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THE DEVELOPMENT OF LAB KIT BASED ON POGIL TO TRAIN SCIENCE PROCESS SKILL IN ACID BASE MAIN SUBJECT FOR STUDENTS OF CLASS XI SMAN 1 GURAH KEDIRI

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Abstract

The study was aimed to know the feasibility of lab kit practical based on POGIL on acid-base material class XI. The feasibility of the lab kit medium based on validity, practicality, and effectiveness aspects. This type of research used development refers to methods of Research and Development (R & D) model that limited to main field testing. This research was a quantitative method with the design of One Group Pretest Posttest Design. The objective of the researched students of grade XI-MIA1 SMAN 1 Gurah Kediri. The data sources of this research shown from validation sheet, student questionnaire response, pretest and posttest science process skills sheet which has been filled by 12 students. The study conducted twice. Kit feasibility based on aspects validity content and construct with an average percentage 85.40% include very appropriate category. Kit feasibility based on practical aspects in terms of students responses obtained percentage with an average of 97.72% include very practical criteria. Kit feasibility based on aspects of effectiveness obtained from the pretest and posttest students science process skills with classical completeness of 91.60% with very effective criteria. It can be concluded that the lab kit on acid-base main subject was feasible based on aspects of validity, practicality, and effectiveness.

Keywords: lab kit, validity, practicality, effectiveness

INTRODUCTION

Based on the Regulation of Ministry Education and Cultural No. 20, 2013, the competency standard of graduates is a qualification of graduate ability that covers attitude, knowledge of attitude, knowledge, and skill of students that must be fulfilled or achieved from an educational unit at primary and secondary level. The graduate competency standards include attitudes, knowledge and skills [1].

Chemistry can not simply be taught through theory, but also necessary to teach the skills domain with direct experience in the field through planned laboratory activities. Therefore, students are expected to: processing, reasoning, and communicating in the concrete and abstract realm associated with the development of what they have learned in school independently, and be able to use the method according to the rules of science.

Based on pre-research data, a questionnaire was given to 25 students of SMAN 1 Gurah Kediri. The students said the acid-base subject matter was difficult. In addition, the science process skills were less trained in chemistry learning. The average score obtained by the students in formulating the problem by 15%, making the hypothesis 17%, determining the 21% variable, collecting and recording data 20%, analyzing 17%, making conclusion 18%. In addition, student learning outcomes on the material acid-base is still not meet the minimum mastery criteria.

Based on existing facts it is necessary for the development of learning media. The low understanding of students on the concept of chemistry still lacking of science process skills. The school facilities that have an intergrated laboratory. It needed to be used the lab kit practical to implementation for students. Lab kit that applied in POGIL based acid base main subject to practice science process skills.

The POGIL (Process-Oriented Guided Inquiry Learning) model that promotes inquiry strategies and values as well as attitudes and process skills such as: observing, collecting and organizing data, identifying, controlling variables, formulating and testing hypotheses, explanations, and making conclusions [2].

Learning should be done by activity, which is to move physically while learning, and to use as many senses as possible to make the whole body or mind actively involved in the learning process [4]. Through POGIL most students engage actively and think in the classroom and in the laboratory in drawing conclusions through data analysis, models, ideas working together in teams to understand concepts and to solve problems, reflect on experiences they have learned and to improve

their performance. It expected that POGIL model could train the skill of science process well. POGIL in lab kit medium involved in conducting experiments, observing, taking notes, processing data, summing up experimental results, and making conclusions.

The development of a lab kit that involves direct students in experiments will help to train students' science process skills that will make it easier for students to understand concepts.

This research applied in grade XI SMAN 1 Gurah Kediri using POGIL-based practice tool kit on acid-base material. Scientific process skills are trained in the researched the skills to formulate problems, create hypotheses, determine variables, collect data, and made conclusions. Stages of implementation of this study were students learning in groups in activities design to improved mastery of the content of subjects and developed skills in the learning process, thinking, solving problems, communicate, group work, management and evaluation. Activities in POGIL are designed in a guided inquiry process. In the inquire there are several points that include the skills of the process of science, namely the skill of the process of formulating the problem, making the hypothesis, determining the variables, presenting the data in the table, analyzing the data, making conclusions.

METHOD

The research of development of lab kit used development refers to Research and Development (R&D). There are 10 steps in the development, which are: potential and problem, collecting data, product design, and validation of design, design revisions, limited trial, product revisions, utility testing, product revisions, and production [7]. However, the research only testing the feasibility of lab kit so the stages is limited to fourth step, namely preliminary field testing.

This studied used only one control class in the absence of a comparison class. The preliminary field testing subjects in this study were of class XI SMAN 1 Gurah Kediri which only taken one random class of 12 students. The design of this studied follows the One Group Pretest Posttest Design. The designed as follows

$$O_1 \times O_2$$ [6]

O1 = Pretest value of process skill Students' science (before being given a practicum kit)

X = Instructional of Media

O2 = Value of posttest process skills Student science (after being given a practicum kit medium)

This research conducted at SMAN 1 Gurah Kediri in the even semester of academic year 2016/2017. This research conducted on the students of class XI with POGIL-based chemical practicum kit to train students' science process skill on acid-base material.

Methods of data collection used validation questionnaire. Students questionnaire, as well as pretest and posttest sheets.

Questionnaires used to gather information in the form of suggestions or input from media experts on the practicum media kit. The results of the study of media experts analyzed descriptively qualitative. Questionnaire validation used to collect data based on assessment by media experts on the feasibility of practicum media kit based on the prevalence aspect. The results of validation questionnaire analysis in the form of a percentage of eligibility obtained by Likert scale, presented in Table 1.

Table 1 Likert Scale

Criteria	Score
Very good	5
Good	4
Good enough	3
Less good	2
Not good	1

[6]

The results of the validity were analyzed using score interpretation in table 2:

Table 2: Interpretation Score

Percentage (%)	Criteria
0-20	Very Poor
21-40	Poor
41-60	Quite
61-80	Good
81-100	Very Good

[6]

The acid-base lab kit medium developed suitable to use in the learning process if the percentage result of every aspect is ≥61%. In the lab kit medium of acid-base main subject, the data analysis for the practical aspect learning media obtained from the observation student response sheet of used in this studied. The percentage of questionnaire data obtained, calculated on a Guttman scale. The Guttman scale used for a clear and consistent answer that was "Yes" or "No" as in Table 3 below:

Table 3 Guttman Scale

Answer	Score
Yes	1
No	0

[6]

The data obtained calculated from the percentage by the formula:

$$\text{Pers (\%)}: \frac{\text{The number of scores the results of data collection}}{\text{Criteria score}} \times 100$$

From the results of student responses could be categorized into the criteria presented in Table 2. The developed medium said to be feasible from the aspect of practicality when the percentage of each aspect was ≥61%. So the media was worthy to use in the learning process.

Furthermore, the effectiveness aspect of the media kit obtained from the results of pretest and posttest. Analysis of pretest and posttest sheets used as follows:

$$\text{student score} = \frac{\text{total score of collecting data result}}{\text{citeria score}} \times 100$$

Learning outcomes analyze used a range of values as in Table 4.

Students said to be good at learning when students get a score of ≥75. Classical completeness achieved if ≥75% of students have complete learning by obtaining a score of ≥75 with the following calculation:

Tabel 4 Assessment

Range of value	Alphabet
96-100	A
88-95	A-
80-87	B+
71-79	B
63-70	B-
55-62	C+
46-54	C
38-45	C-
30-37	D+
25-29	D

[1]

The practicum media kit developed could be said to be feasible from the aspect of effectiveness if the results of the students' science process skills have improved in the "moderate or high" category.

RESULTS AND DISCUSSIONS

Prior to the pilot, the draft lab kit reviewed by two chemistry lecturers and obtained some suggestions that could be used for media improvement. Based on the results of media kit review along with student worksheet and practical guidebooks, the obtained are as follows: Firstly lack of practicum tools so that should be added again the type of solution along with the required tools. Both box kit designs converted into simpler shapes and affordable prices. The third was added the researcher's name on the cover of LKS. Fourth on the LKS sheet there no learned objective there were only indicators of learning so that added learning objectives. Fifth, LKS added the material before it was given the phenomenon along with the observation picture. From these suggestions, further revision and draft II made.

After the revision, the draft II assessed by 2 chemistry lecturers States University of Surabaya and 1 chemistry teacher from Senior High School 1 Gurah Kediri. Validity in this study include consistency validation (also called construct validation) and validation of relevance (also called content validation). Aspects assessed in construct validation include: Tool endurance criteria, tool conformity criteria, tool accuracy criteria, tool efficiency criteria, student safety, and aesthetics.

Aspects assessed on content validation include: students worksheet suitability with POGIL learning model, students worksheet conformity with science process skills. The result of validation of acid-base lab kit can be seen in Table 5

Table 5: Data Result of Validation

Validasi	(%)	Criteria
Contents	83,18%	Very good
Construct	87.62%	Very good
Totality Value	85.40%	Very good

Based on Table 5, the overall percentage on the validity construct that was equal to 83.18%, so that the lab kit declared very valid. The content validity that was equal to 87.62%, so that the lab kit declared very valid.

It known that acid-base lab kit medium could be declared valid because each criterion gets a percentage of ≥61% or in very good category.

Lab kit feasibility could be seen from the results of student responses. Results of student

responses obtained from student questionnaire response could be seen in Table 6.

No	Aspect	Positiive Response		
		Σ	(%)	Criteria
1.	Media kit make students interested	12	100	Very good
2.	Students more easily to understand the concept of acidic base material with media kit	12	100	Very good
3.	Media kit has easy to used	12	100	Very good
4.	The guidebook manual was easy to understand	12	100	Very good
5.	The language of the practicum manual guide and the LKS was easy to understand	12	100	Very good
6.	Box of media kit was interested	12	83.33	Very good
7.	Box kit practical size was easy to move	12	91.67	Very good
8.	The language used in the LKS was in accordance with the EYD	12	100	Very good
9.	The language used in the LKS was in accordance with the students' thinking	12	100	Very good
10.	Preparation of practical manual books and LKS manuals using terms that are appropriate and easily understood by students	12	100	Very good
11.	The language used is simple and does not lead to multiple interpretations	12	100	Very good
	Total score		97.72	Very good

Based on the result of the student's response to the lab kit medium on acid-base main subject contained in Table 6 shown that all aspects get a percentage of ≥61% in a very practical category. Thus, all students responded very well to these aspects as shown by the percentage of 97.72% with a very practical category.

The effectiveness of acid-base lab kit medium was derived from pretest and posttest results. The test result of learning done on 12 students at SMAN 1 Gurah Kediri. The data of science process skill was the result of the assessment on the ability of the students in mastering the process skill which includes observing, making problem formulation, making a hypothesis, determining variables, designing experiments, collecting data, and made conclusions.

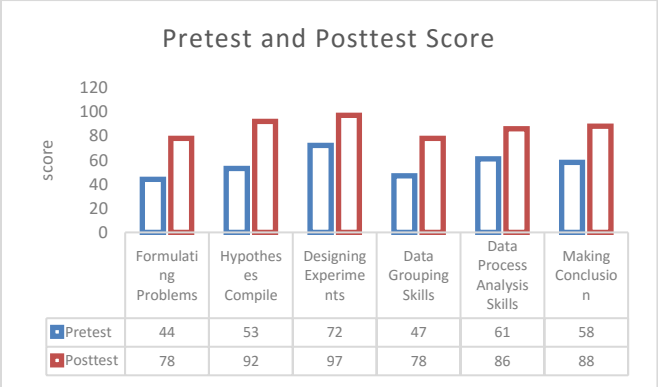

Figure 1 Chart of pretest posttest Score on science process skills

Based on Figure 1, the results of students' science process skills have improved results before and after using acid-base lab kit medium. Science activities conducted by these students were activities on integrated science process skills such as formulating problem formulation, determining hypotheses, determining variables, interpreting data, conducting experiments and concluded [8] This shows that students in Senior High School 1 Gurah Kediri have good science process skills.

1) Processing Skills Formulating Problems
   The percentage of students' classical completeness on the skill of problem formulating process increased from 47% pretest to 78% posttest. Students made the formulation of the problem by making a question concerning the existing problems difenomena. The formulation of the requested problem was a question sentence that connects between the independent variable and the dependent variable in accordance with the phenomenon.
2) Skills Process Hypotheses Compile
   The percentage of students' classical completeness on the skill of formulating the problem has increased from 53% pretest to 92% posttest. The hypothesis was a possible explanation for one observation device or answer one observation device or answer to a scientific question [11]. Students could create a hypothesis in accordance with the expected that was, "The stronger the acid/base then the bubble yag generated will be more and the lights produced will be brighter".
3) Designing Experiments
   The percentage of students' classical completeness on the skill of formulating the problem has increased from 72% pretest to 97% posttest. Students could design the experiment steps in accordance with the formulation of the

problem, hypotheses, and variables that have been made.

The design of experiments made an organized plan to test a hypothesis [11]. Students could design experiments in accordance with existing phenomena or problems, students will used many of the science process skills.

4) Data Grouping Skills

The percentage of students' classical completeness on the skill of problem formulating process has increased from 69% pretest to 97% posttest. students wrote the results obtained from the lab that has been done in the table that has been provided in the LKS. Classified was a process skill to train the various objects of events based on their particular properties so that there was a similar group object of the event in question [12].

5) Data Process Analysis Skills

The percentage of students' classical completeness on the skill of problem formulating process has increased from 47% pretest to 78% posttest. In the interpretation of the data required inferential skills in reading the data and compare it with known theories so that the data could have value [11]. Students used the data obtained associated with the variables, hypotheses and the results of the experiments based on the theories obtained by students so that students made the analysis.

6) Conclusion Making Skills

The percentage of students' classical completeness on the skill of formulating the problem has increased from 61% pretest to 86% posttest. Students made conclusion from the results of the analysis associated with a hypothesis that has been made by students. When a student was able to explained a new event by using a concept he already has, it implements the learned principle [12].

Students said to be complete if they achieve a minimum average score of B. Classical completeness achieved when the minimum test determined that is ≥75 [1]. Percentage of classical completeness of science skills learning outcomes has reached a minimum determined that is ≥75. The percentage obtained from the score of science process skill that trained through the lab kit medium score was 91.60%. So that the lab kit medium on acid-base main subject was effective in tapping the students' science process skills.

CLOSURE

Conclusion

Based on the results of research and discussion it could be concluded that the lab kit medium developed feasible to be used as a medium of learning on acid-base material, with the following details.

1. Small lab kit based on POGIL model in acid-base subject were valid in terms of content and construct validity with average percentages of 85.40% and included in the very appropriate category.
2. Small lab kit based on POGIL model in acid-base subject were practical declared by practically obtain from student's response with an average percentage 97.72% and was included in the very practical category.
3. Small lab kit based on POGIL model in acid-base subject were effective declared by the effectiveness derived from the results of the pretest and posttest science process skills of students with an percentage 91.60% was included in the very effectiveness category.

Suggestion

Based on the research, it found that the media kit has fulfilled the aspects of validity, practical aspect, and effectiveness aspect. Based on the above, the suggestions that could be given to the researchers are as follows:

1. The research was step just until preliminary Field Test on the use of media kit based on POGIL. The application needs to be done with the number of students who more or in the actual class.
2. The Color of box kit used did not have an interested enough in accordance with the color preferred by students, so it needed to be given a more interesting color innovation.
3. Small lab kit was effective to practice student sciences process skills, so it also could to practice others skills that needed by the student

This research based on the scientific literacy textbooks development. It should be implemented to determine the practicality and effectiveness of textbooks based on scientific literacy.

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