THE EFFECTIVENESS OF PRACTICUM KIT AS A LEARNING MEDIA TO TRAIN SCIENCE PROCESS SKILLS (SPS)

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Abstract. *This study aims to produce the Practical KIT along with its devices that are effectively used as learning media to train students SPS on the sub material of the Reaction Rate Law. The method used in this study is Research and Development design. The research instrument used consisted of a sheet of pre-test and post-test. Data analysis was carried out in descriptive quantitative to determine the effectiveness of Practical KIT along with the devices developed. The media is said to be effective if it meets 2 requirements, namely the percentage of classical completeness >85% and N-gain value >0.3. The developed media has been declared effective as indicated by the increase in the value of cognitive learning outcomes in the "Medium" and "High" categories with 100% classical completeness, an increase in the value of science process skills of students after using thePractical KIT media. "With classical completeness reaching 91.67%.*

Keywords: Practical KIT, Science Process Skills, Reaction RateLaw, Effectiveness

INTRODUCTION

The implementation of the learning process so far is considered to be less involving students in finding a concept in learning. Learning is more teacher-centered, where the teacher delivers the material as a product and students memorize the factual information (1). According to Permendikbud number 22 of 2016 the principle of learning in the 2013 curriculum is one of them is from a textual approach to the process as strengthening the use of scientific approaches (2). The whole aspects of the scientific approach have been found in the components of science process skills (3). Therefore, this scientific approach can be inserted through learning by training science process skills.

Science process skills are all activities, carried out by students in scientific investigations to enable the acquisition of scientific knowledge and skills (4). Practicum has an important position in a science learning. Laboratory activities are the basis of 21st century science education (5). Practical activities provide a very large role, especially in growing the process skills for science

lessons (6). One branch of Science is chemistry. Learning chemistry should not only focus on learning theory, but students must also experiment to be able to prove the theory they are learning. Learning chemistry should provide scientific experience, such as: formulating problems, formulating hypotheses, collecting data, and drawing conclusions.

But the problem is, now there are still high school in remote areas that do not have laboratories. This will certainly be a problem in the quality of education in Indonesia, especially at the school. Therefore, it is necessary to develop learning media that can help resolve these problems. One solution that can be offered in solving this problem is the development of Practical KIT (Component Integrated). PracticalKIT is a package of teaching aids or tools used for experiments in learning (7). However, the PracticalKIT developed must certainly meet various media eligibility requirements, one of which is media effectiveness (8). Therefore, in this study, the effectiveness of PracticalKIT was tested in training the Science Process Skills in the Sub Material for Determining the Law of the Reaction Rate.

The discussion on the Determination of Reaction Rate Law material was chosen because there has never been any practical development research in either PracticalKIT, Student Worksheet, or practicum guidebook on this discussion In this study the media developed is Practical KIT in the form of practical support devices provided including tools and lab materials, along with Student Worksheet determining the reaction rate equation, and practicum guidebook for determining the reaction rate law. The tools in the PracticalKIT developed is mostly derived from used materials that are easily available in everyday life. Likewise, the materials used in this study are also materials that are easy to obtain in everyday life.

METHOD

Research Design

In this study the method used is the Research and Development method. Research and development design is a process or step to develop a new product or research related to the improvement of existing products. Research and Development (R&D) is a research method used to produce or produce a particular product and test the effectiveness of the product being developed (9).

Research and Development (R&D) design has 10 steps (9). However, in this study adaptation was carried out by adding another stage, namely the Design Review after Product Design and Design Revision was carried out after the Design Study, so that the steps carried out were starting from potential and problems, data collection, product design, design review, design revision, design validation, product testing, and product revision I.

Research Objectives

The target of this study was Practical KIT as a learning media in the sub material for determining the reaction rate equation for 12 students of class XI MIA High School who had received the reaction rate material.

Data Collection Techniques

Data collection in this study was carried out through tests. This test aims to determine the effectiveness of the media seen student learning outcomes in the sub-material determining the reaction rate equation using

PracticalKIT as a learning medium with. The learning outcome test is a test of science process skills regarding the material of the reaction rate. The pre-test was given before students used the PracticalKIT, while the Post-test was given after students used the Practical KIT.

Instrument Development

The instruments used in this study were pre-test and post-test sheets. Both of them contain questions about Science Process Skills which include formulating hypotheses, observing, analyzing data, and concluding. The research instrument used in the form of multiple choice questions and essay questions.

Data Analysis Techniques

Analysis of student learning results data were conducted to determine student learning outcomes before (Pre-test) and after (Post-test) using PracticalKIT media in the form of science process skills tests. The science process skill test questions in the form of a description question that contains the phenomena, then students observe, arrange hypotheses, analyze and interpret data, and make conclusions. The completeness of individual student learning results is said to be complete in learning if students have reached a value of ≥ 75 (10). The value of student learning outcomes is analyzed by the following formula:

$$Score = \frac{score\ obtained}{maximal\ score}\ x\ 100$$

After the individual completeness value is obtained, it can be determined the classical completeness value, namely:

$$C = \frac{complete\ number\ of\ students}{number\ of\ students}\ x\ 100\%$$

C = Classical completeness value

Classes are declared complete classically if $\geq$85% of students complete individually. These results are used to determine the effectiveness of Practical KIT as a learning media developed. Then the value of the Pre-test and Post-test is used to determine the student's N-gain category. But before calculating the N-gain value, the value data of students tested its normality first to determine the data obtained was normally distributed.

Data normality test is a form of testing about normal data distribution. The purpose of this test is to find out whether the captured data is normally distributed data or not. Normal distributed data is data that will follow a normal distribution form where data is centered on average and median values (11). The normality test was performed using SPSS version 20.0 with the Kolmogorov-Smirnov test which showed that the data obtained were normally distributed with a significance value of more than 0.05 ($\alpha \geq 0.05$). After testing for normality and data declared normally distributed, the N-gain value can be calculated.

The N-gain value is calculated by the following calculation (12):

$$< g > = \frac{\% < G >}{\% < G > max}$$

$$< g > = \frac{(\% < Sf > - \% < Si >)}{(100 - \% < Si >)}$$

Information:

Sf = Post-test score

Si = Pre-test score

Then the numbers obtained are converted into the following categories (12):

Table 1 Category ofN-gain

Average score (%)	Category
g > 0,7	High
0,7 > g > 0,3	Medium
g < 0,3	Low

Based on the N-gain category,Practical KIT as a learning media can be said to be feasible from the aspect of effectiveness if student learning outcomes increase with the categories "Medium" and "High (12).

RESULT AND DISCUSSION

The Results of Data Normality

The normality test was carried out using SPSS version 20.0 with the Kolmogorov-Smirnov test which showed that the data obtained were normally distributed if the significance value was more than 0.05 ($\alpha \geq 0.05$). Pretest and posttest data on Science Process Skills learning outcomes obtained by

students have been said to be normal, so that the data can be used to calculate the N-gain value. The student cognitive significance value (α) obtained at the pretest was 0.441, while the significance value (α) obtained at the posttest was 0.145.The Science Process Skills significance value (α) obtained at the pretest was 0.893, while the significance value (α) obtained at posttest was 0.774.The Results certainly meet the minimum criteria of a data that can be said to be normally distributed, that is, at least reaching 0.05.

Learning Result of Student Cognitive

One of the learning outcomes that want to be known and improved in this research is the cognitive learning outcomes of students. Because the cognitive domain includes a part of Core Competencies contained in the curriculum in Indonesia. The cognitive domain (knowledge) in the syllabus is found in Core Competence 3 (13). To determine the increase in cognitive learning outcomes of students, in this study was measured using the question instrument pre-test and post-test. For this reason, before learning using Practical KIT, a pre-test test was carried out and after the learning was done a post-test was conducted.

Before calculating the N-gain value, the pre-test and post-test value data of students tested their normality first to determine the data obtained had been normally distributed. Data normality test is a form of testing about normal data distribution. The purpose of this test is to find out whether the captured data is normally distributed data or not. Normal distributed data is data that will follow a normal distribution form where data is centered on average and median values (11).

Media Practical KIT along with Student Worksheetand KIT Guidebook. This practicum can be said to be feasible in terms of effectiveness if the minimum N-Gain value is 0.3 or is in the medium or high category (12). In addition, the effectiveness of the media must be supported by classical completeness of cognitive learning outcomes with a minimum percentage of 85% (14). Students are said to be complete if the value achieved by students reaches at least the Minimum Completion Criteria of 75 (10). In Table 2 the following results of the pretest and posttest will be presented along with the N-gain value.

Table 2LearningResult of Student Cognitive

Name	Pre-test	Post-test	N-gain	Criteria
S 1	20	100	1,00	High
S 2	40	80	0,67	Medium
S 3	60	100	1,00	High
S 4	40	100	1,00	High
S 5	40	100	1,00	High
S 6	60	80	0,50	Medium
S 7	20	80	0,75	High
S 8	40	80	0,67	Medium
S 9	20	100	1,00	High
S 10	40	80	0,67	Medium
S 11	40	80	0,67	Medium
S 12	60	100	1,00	High

Information:

S = Student

Based on the data in Table 2, the results of the students' pretest cognitive abilities showed that no one had scored above the Minimum Completion Criteria or it could be said that overall from 12 students there was no completion in working on the pretest problem. If calculated in percentage, classical completeness in the matter of the pretest is 0%. The existence of incompleteness at the pretest was caused by many students who forgot the reaction rate material, especially the sub-material for determining the reaction rate equation. In fact there are some children who claim to not understand this material during class learning in the previous odd semester.

But after the learning process is done using PracticalKIT Determination of Reaction Rate Equations along with the devices that have been developed, the overall posttest results of students become increased. If table 2 is interpreted in a graph, a graph is obtained which shows an increase in cognitive learning outcomes in the sub-material for determining the reaction rate equation.

The effectiveness of PracticalKIT learning media and its devices is determined by the value of N-gain (Normalized Gain). The media developed can be said to be feasible in terms of effectiveness if the N-gain value obtained gets a value of >0.3 or is in the criteria of being moderate or high (12).

Based on the calculation, the N-gain value obtained is shown in Table 2. According to the data obtained, the overall N-gain value has reached the required minimum limit. Even the N-gain obtained by 7 students in this study was in high criteria, while the rest were in the criteria of being. The lowest N-gain value obtained by Student 6 is 0.50, while the highest N-gain value is obtained by students 1, 3, 4, 5, 9, and 12 which reach 1.00. Thus, the media developed has been said to be feasible for use in Chemistry learning in the sub material for Determining Reaction Rate Equations in terms of effectiveness.

Apart from being determined by N-gain, the effectiveness of the media developed is also determined by the percentage of classical completeness. In accordance with Table 2, the posttest results of students' cognitive abilities showed a significant increase in value. In working on the posttest questions, all 12 students were declared complete or the value they got had exceeded Minimum Completion Criteria (75). The lowest value obtained by students is 80, while the highest can reach the maximum value of 100. This is in accordance with the minimum criteria for completeness of student learning outcomes which states that the minimum completeness criteria (KKM) students must achieve in learning is 75 . If calculated in percentages, the classical completeness in working on the posttest questions is 100%. This is also in accordance with the expectations of the Ministry of Education and Culture mentioned in the Assessment Guide by Educators and Educational Units which states that the minimum classical completeness that must be achieved in learning is 85% (14).

Learning Results of Students' Science Process Skills

The main learning outcomes that were trained in this study were student Science Process Skills (SPS) learning outcomes. Science Process Skills (SPS) which are trained to students in this study include submitting hypotheses (making hypotheses), observing (observing), analyzing data (analyzing data), and making conclusions (making conclusions) (3). Through learning using Practical KIT along with the devices that have been developed, it is expected that the ability of Science Process Skills (SPS) in the sub-material for Determining the Rate Equation of Reactions that students have can increase. To find out the improvement of students' learning

outcomes in Science Process Skills (SPS), this study was measured using pretest and posttest. For this reason, before learning using the PracticalKIT, a pretest test was conducted and after the posttest test was completed. But before the calculation of the N-gain value, the data on the pretest and posttest scores of students tested their normality first to determine the data obtained had been normally distributed. Data normality test is a form of testing about normal data distribution. The purpose of this test is to find out whether the captured data is normally distributed data or not. Normal distributed data is data that follows a normal distribution form where data is centered on the average and median values (11).

Practical KIT media along with Student Worksheet and KIT Guidebook This practicum can be said to be feasible in terms of effectiveness if the minimum N-Gain value is 0.3 or is in the medium or high category (12). In addition, the effectiveness of the media must be supported by classical completeness of Sciences Process Skills with a minimum percentage of 85% (14). Students are said to be complete if the value achieved by students reaches at least the Minimum Completion Criteria of 75 [10]. In the following table 4.23 the results of the pre-test and post-test results will be presented along with the N-gain value.

Table 3Learning Results ofStudentsSPS

Nama Siswa	Pre-test	Post-test	N-gain	Kriteria
S 1	3,03	75,76	0,75	High
S 2	0	69,69	0,70	High
S 3	15,15	81,82	0,78	High
S 4	36,36	87,88	0,81	High
S 5	15,15	84,85	0,82	High
S 6	15,15	81,82	0,78	High
S 7	18,18	84,85	0,81	High
S 8	21,21	87,88	0,85	High
S 9	6,06	75,76	0,74	High
S 10	15,15	84,85	0,82	High
S 11	24,24	84,85	0,80	High
S 12	30,3	84,85	0,78	High

Information:

S = Student

Based on the data in Table 3, the results of the pretest Skills Ability Science process students showed that no one obtained a score above the

Minimum Completion Criteria or it could be said that overall from 12 students there was no completion in working on the pretest problem. If calculated in percentage, classical completeness in the matter of the pretest is 0%. The existence of incompleteness at the pretest was caused by many students who forgot the reaction rate material, especially the sub-material for determining the reaction rate equation. In fact there are some children who claim to not understand this material during class learning in the previous odd semester. But after the learning process is done using Practical KIT Determination of Reaction Rate Equations along with the devices that have been developed, the overall posttest results of students become increased.

The effectiveness of PracticalKIT learning media and its devices is determined by the value of N-gain (Normalized Gain). The media developed can be said to be feasible in terms of effectiveness if the N-gain value obtained gets a value of 0.3 or is in the criteria of being moderate or high (12).

Based on the calculation, the N-gain value obtained is shown in table 3. According to the data obtained, the overall N-gain value has reached the required minimum. Even the N-gain obtained by students in this study as a whole is at high criteria. The lowest N-gain value obtained by Student 2 is 0.70, while the highest N-gain value is obtained by students 8 which reaches 0.85. Thus, the developed media can be said to be feasible to be used in learning in training students' Science Process Skills (SPS) in the sub material for Determining Reaction Rate Equations in terms of effectiveness.

In accordance with the data contained in Table 2, posttest results Skill Ability Science process students show a significant increase in value. In working on the posttest question, 11 out of 12 students were declared complete or the value they got had exceeded Minimum Completion Criteria (75). This is in accordance with the minimum criteria for completeness of student learning outcomes which states that the minimum completeness criteriathat students must achieve in learning are 75 (10). If calculated in percentage, the classical completeness in working on the posttest question is 91.67%. This is also in accordance with the expectations of the

Ministry of Education and Culture mentioned in the Assessment Guide by Educators and Educational Units which states that the minimum classical completeness that must be achieved in learning is 85% (14).

Based on the explanation above, it is known that 91.67% of students have been declared complete in their SPS learning on the sub-material for Determining the Reaction Rate Equation. This result is supported by Piaget's Cognitive Development theory which states that aged 11 years and above or for high school students should indeed be able to think about several variables in a systematic way, can form hypotheses, and think about abstract relationships and concepts.

The existence of incompleteness in the posttest results of students 2 is due to various things. When learning takes place, these students appear to be less focused on practicing. In the two meetings at practicum 1 and 2, these students often looked sleepy, even when the other students had finished working on the Student Worksheet, students 2 were still not finished working on the Student Worksheet. But these students showed a high increase in SPS learning outcomes. At the pretest this student gets a zero score. When the pretest took place this student had stated that he had not been able to materialize the rate of reaction especially in the sub material for Determining the Reaction Equation during learning in the odd semester before. However, during the posttest, these students received a high increase in grades to reach 69,69.

Students' Science Process Skills Analysis will also be carried out on each component of the PPP taken in this study. For this reason, the SPS test results obtained in a limited trial will be described in the graph found in Figure 1 below.
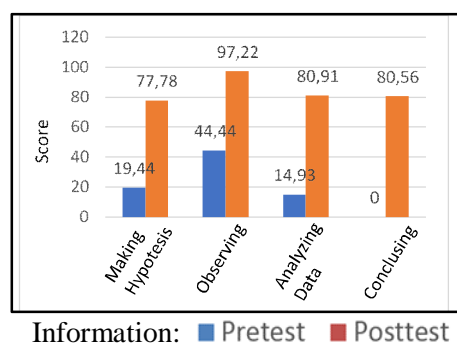

Information: ■ Pretest ■ Posttest

Figure 1 Pretest and Posttest values for each SPS component

Based on the graph contained in Figure 1, the results of the SPS of students experienced an increase in results that were reviewed from before implementing learning using Practical KIT and after carrying out learning using the Practical KIT. This shows the influence of the use of Practical KIT media in the learning process in training SPS students which include making hypotheses, observing, analyzing data, and making conclusions (3).

CONCLUSION AND RECOMENDATION
Conclusion

Media PracticalKIT Determination of Reaction Rate Equations developed has been declared effective as indicated by the increase in cognitive learning outcomes in the category "Medium" and "High" with 100% classical completeness, increasing the value of students' science process skills after using PracticalKIT Determination of Equation Reactions in the "High" category with classical completeness reached 91.67%.

Recomendation

Based on the research that has been done it was found that the Practical KIT media Determination of the Reaction Rate Equation has fulfilled the aspects of content effectiveness. Based on the results of the research, suggestions that can be given to the next researcher are further development related to the Handbook of PracticalKIT. The development research in question is adding instructions for using tools and maintenance of tools while being used in learning takes place.

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