and psychomotor. The data on the cognitive competence were obtained through lab test results, while data on affective and psychomotor competences were obtained from non-test techniques in the form of observation sheets. The average result of the cognitive competence in the experimental class was higher than the control class. The average result of the experimental class was 83.12. The highest score was 92 and the lowest was 72. Meanwhile, the average result of the control class was 73.65. The highest score was 88 and the lowest was 64. The results of the t-test for the students' cognitive competence showed the use of guides. The guided inquiry-based practicum has an effect on the cognitive competence of students.

The average result of the students' affective competence in the experimental class was higher than the control class. The average result of the experimental class was 91.36. Then, The average result of the control class was 83.82. The average result of the students'

psychomotor competence in the experimental class was also higher than the control class. The average for the experimental class was 90.07 while the average for the control class was 82.54. Furthermore, the hypothesis test was carried out for affective and psychomotor competences by using the non-parametric test, namely the *Mann Whitney U-Test*. The calculation results showed that the use of the guided inquiry-based practicum guide affects the competence of the students' affective and psychomotor. This is in accordance with the opinion of Kurniasih (2017: 114) which states that inquiry learning is a learning strategy that emphasizes the development of the cognitive, affective, and psychomotor aspects in a balanced manner.

IV. CONCLUSION

Based on the research that has been done, it can be concluded that a learning design has been produced an online guided inquiry-based biology practicum guide using the geschool application on membrane transport and food substance testing material in valid, practical, and effective criteria for high school students at grade XI.

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