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DEVELOPMENT OF CHEMISTRY STUDENT WORKSHEET WITH PROCESS SKILL ORIENTATION ON THE FACTORS INFLUENCING REACTION RATE MATTER FOR RINTISAN SEKOLAH BERTARAF INTERNASIONAL (RSBI)

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Abstrak: Penelitian ini bertujuan untuk menghasilkan *Chemistry Student Worksheet* yang layak untuk siswa kelas XI RSBI. Jenis penelitian ini adalah penelitian pengembangan dengan desain penelitian *Research and Development* (R&D), sedangkan pengembangan perangkat mengikuti alur 4-D. Sumber data diperoleh dari dosen kimia, guru kimia, dan 12 siswa kelas XI SMA Negeri 2 Lamongan. Instrumen penelitian terdiri atas lembar telaah, lembar validasi, dan angket respon siswa untuk mengetahui kelayakan *Chemistry Student Worksheet* yang dikembangkan. Hasil penelitian menunjukkan bahwa kelayakan ditinjau dari kriteria isi, penyajian, unsur keterampilan proses, kebahasaan, dan respon siswa, berturut-turut sebesar 83,33%; 86,46%; 84,38%; 75,83%; dan 93,92%. Hal ini menunjukkan bahwa *Chemistry Student Worksheet* layak digunakan dalam proses pembelajaran.

Kata Kunci : *Chemistry Student Worksheet*, keterampilan proses, RSBI.

Abstract: The aims of this research is to produce Chemistry Student Worksheet that are feasible for class XI RSBI. Type of this research is development research with research design using Research and Development (R & D). While instructional development follows the 4-D. Sources of data obtained from the chemistry lecture, chemistry teacher, and 12 students in class XI SMA Negeri 2 Lamongan. The research's instrument consisted of review sheet, validation sheet, and questionnaire responses of students to determine the feasibility of developed Chemistry Student Worksheet. The result of research showed that the feasibility of the criteria of content, presentation, component of process skill, language, and student responses in a row at 83.33%, 86.46%, 84.38%, 75.83%, and 93.92%. This suggests that the Chemistry Student Worksheet is feasible for be used in the learning process.

Key Words : Chemistry Student Worksheet, process skill, RSBI

INTRODUCTION

Implementation of *Sekolah Bertaraf Internasional (SBI)* at least one education unit at elementary, junior high school and senior high school is one of the real implementation of the seriousness of the government to improve the quality of national education in line with the accelerated of the flow of information and technology also prepared students of international competitiveness (UU No. 20 tahun 2003 pasal 50 ayat 3). Curiculum that be used in implementation RSBI is *Kurikulum Tingkat Satuan Pendidikan (KTSP)* by inserting or adding the curriculum of developed countries were deemed

suitable to become an international standard curriculum.

Material that be developed for pioneer international high school still limited at Mathematic and Science (Biology, Physic, Chemistry, and Mathematic), English, and ICT. The learning process is done by implementing ICT but still using two language (bilingual) that is English and Indonesia language.

Chemistry is a part of science should be taught to equip the students a knowledge, an understanding and a number of capabilities that be required to enter higher education and to develop science and technology. These objectives can be achieved by learners through a variety of approaches, including an inductive approach in the form of scientific inquiry process at the level of open inquiry. The process aims to growth thinking ability, working and scientific attitude also communicating as well as being one of the important aspects of life skills. Therefore, the learning of chemistry emphasizes providing direct learning experience through the use and development of process skills and scientific attitudes [1].

According to Semiawan [2], the process skills is acquisition developing skills in the learning process by the students so that students can discover and develop their own facts and concepts as well as grow and develop attitudes and values required. This skill not only involve cognitive or intellectual skills, but also involves the manual and social skills.

There is several opinion that divided process skill. According to Bryce, et all [1], process skill divided become three that are basic skill, process skill, and investigation skill. Yeap Tok Kheng [3] too divided process skill become three that are science process skill, experimenting and manipulative skills, and scientific attitudes. Beside that, according to Nur [4], process skills are divided into basic process skill and planning experiment. From the several opinions, so process skills are divided into basic and advanced process skill.

In the senior high school level is taught advanced process skill. This aims to gain experience in applying the scientific method through experiments, where the students conduct testing of hypothesis by planning, making, processing and interpreting data, also presenting the results of experiments [1].

Based on the field study on class XI SMA Negeri 2 Lamongan, it was found that the advanced skills students are lacking, especially in planning experiment skills such as the ability of problem formulation at 33.33%, formulate hypotheses at 44.44%; determine the variables at 20.83%, and defining operationally of variable at 11.81%. For other process skills was found that students' skills in collecting and recording data at 54.86%; analyzing and interpreting data at 54.63% and 66.67% for making conclusions. Beside that, worksheet that be used only contains a few process skills such as purpose of the experiment, the working steps arranged systematically that accompanied by drawings, equipments, tables of observations data, analysis data that is done by answering a few questions, and the conclusion of the experiment.

Ningsih [5], in her research, explained that the implementation of learning by applying process skills can increase mastery learning, but worksheet that be used still Indonesia language and simple. Beside that, research that be done Andianasari [6] states that the developed worksheet to train process skill at element, substance, and mixture is feasible to be used as learning material.

Based on the explanation of facts in field and expectation, so needed to develop Chemistry Student Worksheet that trained more process skills. Presentation of worksheet 1 is done through Direct Instruction with guided student by exercise of science process skill, while the next worksheet used inquiry. Matter that is suitable to

developed this Chemistry student Worksheet is the factors influencing reaction rate. This is in line with Basic Competence that hoped the presentation of matter by experiment. Beside that, equipments and materials that be used are easily to be gained, also the procedure can be used to train advanced process skill.

Based on the above background, so the problem formulation is how the feasibility of Chemistry Student Worksheet with process skills orientation on the factors influencing reaction rates that be developed for class XI beginner senior high school. The feasibility criteria in terms of content, presentation, compliance with process skills, language, and student responses.

Related to the above problems, this research intended to produce a Chemistry Student Worksheet with process skills orientation that is feasible by expecting can be used as alternative of learning material for study activity and can train process skill.

METHODS

Type of this research is the development research with the research design by Research and Development (R & D). Material development refers to the 4-D. Targets in this research were developed Chemistry Student Worksheet. Data sources of this research are review, validation, and student responses resulted. Instruments of this research are review sheet, validation sheet, and questionnaire responses of students.

Validation sheets were analyzed using the Likert scale [7]. Student response data obtained from the questionnaire responses of students is calculated based on Guttman scale [7]. To know the feasibility of developed chemistry student worksheet is used score interpretation criteria as like as Table 1.

Table 1 Score Interpretation Criteria

Percentage (%)	Criteria
0 – 25	Very Less
26 – 50	Less
51 – 75	Feasible
76 - 100	Very Feasible

(Modifycation of Riduwan, [8])

RESULTS AND DISCUSSION

Data from the Chemistry Student Worksheet assessment by experts then analyzed descriptive quantitatively. Validation sheet are presented in Table 2.

Validation results of Chemistry Student Worksheet based on the contents criteria at a worksheet 1, 2, 3, and 4 respectively at 83.33%, 83.33%, 81.25% and 85.42%. These results have meet the feasibility of content criteria that was adapted from BSNP [8] because it has been awarded ajudgment ≥51%. Based on the criteria of interpretation score, it can be said that the feasibility of content criteria for the Chemistry Student Worksheet is very feasible.

Very good or very feasible category in criteria of content is acieved because developing Chemistry Student Worksheet has meet criteria of content that is described in BSNP [8] that the material reflects the descriptions of matter that contained in the Competency Standard and the Basic Competence that is exist in the KTSP and Cambridge curriculum. Based on the Competency Standard and Basic Competence, this matter requires students to conduct an experiment in mentioning the influenced of the factors (concentration, surface area, temperature, andcatalyst) on the reactions rate that involves process skills so students can find their own facts or concepts that exist. In addition, a description as a phenomenon or evaluation are presented in accordance with the development of thinking and teaching materials of students in senior high school because it can describe a concrete example (which can been countered by learners) until abstract

examples (which are imaginative can easily be imagined by students). The material that is presented can also give benefits for knowledge such as introducing equipments in laboratory or about the uses of substances that existing in around environment.

Table 2 Validation result from chemistry lecture and teacher

No	Aspects	Percentage (%)			
		Worksheet 1	*Worksheet 2*	*Worksheet 3*	*Worksheet 4*
1	Content	83.33	83.33	81.25	85.42
2	Presentation	84.72	87.50	86.11	87.50
3	Compliance with process skills	84.38	84.38	84.38	84.38
4	Language	78.30	75.00	75.00	75.00
Percentage of all aspects		82.12	81.94	80.77	82.64
Criteria		Very good	Very good	Very good	Very good

Validation result of presentation criteria of Chemistry Student Worksheet on worksheet 1, 2, 3, and 4 respectively by 84.72%, 87.50%, 86.11% and 87.50%. The results showed that the Chemistry Student Worksheet can be said feasible because have gotten an assessment $\geq$ 51%.Therefore, based on the Chemistry Student Worksheet is very feasible.

Very feasible presentation criteria is obtained because concepts that are presented in the Chemistry Student Worksheet have meet categories that existing in BSNP [8] are a logical and systematic presentation of material that means in accordance with the logic inductive (specific to general). An interesting variation of the presentation of the material, not boring, and can evoke motivation (curiosity) of students to the material, can stimulate students to think more deeply about the material. In addition, presentation of process skill in finishing a problem in phenomenon also has sorted by starting to plan experiment acttivity, then conduct experiment, collect and record data, analyze and interpret data, and the last is making conclusion. Illustration of figures, tables, and charts as well as text layout are harmonious, clear, relevant and accurate that can support the concept. This presentation also pay attention to the orientation of the skills that are used as the basis for the development of this Chemistry Student Worksheet.

The developed Chemistry Student Worksheet is said to have meet the criteria of the compliance of the process skills component if the Chemistry Student Worksheet have meet process skills component for all aspects that be research include: planning experiment (formulating problem, making hypotheses, determining variables, defining operationally variables, and makinga scheme of procedure), conducting experiments, collecting and recording data, analyzing and interpreting data, and making conclusion.

Chemistry Student Worksheet validation results based on the criteria of compliance with process skills component on worksheet 1, 2, 3, and 4 respectively by 84.38%. Based on the results of the validation, Chemistry Student Worksheet is said very feasible because it has a rating 76-100%.

Assessment of very good or very feasible category is obtained by Chemistry Student Worksheet in terms of process skills component criteria in accordance with process skill of Yeap Tok Kheng [3]. This is because Chemistry Student Worksheet have presented process skill component well. Planning experiments are presented to train students to plan experiment from a phenomenon. These activities include formulating the problem, making hypothesis, determining variables, defining operationally variables, and making a scheme. Collecting and

recording data activity after conducting experiments which are presented to train students to collect and record data as well as in table form.Activities of analyzing and interpreting data are trained to help students to analyze and interpret data from experiments by presenting a few questions. Activities of making conclusions that contained in the Chemistry Student Worksheet trained students to make a statement that the answer of problem formulation based on the results of the experiments that have been performed.

For language criteria, validation results of the Chemistry Student Worksheet for Worksheet 1 by 78.30% and for Worksheet 2, 3, and 4 respectively by 75%. Based on these validation results, Chemistry Student Worksheet can be said feasible because it has a rating ≥51%.

Based on BSNP [8], the feasibility of Chemistry Student Worksheet in terms of language criteria can be obtained due to the language that be used, can describe a concrete example (which can been countered by learners) until abstract examples (which are imaginative can easily be imagined by students). Accuracy and ease of the use of spelling, terminology, and the language that be used, could easy student to understand matter or concept that be studied. Using a communicative language can facilitate substance of the messages learned from each of the relevant discussion.The use of English is good and right with reference to the rules of writing in English. In addition, the use of terms and symbols that describe a concept, principle, a certain meaning, or others have been steady turf in the Worksheet.

Table 3 Result of student response

Worksheet	Percentage (%)
Worksheet 1	95.83
Worksheet 2	95.83
Worksheet 3	90.97
Worksheet 4	93.06

Student response is a response and opinion that be given by students on a number of questions about the developed Chemistry Student Worksheet. Based on Table 3, it can be said that Worksheet 4 with an overall Worksheet qualifies as very feasible. This is because, every criteria is suitable with BSNP [8]. In addition, the positive response from students' comments to the developed Chemistry Student Worksheet. Generally, students commented that the Chemistry Worksheet with process skills orientation nice, attractive, and the English language used easy to understand.

CONCLUSION

Based on data analysis and discussion, it can be concluded that the Chemistry Student Worksheet has been developed suitable as learning devices for obtaining the percentage of ≥ 51% for all aspects including: criteria of content as 83.33%; criteria of presentation as 86.46%; criteria of compliance with component of the process skills as 84.38%, criteria of language as 75.83%, and student responses as 93.92%.

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