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Making Chemical Practicum Kit For Polimedia Students

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Abstract: The purpose of this study was to obtain a chemistry practicum kit according to standards for graphic engineering study program students in applied chemistry courses. The population in this study were students of the Polymedia PSDKU Medan graphic engineering study program, which consisted of 2 classes. The sample in this study was obtained by simple random sampling technique for one class. This research is descriptive and experimental in nature (development and research). The research steps include: a) Design and manufacture of a chemistry practicum KIT for applied chemicals; c) Implementation of KIT practicum in learning to find out student learning outcomes. The results of the research show that the practicum KIT has been developed for students of the graphic engineering study program. The implementation of the chemistry practicum KIT that has been developed shows that student learning outcomes are higher than the KKM score of 83.72 and the average student psychomotor score is 91.1. This shows that the practicum KIT that has been developed is suitable for use in chemistry learning at Polimedia PSDKU Medan.

Keywords: Practicum KIT, Applied Chemistry, Student Learning Outcomes.

Introduction

Chemistry is a science that needs proof experiments that have two things that are very related and cannot separated, namely chemistry as a product (chemical knowledge in the form of facts concepts, theories, and principles) and processes (scientific work). Both of these things can achieved by students, one of which is through practicum activities (Zidny, et al.,2017).

According to Rustaman as quoted by Trisnawati (2011:110), practicum instructions or practicum diktat are some of the tools needed so that activities in the laboratory run smoothly, so that the objectives learning can be achieved, minimizing the risk of possible accidents happen and others. The benefits of practical instructions / practical instructions between others: (1) can help achieve student learning mastery, (2) cultivate scientific work habits, (3) to provide feedback on teacher in preparing a more varied learning design and meaning. Practical instructions have a very very important role in carrying out laboratory activities. With practical instructions expected to have a positive impact on success in the laboratory. However not all schools have practicum instructions / dictates. Educators tend to more emphasis on the material without linking between the science being studied environment, technology, and society as one unit (integrated). The school has adequate facilities. Equipment and The materials available in the laboratory are sufficient practicum is carried out.

The absence of tools and chemicals is one of the factors that often becomes the obstacle is not doing practicum, because of the practicum guidebook still use a lot of tools and materials that are hard to come by. Therefore Chemistry teachers really need creativity in developing practicum kits by looking for alternative materials and other tools that are easily found in everyday life. Thus the practical implementation will remain carried out and does not depend on laboratory facilities in schools. One alternative solution to support experimental learning then it is deemed necessary to use KIT learning media (Box Integrated Instrument) simple chemistry practicum without compromising objectives the practicum itself (Zidny, et al., 2017). The practicum KIT is a set practicum tools

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packaged in such a way in a box containing the tools practice. Implementation of chemistry learning practicum with practicum KIT become easier, simpler, not scary, safer for health, and can reduce the risk of laboratory accidents (Epinur, et al., 2015).

Based on the problems described above, the purpose of this study is to develop an alternative chemistry practicum kit that is relatively cheaper and easy to overcome the problem of limited facilities and infrastructure laboratory as a support for chemistry learning in high school according to the curriculum 2013.

Identification of problems

1. Difficulties in providing practicum tools and materials available on campus thus hindering the teaching and learning process with experiments.
2. There is no adequate practicum included in the textbook
3. The difficulty in providing practicum tools and materials in the available guides hinders the teaching and learning process with experiments.
4. Implementation of chemical practicum which is rarely carried out on campus
5. Chemistry learning outcomes of students who still have not reached grades

Scope of problem

1. The material being analyzed is a solution material.
2. The learning model used is a practicum learning model.
3. The media used is KIT (integrated instrument box).
4. The research was conducted in Semester II Graphic Engineering class

Formulation of the problem

1. Does the chemistry practicum kit designed for the Graphic Engineering class meet the eligibility standards of a KIT?
2. Are student learning outcomes using the developed chemistry practicum KIT higher than the KKM price?

Research purposes :

1. To find out whether the chemistry practicum kit designed for the Graphic Engineering class on solution material meets the eligibility standards of a KIT.
2. To find out whether student learning outcomes use the chemistry practicum KIT that has been developed to be higher than the KKM price.
3. To find out the results of the validation of the Lecturer and Teacher chemistry practicum KIT that was developed to have a high value

Benefits of Research Research

Theoretical benefits are:

1. understanding how to analyze chemistry practicum KIT;
2. understand how to develop practicum guides;
3. understand how to design a chemistry practicum KIT. Meanwhile, the practical benefits are: (a) a chemistry practicum kit and guide is obtained that is easy to obtain, feasible and interesting, and easy to implement; (b) practicum KIT products can be applied by chemistry teachers in the learning process; and (c) contributing ideas for teachers, lecturers, students, and all groups in developing chemistry practicum KIT and guides.

Materials and Methods

A. Types of research

The type of research used in this research is development and research. Development research is research that is used to produce certain products and test the effectiveness of these products (Sugiyono, 2014).

B. Research Instruments

1. Chemistry Practicum KIT Validation Questionnaire

The aspects contained in the validation questionnaire included aspects contained in the

practicum KIT validation questionnaire including the feasibility and practicality assessment which had been modified from research by Zidny et al. (2017).

The rating scale used is a Likert scale where the score used is 1 to 4 where:

a. The number 4 means very good / very interesting / very easy / very clear / very precise.

b. Number 3 means good / valid / interesting / easy / clear / precise.

c. The number 2 means not good / not interesting / not easy / not clear / not quite right.

d. Number 1 means very unfavorable / very unattractive / very not easy / very unclear / very inaccurate.

2. Learning Outcome Instrument
   a) Cognitive Instruments
      The cognitive instrument used in this research is an objective test in the form of multiple choice questions totaling 20 questions with each item consisting of five answers (a, b, c, d, and e) and there is only one correct answer.
   b) Psychomotor Instruments (Activities)
      The instrument in this study used performance sheets (activities) consisting of 2 aspects of assessment, namely practicum practicum (before practicum) and practicum implementation (including student work results). The pre-employment aspect consists of 3 aspects, namely the aspect of clothing, the aspect of practicum readiness and the systematic aspect of work, while the implementation aspect consists of 6 aspects, namely the aspect of skills, the aspect of using materials, the aspect of waste management, the aspect of cleanliness and the aspect of observational data. This rubric is used to assess students' (psychomotor) performance during practicum activities using observation sheets guided by the psychomotor rubric.

C. Research design

In this study, the One Group Pretest-Postest Design was used in the implementation of the guide and practicum KIT. This design was used because there was only one group (class) to be sampled and there was no control class as a comparison.

Table 1. Guide Implementation Research Design and Practicum KIT

Group	Pre-test	treatment	Post-test
Experiment	T1	X	T2

Information :

X = Learning using the developed chemistry lab guide and KIT

T1 = Administration of the initial test (pretest)

T2 = Provision of the final test (posttest)

At the beginning of the study, an initial test (pretest) was given, followed by treatment over a certain period of time and ended with a final test (posttest).

D. Research procedure

The research procedure are the steps used as a tool for collecting data and answering questions in the study. The procedures for implementing this research include the following stages:

1. Observation and Data Collection Stage

In this observation, the first part is research and data collection. The research and data collection section aims to collect supporting data that can provide information regarding field situations and conditions and as a reference or comparison in developing products. In the research and data collection section consists of two steps, namely library research and field studies.

a. Literature and Curriculum Studies

Literature and curriculum studies are studies to study concepts or theories relating to the product or model to be developed. Next, collect data regarding the steps that need to be taken to make a good and feasible tool by following the criteria for tool development, for example from tool materials that are easy to obtain, tools are easy to operate, easy to carry and store, tools that are not dangerous when used and most importantly The tool has sufficient accuracy and is easy to assemble. Furthermore, the results of this study are used as a reference in making products.

b. Field Study

The field study section was carried out at Polimedia Medan. Observations were made regarding the circumstances and conditions of the campus related to practicum activities. In addition to observations, interviews were also conducted

with PLP Polimedia Medan. The purpose of this interview was to obtain data regarding the practicum including the tools and materials that have been used so far that an analysis of the deficiencies and weaknesses in the practicum activities can be carried out.

2. Planning Stage

After obtaining the data needed in the design of making the KIT, the next part is to determine the material or shape of the practicum tool in the form of a KIT which will be developed based on the results of the analysis that has been carried out. In addition, the planning section also determines what aspects are used by the validator in assessing the feasibility of the practicum tool in the form of a KIT that is made.

3. Initial Development Stage (Design)

a. Tool Design

In the draft development section, the first thing to do is to design the reaction rate material KIT which will be made by considering aspects related to teaching materials, the efficiency of making tools, the ease of use of tools, safety for students and the durability of tools.

b. Design Discussion

After designing the tool, the results of the design are discussed with fellow lecturers. This stage aims to assess the feasibility of the tool to be made with reference to the aspects to be achieved.

c. Tool Design Revision

If there are still deficiencies, then a revision is made to the KIT design which is designed according to the inputs given by fellow lecturers.

4. Advanced Development Stage (Tool Making)

The next part is the manufacture and development of practicum tools in the form of a KIT which is made based on the results of the revised tool designs at a later stage.

a. Tool Making

After completing the revision of the KIT design, the KIT is made. Tools and materials are provided according to what has been arranged in the KIT instructions. Tools that are tailored to the needs of applied chemistry practicum.

b. Tool Validation

After the tool has been assembled, the product in the form of a KIT is brought to the validator for product validation. Tool validation aims to obtain recognition or validation of conformity with needs so that the tool is feasible and suitable for use in learning. This validation consists of various aspects of feasibility that have been determined. The validator is an expert in related fields of chemistry where the validator can be a lecturer in chemistry expert and also PLP Chemistry on campus. Before implementing the practicum KIT, it is tested first with the exact same tools and materials and work procedures so that the effectiveness can be tested first before testing.

5. Practical KIT Implementation Stage

The trial phase of using the practicum KIT is carried out to find out whether the practicum KIT that has been made can be understood and is suitable for use by students seen from the results of student learning after getting learning using the practicum KIT. This trial uses one class as the experimental class. Prior to practicum, a pretest was first carried out, then followed by practicum using the practicum KIT along with the instructions. After that, at the end of the treatment, a posttest was carried out.

6. Evaluation of the practicum kit

At this stage an assessment and analysis of student learning outcomes is carried out to find out how the influence of the use of practicum kit in improving chemical learning outcomes.

E. Data Collection Technique

The data obtained from this study are (1) in the form of responses and suggestions for improvement from lecturers and PLPs to guidance and practicum kit obtained from the answers to the Validation of Guidance and Modified Kit Validation. Assessment (responses) obtained are collected and tabulated and calculated the average assessment, and (2) learning outcomes during the practicum guide test that has been developed. This data is in the form of data pretest and student postest data.

1) Analysis, validation, and assessment of practicum kit.

Data obtained based on the questionnaire will be processed by descriptive statistics. Descriptive statistics are statistics used to analyze data by describing or describing the data that has been

collected as it is without intending to make generally accepted conclusions or generalizations (Ridwan, 2007). The equation used to calculate the results of the questionnaire filling is by calculating the average put forward by Arikunto (2013), namely:

$$\text{Average score for each item question} = \frac{\textbf{\textit{Total scoring score}}}{\textbf{\textit{Number of validators}}}$$

$$\text{The average score of the feasibility of teaching materials} = \frac{\textbf{\textit{Total average score of each question item}}}{\textbf{\textit{Number of question items}}}$$

To strengthen the validation result data, a range of validity criteria qualifications was developed. Determination of the range can be known by means of the highest score minus the lowest score divided by the highest score. The rating scale to be used is 1 to 4, where 1 is the lowest score and 4 is the highest score. Thus the validity criterion qualification range is obtained by (4-1): 4 = 0.75. The average analysis validation criteria used can be seen in Table 2.

Table 2. Practicum KIT Validation Criteria

Average	Variable criteria
3.26 - 4.00	Valid and does not need revision
2.51 – 3.25	Valid enough and does not need revision
1.76 – 2.50	Invalid, some of the contents need to be revised
1.00 – 1.75	Invalid and needs to be totally revised

1) Psychomotor Results Data

Performance assessment (psychomotor) is carried out when students are doing practicum activities. Assessment of performance (psychomotor) is carried out on each aspect and the value of the performance results (psychomotor) of each student. The calculation of the value obtained from each aspect is:

$$\text{The average value of each aspect} = \frac{\textit{The number of student grades for each aspect}}{\textit{The Number of students}}$$

Determination of the range can be known through the range of high scores minus the lowest score divided by the highest score. Based on the determination of the range, a range of 0.6 is obtained. The criteria for the average value of each aspect used can be seen in the following table:

Table 3. Criteria for the Average Value of Each Aspect

Average	Variable criteria
2.4 – 3.0	Tall
1.7 – 2.3	Currently
1 – 1.6	Low

In addition to the average score for each aspect, the performance (psychomotor) score of each student is also produced, whose assessment is based on these nine aspects with a maximum score of 27. The calculation of the value obtained for each student is:

$$\text{Score} = \frac{\textit{Total acquisition score}}{\textit{Maximum score}} \text{ x } 100$$

The value obtained from each student is then calculated on average to find the final value. Clarification of the average value obtained can be determined in the following criteria table:

Table 4 Value Conversion

Score	Information
91–100	Very Good
76–90	Well
61–75	Enough
51–60	Currently
< 50	Not Enough

Results and Discussion

The data described in this study include: KIT analysis of applied chemistry practicum based on feasibility and practicality assessment; and the acquisition of student scores and psychomotor skills in applied chemistry material using the practicum KIT that was tested.

A. Making Practicum KIT

After making observations and analyzing them as well as designing the initial KIT design, the next step in this research is making a chemistry practicum KIT. In this manufacturing stage, KIT instructions were compiled and developed based on the results of descriptive analysis data from field observations and practical adjustments to the needs of the syllabus. The deficiencies obtained from the results of the previous analysis are used as a reference in designing the KIT and the instructions so that the products created are suitable for use.

The tools and materials contained in the practicum KIT that have been made are in the form of simple tools and materials, namely tools and materials that are easy to obtain in everyday life such as plastic cups, glass cups, water, and so on. The tools used are durable and not easily damaged.

The first in making the KIT is to provide the tools and materials needed, the tools provided are: glass cups, flashlights, plastic cups, plastic spoons. While the materials provided are: Salt, Milk, Wheat Flour, Coffee and Water. Materials are put into containers according to needs. All tools and materials fall into the easy-to-find category, such as glass cups, plastic cups, flashlights, plastic spoons, salt, milk, flour and coffee obtained from chemical supply stores. Tools and materials are arranged in such a way in a box with partitions separating each type of tool and material so that the tools and materials are not damaged or contaminated. All tools and materials used in the experiment regarding the Tyndall Effect and Distinguishing solutions, suspensions and colloids, namely in detail in the Tyndall Effect using tools and materials in the form of salt, water, milk, a flashlight as well as glass cups and plastic spoons. In the experiment of differentiating solutions, suspensions and colloids using tools and materials in the form of salt, milk, coffee and wheat flour.

To test the effectiveness of tools and materials, testing is carried out by carrying out experiments according to work procedures that have been prepared and carried out with tools and materials that are exactly the same as the tools and materials arranged in the box.

B. Validation Of The Practicum Kit That Has Been Made

The practicum KIT validation that was developed was carried out by providing an assessment in the form of a score, the practicum KIT assessment was based on an assessment of feasibility and practicality. Where the scores range, among others: a score of 4 (very good), 3 (good), 2 (poor), and 1 (very bad).

From the results of the research, the assessment made by 1 chemistry lecturer at Polimedia on the KIT practicum obtained an average of 4.62 and 4.87. This means that the lecturer gives a positive opinion on the practicum KIT as a result of development and the chemistry practicum KIT that has been made by researchers, meaning that it is valid and does not need revision.

The overall research results are presented based on all existing assessment items in accordance with the material suitability standards. The average value of each assessment item was calculated from the two assessment teams. At the end of the study, the average of all items was calculated so that the final value of the KIT practicum was known. The average practicum KIT assessment can be seen in detail.

Tabel 4. The average KIT practicum assessment according to Lecturers and PLP

Components assessed	Assessment of practicum KIT		
	D	G	Average
Linkage with learning materials	4,00	4,00	4,00
Educational value	3,95	4,00	3,95
Tool Resistance	4,00	3,95	4,00
Tool Accuracy	4,00	4,00	3,85
Tool Efficiency	4,00		4,00
Security For Students	4,00	4,00	4,00
Aesthetics	4,00	4,00	3,95
Equipment Mobility Endurance	4,00	3,95	4,00
Total Average	4,00	3,95	3,95

The practicum KIT that has been validated is then improved. Improvements to the practicum KIT were carried out based on suggestions and input that had been given by lecturers and PLP.

C. Implementation Of The Practicum Kit That Has Been Developed

1. Student learning outcomes

The last stage in this research is the trial phase. The trial conducted was a limited trial. A limited trial was conducted to determine the level of students' understanding of the chemistry practicum that had been developed using the instruments provided at the end of the practicum and to find out how much the use of the practicum KIT could have a positive impact seen from the student's learning outcomes during the practicum process. The instrument used is a question that is standard and valid to use.

This limited trial was carried out at Polimedia Medan in 1 class (experimental class). During the practical KIT trial implementation to students, practicum guides were distributed to students in the form of LKM (Student Worksheets), after which students were divided into 6 groups, where each group consisted of 2-3 students. In student groups it will be easier to carry out practicum activities.

To see the level of students' understanding of the practicum KIT that has been developed, a treatment is made by giving a limited test to students. The initial stage is to give an applied chemistry pretest, then use the practicum KIT that has been developed as a guide in practicum activities and finally give a posttest to see the level of student understanding after using the practicum KIT that has been developed.

Based on the results of the analysis of the level of student understanding in the pretest and posttest, the results are as listed in Table 5

Table 5. Students' Pretest and Posttest scores on students' understanding of the practicum KIT.

Data Type	Pre-test	Post-test
The number of students	12	12
The highest score	68	98
Lowest value	26	62
Total value	1012	1242
Average value	53,68	85,23
ΣStudent complete	3	9
ΣStudents do not complete	10	2
%completeness	7,45%	94,56%

Based on table 5. it can be seen that learning using the chemistry practicum KIT shows a high level of understanding. The high level of understanding of the practicum KIT turns out to be proportional to the value of the learning outcomes obtained. Student grades have increased after receiving learning using the chemistry practicum KIT.

Mulyasa (2006) said that learning is considered successful, if the completeness of student learning outcomes reaches 85%. The chemistry KKM score is 75. In general, one class has been completed but individually there are still 7.12% of students who have not completed it. This is due to the low interest in studying practical instructions before learning and the ability of each individual to absorb the material presented varies. The student's incompleteness can be followed up with remediation, so that all students can complete individually. Overall, an increase in the level of student understanding indicates that the practicum KIT that has been developed is good and suitable for use in chemistry practicum activities.

Conclusions

Based on the results of the research that has been done it can be concluded that:

1. The chemical practicum KIT on solution material that has been developed is suitable for use and has met the eligibility and practical criteria.
2. The learning outcomes using the Chemistry practicum KIT on solution materials that have been developed are higher than the KKM score.
3. From the results of the research, the assessment carried out by 1 lecturer at Polimedia, for KIT practicum obtained an average of 4,00 and 3.95. This means that the lecturer gives a positive opinion on the practicum KIT resulting from the development and the solution chemistry practicum KIT that the researcher has made, meaning that it is valid and does not need revision. Using the same questionnaire criteria, the assessment results were also obtained from each chemistry lecturer who taught at the research site, namely at the Polimedia

Campus in Medan, with a total of 1 assessor as a fellow lecturer.

4. %completeness students' pretest and posttest scores on students' understanding of the practicum KIT 7,45% and 94,56%.

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