

The Influence of Practical Guide Based on Inquiry Approach toward Students' Achievement on pH Scale and use of Indicator Subjects

Predi S. Perangin Angin

Postgraduate of Chemistry Education
Universitas Negeri Medan
Medan, Indonesia
predi.setiadi@gmail.com

Wesly Hutabarat

Department of Chemistry
Universitas Negeri Medan
Medan, Indonesia
barathuta@gmail.com

Saronom Silaban

Departement of Chemistry
Universitas Negeri Medan
Medan, Indonesia
saronomsilaban@unimed.ac.id

Abstract— The purpose of this research was to observe the influence of practical guide based on the inquiry approach toward student achievement on the subject of pH scale and the use of indicators. The research was carried out in the chemistry education study program, Universitas Negeri Medan. Before the hypothesis measure test, the normality and homogeneity test was performed first, signed both of distributed samples has normal and homogeneous. The results of the research shown that there was the influence of practical guide based on the inquiry approach toward student achievement on the subject of the pH scale and the use of indicators, the average of the learning result and percentage gain which taught by practical guide based on inquiry approach are 78.74 and 66.9 respectively while the results of learning chemistry and percentage gain taught with conventional practical guide are 73.03 and 59.4, with difference of percentage gain equal to 7.4. The hypothesis in this study was tested by using the right-t-test and hypothesis testing results obtained t count higher than t table with the value, 3.167 higher than 1.669 with level of significance or alpha is 0.05. There was an influence of practical guide based on inquiry approach toward students' achievement on pH scale and use of indicator subjects.

Keywords— Inquiry Approach, Practical Guide, Student Achievement)

I. INTRODUCTION

Chemistry in general has abstract characteristics so it requires the ability of the instructor (lecturer) to make the subject matter more concrete, one of which was by conducting a practicum on the material being taught. For students holding a practicum can practice the ability to use materials appropriately, and increase understanding of chemical materials that have been taught in theory. For students who have high curiosity, through practice they can get answers from their curiosity significantly, so as to improve student learning achievement [1, 2].

Chemistry is a science which broadly includes two parts, namely chemistry as a process and chemistry as a product. Chemical as a product includes a collection of knowledge consisting of facts, concepts, and the principles of chemistry. Chemistry as the process includes skills and the attitude held by scientists to obtain and develop products chemistry [3].

The Indonesian National Qualifications Framework curriculum expects that the profile of graduates produced must have learning achievements. Learning achievement was the internalization and accumulation of science, skills, attitudes, and competencies that cover areas of expertise achieved through Field Experience and/or work experience in the Laboratory [4].

Implementation of practicum activities in the laboratory requires guidance to make it easier to determine the steps in the practicum. From the results of observations that have been made still found some problems regarding the implementation of the practicum. First, the practicum guides that are available are not in accordance with the National Standards of Higher Education. Second, the practicum approach that is used now is still a conventional practicum approach, namely giving problems, tools, materials and work steps to students.

Not only changes in assessment methods were needed to improve the quality of teaching practice, but it requires changes in methods, approaches or learning models, so that after practicum implementation students can already understand the material, ways of working and also the objectives of the practicum implementation. Therefore the use of the right learning approach was very necessary to do, one of the appropriate approaches in chemical materials is the inquiry approach [5, 6].

Inquiry approach was a process to obtain and obtain information by conducting observations and / or experiments to find answers or solve problems to questions or formulation of problems [7]. This inquiry learning strategy was very necessary to applied based on the recognition that science was essentially a question-oriented, inquiry-oriented process and that students must have personal experience with scientific inquiry to understand the fundamental aspects of science itself [8]. The results of research conducted by [9] reported that the inquiry approach can improve student competencies and interests, and was very effective in learning science.

In the inquiry learning, students were involved in the thinking activities and processes that scientists use to generate new knowledge. Changes from traditional learning such as the use of textbooks, lectures, and scientific facts, must be changed with an inquiry-oriented approach that (a) involves student interest in science, (b) provides opportunities for

students to use appropriate laboratory techniques to collect evidence, (c) asking students to problem-solve using logic and evidence, (d) encouraging students were to conduct further studies to develop more detailed explanations, and (e) emphasize was the importance of writing scientific evidence based on evidence [10], in this research will be examined how the influence of basic chemistry practicum guides that have been developed first, then compared the results with the use of conventional practicum guides.

Some research that underlies the need for the development of chemistry practicum guides in tertiary institutions was referred to based on the results of studies on research at the secondary school level and the development of previous practicum guides. Analysis and development of practicum guides that have been done previously stated that practicum guides were feasible to be a source of support for learning Chemistry [2].

The basic chemistry lab guide integrated the inquiry approach was easy for students to understand [11]. This can be seen from the results of affective and psychomotor assessment of students classified as good. In line with the results of the study [12] the results of the study showed that the response of students to the guide developed was very positive. So, Application of inquiry-based practicum guides can improve science process skills and student learning outcomes.

II. METHOD

This research uses the development stage before the implementation phase to see the effect of basic chemistry practicum guides integrated inquiry approaches that have been developed beforehand, in the guide there was a pH scale material and the use of indicators [13]. The development procedure was a series of implementation steps that must be carried out in stages to achieve the goal or complete a product [14]. The development of this practical guide uses the type of research and development (R&D). R&D is the research used to produce certain products and test the effectiveness of these products [15]. The product developed in this study is a practical guide to the Fundamentals of Chemistry. At the development stage, it was carried out using the ADDIE stages [16], the following stages (Figure 1).

The research instrument was useful for obtaining the data needed in accordance with the research objectives, the research instrument used in this study was the test instrument, the Test Instrument used in this study was the essay test, which has been validated by an expert validator, a lecturer at Universitas Negeri Medan. The test can be defined as a question or assignment / set of tasks planned to obtain information about the educational attributes for which each question or assignment has an answer or provision that was considered correct [17]. The test instrument used in this study is the Essay Test and to reduce its subjectivity, a scoring guideline is needed and then a test instrument validation sheet is needed

The research began with the provision of initial tests (pretest) to the two class samples that were selected by random sampling. Pretest was done one week before learning with the aim to find out the student's initial ability. From the results of the initial data analysis it was obtained that the data was normally distributed, $F_{count} < F_{table}$, it can be said that

the two groups namely the experimental group and the control group depart from the same or homogeneous state. Then the two groups were given different treatments, namely the experimental group was treated with the use of integrated practicum guides on the inquiry approach and the Control group were treated with conventional practicum guides.

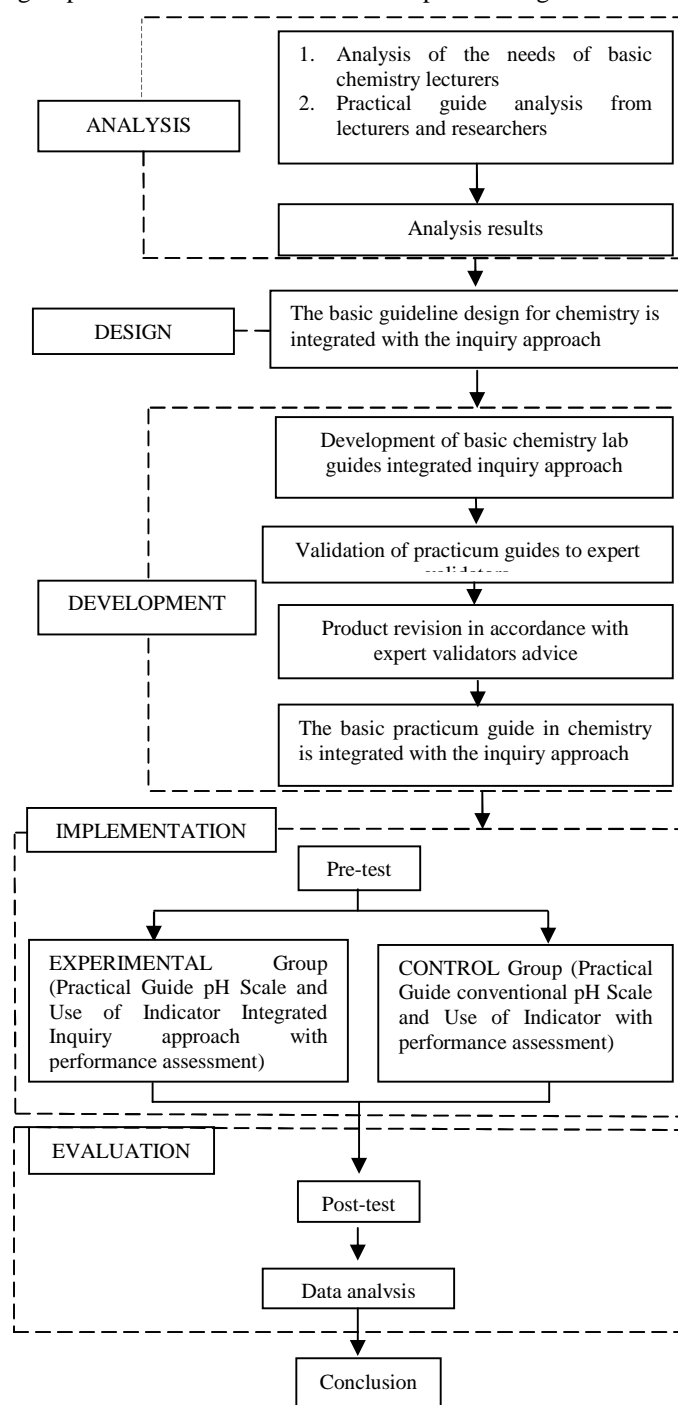


Fig. 1. Research design

III. RESULT

A. Students' Achievement

Based on student achievement data obtained in the study and after the tabulated data obtained the average, standard deviation, and variance of the pre-test and post-test data both from the group experiment, the group control like table I:

TABLE I. AVERAGE AND STANDARD DEVIATION

Group	Average value		Standard deviation	
	Pre-test	Post-test	Pre-test	Post-test
Experiment	34,74	78,74	10,57	10,12
Control	32,91	73,03	11,89	8,88

B. Improved Students' Achievement

From the results of the initial data analysis (pre-test) it was found that the data were normally distributed, $F_{\text{count}} < F_{\text{table}}$ so it can be told that the two groups, the experimental group and the Control group was departed from the same or homogeneous condition. Then the two groups were given different treatments, namely the experimental group was treated with the use of inquiry learning strategies and Control groups were treated with conventional learning.

Furthermore, the experimental group and the Control group were given posttest, the data of the research results will be collected for analysis. The instrument reliability test results in this study are r_{count} equal to $0.89 > r_{\text{table}}$ which is 0.374 . Test results of both groups were tested for normality, homogeneity test, and hypothesis test. From the normality test and homogeneity test shows that both groups are normally distributed and homogeneous. From the collected data obtained the average learning outcomes of the experimental class is equals to 78.74 and the increase's students' achievement is equal to 66.91% (Table II). While the average students' achievement of control class students is 73.02 and the increase in students' achievement is equal to 59.24% . From the posttest results obtained $t_{\text{count}} = 3.167 > t_{\text{table}} = 1.669$, because $t_{\text{count}} > t_{\text{table}}$ then H_0 was rejected and H_a was accepted so it can be concluded that there is an influence of the use of Practical Guide Based on Inquiry Approach on student's chemistry learning outcomes on pH and use indicators subject (Table III), where the learning outcomes of students were taught by Practical Guide Based on Inquiry Approach higher than student learning outcomes taught with Practical Guide conventional on pH and use indicators subject.

Based on the calculation using the gain formula, the average percentage of the increase of students' achievement in experimental group and control group is shown on table below as follows:

TABLE II. DIFFERENCE IN GAIN

Group	% Gain	Difference in Gain	Explanation
Experiment	66,91%	7,49%	Medium
Control	59,42%		Medium

Based on the table it can be concluded that the increase in learning outcomes in Experiments group is higher than the increase in learning outcomes in Control group.

TABLE III. HYPOTHESIS TEST

Group	Data	t_{count}	t_{table}	Explanation
Experiment	$X_1 = 0,669$	3,167	1,669	Ha accepted
	$S_1 = 0,10$			
Control	$X_2 = 0.593$			
	$S_2 = 0.11$			

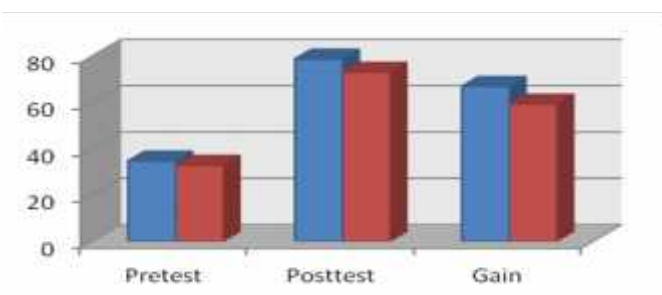


Fig. 2. Research Data Graph

Supported by [18] showed significant results for 50.54 experimental classes and conventional 40.93. Furthermore, [19] showed students' learning outcomes that were taught with inquiry learning strategies higher than conventional learning namely for experiment 92.32 while for conventional 87.5

Based on the overall data analysis of the results of research that has been done, it can be concluded that there was an influence of the use of integrated practicum guide inquiry into the learning outcomes of student chemistry on the subject of the pH scale and the use of indicators.

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