Unesa Journal of Chemical Education *ISSN: 2252-9454*
Vol 7, No. 1, pp 70-75, January 2018

THE DEVELOPMENT OF LAB WORK *KIT* "REACTION RATE CHEMISTRY" TO TRAIN SCIENCE PROCESS SKILL ON REACTION RATE MATTER OF XI GRADE SENIOR HIGH SCHOOL

Intan Dwi Rachmawati, Sukarmin, and Bertha Yonata
Chemistry Department of Math and Natural Science Faculty Universitas Negeri Surabaya
Email: id061194@gmail.com Hp: 085731419872

Abstract

This research aims to determine the feasibility of lab work *KIT* Reaction Rate Chemistry that used as an intructional media to train the science process skills on the reaction rate matter of XI grade, the validity seen from the validation requirements, the practicality through student responses to lab work *KIT* reaction rate chemistry, the effectiveness through student learning outcomes and student activity observation results. This was a research development by Borg & Gall, the research model which is limited to preliminary field testing stage. Praliminary field testing conducted on 12 students of XI grade Science 1 *SMAN* 2 Mojokerto. The instrument that used in this research is the research paper sheet, validation sheet, student response questionnaire, student activity observation sheet, pretest and posttest sheet. The results showed that the developed of lab work *KIT* reaction rate chemistry was stated feasible on the validity requirement by obtaining an average percentage of 85.22%. Qualified practicality shown from student's responses on student interest to lab work *KIT* aspect obtained an average percentage of 97.92%, on the aspect of easy to understanding the matter obtained an average percentage of 93.75%, and on the aspect of easy to use of lab work *KIT* as instructional media obtained an average percentage of 95.85%. The feasibility of effectiveness shown from student learning outcomes in which 11 students passed the grade individually so that classical completeness reaches 91.67% with gain included in the "Moderate" to "High" category and student activity observation results get an overall average percentage of 89.81%.

Keywords: Lab work *KIT*, Intructional media, Science Procces Skills, Reaction Rate.

PRELIMINARY

Implementation of the learning process considered less involving students in finding a concept learning to prove that the learning is more teacher-centered, the teacher conveys the material as a product and the students memorize the real information [1]. The Indonesia curriculum 2013 emphasizes the application of a scientific approach that includes observing, asking, trying, processing, presenting, summarizing and creating for all subjects [2]. It is intended that graduates expected to have a skill, one of which is process skill.

Process skill is the whole directed scientific skill (both cognitive and psychomotor) that can be used to discover a pre-existing concept, or to perform a discovery of an invention [3]. Based on the results of pre-research to 27 students of XI grade science 1 *SMAN* 2 Mojokerto, as many as 70% of students stated that the reaction rate matter was quite difficult to understand. Additionally, researchers provide a test of student's science process skills by a written test to collect data, most of them difficult to do the test, because they have not accustomed. It indicates that it was necessary to teach that can train student's science process skills by do lab work activities in studying the reaction rate matter, because with the lab work activities students can develop basic skills of experiment [4]. Additionally, 96% of students expressed want to carry out the lab work activities with reason to be more understand and some in order to use practice exam to graduate from senior high school.

Lab work *KIT* Reaction Rate Chemistry was a set of tools, experiment materials, manual book, and student worksheet of reaction rate matter that packed in a box. Lab work *KIT* can be used by praktikan anywhere and anytime. It can also be used during class demonstrations, practical exams, as well as home labs. This lab work *KIT* may be used for 4 experimental titles on the sub-matter of factors affecting Chemical

Reaction Rates and can be used repeatedly for 10 attempts.

Various researches have shown that development of kit can increase student's interest in learning. The research aims to assess student responses to chemistry learning using small laboratory kits on organic chemistry experiments. The results showed that 80% of student comments are approve to use a small laboratory kit. The use of small lab kits has managed to arouse student's interest in chemistry. The small laboratory kit was safe and easy to carry [5].

The development of a lab kit that involves students in direct experiments helped to train student's science process skill that facilitate students in understanding the concepts [6]. In addition, the use of kit in learning was dynamic, which can be used for experiments in the laboratory or can also be used for learning activities in the classroom so that the experiment still keep going [7].

Based on the results of interviews conducted to teachers of Chemistry in XI grade *SMAN* 2 Mojokerto, it is known that the laboratory cannot be fully utilized, because of the lesson time that coincident with XII grade. So that XI grade never do lab work activities and only do teaching and learning process in classroom. In addition, student worksheet that used for learn was still conventional and has not trained the science process skills.

In this research, the student worksheet that developed was equipped by lab work *KIT* reaction rate chemistry for reaction rate matter to train science process skill. The problem formulation in this research is how the feasibility of Lab Work *KIT* reaction rate chemistry to train science process skills on reaction rate matter of XI grade as instructional Media. The general problem formulation described to be 1) How is the validity of lab work *KIT* reaction rate chemistry to train science process skills of reaction rate matter in XI grade Senior high school? 2) How is the practically of lab work KIT reaction rate chemistry to train science process skills of reaction rate matter in XI grade Senior high school? 3) How is the effectiveness of lab work *KIT* reaction rate chemistry to train science process skills of reaction rate matter in XI grade Senior high school?

METHOD

This type of research is a type of research and development. The object of this research is Lab Work *KIT* as an instructional media on reaction rate of XI grade to 12 students of XI Science 1 *SMAN* 2 Mojokerto who have received reaction rate matter. The research design used research and development model (Research and Development / R & D) which limited until stages 4, Research and Information Collecting includes literature study and field observation, Planning includes making *KIT* box design and preparation of Lab work *KIT* complement, Design Preliminary of Product includes the manufacture of lab work *KIT*, preparation of manual books, and preparation of worksheets, Preliminary Field testing includes the study, revision, validation, and limited testing [8].

Methods of data collection in this research used a questionnaire method consist of questionnaire review, questionnaire validation, student response questionnaire; observation method that has been student activity observed; and test methods consist of pretest and posttest. The instrument used in this research are the study sheet, validation sheet, student response sheet, pretest and posttest sheet, and student activity observation sheet. Data analysis of validation result was analyzed quantitative descriptive by 2 chemistry lecturers of *Unesa* and 1 chemistry teacher. The data analyzed using Likert scale presented in **Table 1** below:

Table 1 Likert Scale

Score	Criteria
5	Very good
4	Good
3	Enough
2	Less
1	Bad

[9]

The value obtained was calculated by the percentage of feasibility using formula (1):

$$P(\%) = \frac{(total\ score\ gained)}{(total\ score)} \times 100\%$$

Information:
P (%) = percentage (%).
Then, the percentage obtained by interpreted using a Likert scale criteria in **Table 2**:

Table 2 Likert Scale Criteria

Percentage	Category
0% -2%	Very bad
25% -40%	Bad
41% -60%	Medium
61% -80%	Good
81% -100%	Very good

[9]

The reaction chemistry *KIT* was considered feasible if each compound gets a percentage of ≥ 61%.

Data Analysis results of student responses were analyzed by modification of the Guttman Scale in **Table 3** below:

Table 3 Modified Guttman Scale

Answer	Positive statement score	Negative statement score
Yes	1	0
No	0	1

[9]

The obtained data was calculated to get the percentage of student response result by using formula (2):

$$P(\%) = \frac{total\ of\ yes\ or\ no\ answer}{total\ of\ respondents} \times 100\%$$

Determine feasibility of lab work *KIT* seen from the practically that interpreted into the criteria in Table 2.

Based on Table 2, the practicality of the developed lab work *KIT* was considered feasible as obtaining a percentage of ≥ 61% [9].

Data analysis of student's learning outcomes had done by find out the pretest and post test results of science process skill. Student stated passed the grade individually if they got a score of ≥75. The score of student learning outcomes analyzed by the following formula (3) below:

$$\text{Score of learning results} = \frac{\text{scores obtained}}{\text{maximum scores}} \text{ x } 100$$

After obtained by individual completeness hence can be determined classical completeness, which is classical completeness reached if ≥75% of student was throughly passed the grade individually. The classical completeness analyzes by the following formula (4) below:

$$\text{Classical Completeness} = \frac{\text{Completed Student}}{\text{Total Of Student}} \text{x } 100\%$$

Then the score of pretest and posttest used to know the student gain category with the formula (5) below:

$$<g> \equiv \frac{\%<G>}{\%<G>max} = \frac{(\%< S_f > - \%< Si >)}{(100 - \%< Si >)}$$

Information:
S_f = posttest score
S_i = pretest score
Furthermore, score obtained was converted to the following categories in **Table 4**:

Table 4 Category gain

Gain Score	**Category**
g> 0.7	High
0.7> g> 0.3	Medium
g <0.3	Low

[10]

Based on these categories, the lab work *KIT* reaction rate chemistry as an intructional media was considered feasible if the gain in the "medium" or "high" category. The gain score indicates an increase in student's science process skills after conducted the lab work *KIT* [10].

The observation result of student activity that analyzed was another aspect determinant of effectiveness of lab work *KIT* which analyzed using Guttman scale presented in **Table 5** below:

Table 5 Guttman Scale

Implementation	Score
Yes	1
No	0

[8]

The acquired scores data were analyzed by using the formula (6):

$$P(\%) = \frac{total\ of\ yes\ or\ no\ answer}{total\ of\ respondents} \times 100\%$$

The percentage obtained was interpreted into the criteria seen in Table 2.

Lab work *KIT* reaction rate chemistry as an intructional media stated feasibility when obtained a percentage of the observer's assessment of student activity by ≥61%.

RESULT AND DISCUSSION

The data obtained from this research is the percentage of validity of lab work *KIT* reaction rate chemistry from 3 validators, percentage of responses to lab work *KIT* which is developed, student learning outcomes, and observation of student activity.

Validity

The following validity of lab work *KIT* reaction rate chemistry was presented in **Table 6**.

Table 6. Validity Result

Rated aspect	Percentage (%)
Content Validity	
Suitability of Student worksheet with manual book	86.67
Suitability of student worksheet with component of science process skill	82,50
Construct Validity	
Endurance Tool and *KIT* Box	82.23
Measurement Instrument Accuracy (thermometer, measuring glass, stopwatch)	86.67
Efficient Use of Tools and materials	91.11
Security for students	80
Aesthetics	90
Average Percentage (%)	**85.22**
Criteria	**Very Feasible**

Based on validity data results in Table 6, some of indicator get lowest percentage for indicator of planning an investigation, analyze data, and concluding, still get the criteria deserve, but get the lowest percentage of 73.33%. This was caused by the aspect of planning investigations in the student worksheet still considered less attention for students. Students bored with writing experimental needs and procedures, they have not recognized yet, only reading a manual book. Students tend to have difficulty thinking about appropriate sentences to fill in the procedure columns, analyze data (answer questions) and make conclusions. The conformity of student worksheet with component of science process gestation on indicator observe and identify variable get percentage 93.33% with criteria very feasible. It cause students are often enough to do a story-shaped problem (phenomenon), so it was easy to make observations and determine the variables.

Based on the Table 6, it can known the average percentage was 82.55%. According to Riduwan (2015) this percentage belongs to very feasible categories, so that the lab work *KIT* reaction rate chemistry deserves to be an intructional media [9].

Student Response Questionnaire

The practicality of lab work *KIT* reaction rate chemistry as an intructional media can be known through student questionnaire data results in **Table 7**.

Table 7 Results of Student Response

Rated aspect	Percentage (%)
Knowing Student's Interest on lab work *KIT*	97.92
Knowing the Ease of Understanding the Material	93.75
Knowing Ease of Use of lab work *KIT* as an intructional media	95.83

Based on Table 7, it can be seen that the average percentage of student's responses based on the aspect of knowing the student's interest to the lab work *KIT* was 97.92% with the criteria very feasible, the aspect of knowing the ease of understanding the material gets the percentage of 93.75% with the criteria was very feasible, and the aspect to know ease of uses *KIT* gets a percentage of 95.83% with criteria very feasible. It can be concluded that student's response to lab work *KIT* reaction rate chemistry as an instructional media was very good, as it gets an average percentage of ≥61% [9].

Student learning outcomes

The effectiveness of lab work *KIT* reaction rate chemistry as an instructional media can be known from student learning outcomes. The form of test result were the science process skill test about reaction rate matter. Pretest given before the students use the lab work *KIT* reaction rate chemistry, whereas posttest given after the students use the lab work *KIT* reaction rate chemistry. Student completeness graph presented on **Figure 1**.

 ISSN: 2252-9454

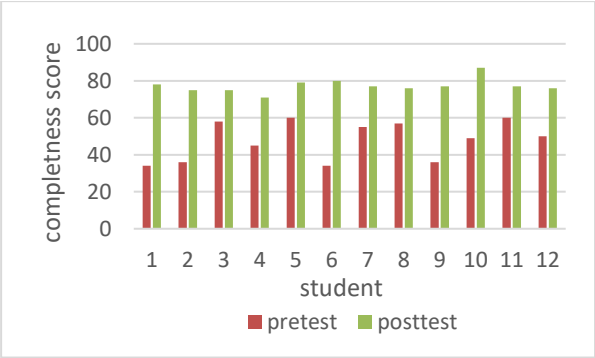

Figure 1 Graphic Completeness of Student Learning Result

Based on Figure 1, it can be seen that the pretest of 12 students, all of students can not reach the grade completeness individually, but the student after done lab work activity use the lab work *KIT* reaction rate chemistry then do the posttest, 11 students passed the grade individually. So get classical completeness of 91.67% with gain in category "medium" and "high".

In this research, based on the improvement of learning outcomes in Figure 1 it can be seen that lab work *KIT* effectively as an instructional media, because it can improve learning outcomes. It supported by previous research that states the effectiveness of *KIT* in terms of cognitive student's learning outcomes in both categories with classical completeness above 90% [11].

Observation of Student Activities

Another aspect to determine the effectiveness of lab work *KIT* was the result of student activity observation. This observation was performed when the students conducted lab work activity used lab work *KIT* reaction rate chemistry guided by activity observation sheet. In observation sheet of student activity, observed aspects are activities includes aspects of science process skills start from observing to concluding experimental results in student worksheet and getting teacher reinforcement on reaction rate matter.

Lab work *KIT* effectively used as an instructional media on the reaction rate matter by getting the average percentage of the overall observation of student activity amounted to 89.81% and belong to very feasible category.

CLOSURE

Conclusion

Based on the formulation of the problem and the results of research, it can be concluded that lab work *KIT* raction rate chemistry as an instructional media on the reaction rate matter of XI grade senior high school stated feasible based on the results and criteria below:

1. Lab work *KIT* reaction rate chemistry as an instructional media on reaction rate matter was feasible to be used on validity requirements, based on content validity and construct validity obtained an average percentage of 85.22% with very feasible criteria.
2. Lab work *KIT* reaction rate chemistry as an instructional media on reaction rate matter stated feasible on the terms of practically by obtaining criteria very feasible based on the results of student responses to the use of lab work *KIT* in the first aspect of knowing student's interest of lab worl *KIT* obtained an average percentage of 97.92%, at the second aspect of knowing the ease of understanding the material obtained average percentage of 93.75%, and on the third aspect of knowing the ease of using lab work *KIT* as instructional media obtained average percentage of 95.83%.
3. Lab work *KIT* reaction rate chemistry as an instructional media on reaction rate matter stated feasible on the terms of effectiveness seen from 11 students passed individually in doing posttest so that classical completeness reaches 91.67% with gain in "medium" or "high" category. In addition, the lab work *KIT* reaction rate chemistry considered feasible on the terms of effectiveness seen from the observation of student activity with a percentage of 89.81% with very feasible criteria.

Suggestion

Suggestions given for further research include:

1. According to manual book, always use safety equipment inside the lab to minimize accidents.
2. Based on validity result for the aesthetic aspect. For the next researcher looking for innovation of the box, to make the appearance more interesting.

3. The use of lab work *KIT* developed only up to the limited trial stage, so it is necessary to conduct research with broader trial to determine the effectiveness of the use of lab work *KIT* as instructional media in a larger class.

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