Development of a Problem Based Learning Lab Worksheet on Chemical Material in The Life of 10th MIA Grade Senior High School

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Abstract

This study aims to develop practical worksheets and find out the feasibility of PBL lab workshops with chemical material in life for student of 10th MIA Grade High School. This research is classified as a development research subjects from Public Senior High School 2 Maumere and St. Gabriel Maumere High School. Data collection techniques through interviews, observation and questionnaire with instruments in the form of interview sheets, validation data analysis using Aiken Formula, while the feasibility analysis is based on the feasibility category which refers to a scale of 5. The result showed that PBL based lab worksheet were developed by modifying the 4-D model, namely define, design dan develop. Based on the calculation of a practicum Student Worksheet valid with a value of 0,93. Student Worksheet practicum is suitable for use based on the assessment of students and teachers. Assessment of students on an individual scale, small group and field respectively 82,60, 83,60 dan 83,43. Teacher ratings at individual, small group and field scale were 138,00, 139,00 and 139,50 respectively.

Keywords: Student worksheet practicum; problem based learning model; chemical material in Life

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INTRODUCTION

The learning process of Natural Sciences emphasizes the help of direct experience to develop the potential that exists in students (Martini, 2008).. Education is very important in human life. The national education system based on Law Number 20 Year 2003 states that "education is a conscious and planned effort to create an atmosphere and learning process in developing student potential. This expression means that education has a direct relationship with learning activities. The learning aspect includes several components, including: students, teachers, subjects, curriculum, learning methods, and supporting facilities and infrastructure.

The curriculum is one element that contributes significantly to the learning process. The latest curriculum used is the 2013 curriculum. This curriculum is a refinement of the education unit level curriculum (KTSP). The 2013 curriculum is an integrated effort between reconstruction of graduate competencies, suitability and adequacy, depth and breadth of material, learning revolution and assessment reform. One refinement of the mindset of the 2013 curriculum is the change in passive learning patterns into active learning patterns.

Students actively seek knowledge and are strengthened by using a scientific approach to learning models (Sirait & Hutabarat, 2015). Chemistry is a science that studies material in the form of structure, composition, nature and changes in matter and energy that accompany it (Agung Nugroho, Catur Saputro & Irwan Nugraha, 2008). Chemistry involves scientific investigations. Based on a scientific approach to chemistry is seen as a science that is rich in concepts and experiments, but is abstract.

The conclusions of the results of observations and interviews with chemistry subject teachers at Public Senior High School 2 Maumere and Catholic St. Private Senior High School Gabriel Maumere, that the chemistry in life is still considered difficult for students. The solution to this problem is to change the learning paradigm. Arnyana (Ida 2010) explains that several learning paradigms are as follows: (1) the teacher as a source of knowledge acts as a learning companion, (2) learning based on facts into problem-based learning or projects, (3) the habit of repeating and training towards planning and inquiry. Ida (2010) further explained that the application of problem-based learning, namely applying the Problem Based Learning (PBL) model.

PBL is a learning approach that exposes students to problems. With the knowledge and abilities that have been owned, students are required to solve problems that are rich in concepts (Herman, 2007). The application of the PBL model is proven to provide good results in research into student learning outcomes. Research by Ida (2010) provides results that the implementation of PBL affects student learning outcomes in terms of IQ in class XI science students of Public Senior High School 1 Ubud. Research in line by Ulfah (2013) shows the results that the application of PBL models increases students' critical and logical thinking skills. Another study by Fadlana (2013) states that in the material of acid, base and salt of class VII of SMP Negeri 1 Jaten Karanganyar in the 2012/2013 academic year, there is an influence of the use of PBL learning models with macromedia flash and worksheets on student achievement in terms of student motivation.

Trianto (2007) explains that the worksheet is a guide to the exercise of developing cognitive aspects as well as all aspects of learning in the form of experiments and demonstrations. The use of worksheets is expected to be able to increase students' understanding in learning problem-based material, so that students have a high sense of curiosity and are able to motivate and encourage student activity in learning. Therefore, Student Worksheet can act as one of the supporting media in the learning process.

METHOD

Development research is a process for developing a new product or perfecting an existing product. In this development research design, researchers chose a modification of the Four-D (4d) model to develop Student Worksheet learning tools. This model was developed by S. Thagarajan, Dorothy S. Semmel, and Melvyn I. Semmel (Trianto, 2007) which consists of 4 main stages: (1) Define, (2) Design, (3) Develop (Development) and (4) Disseminate.

The subjects in this study were students of 10th MIA Grade MAN 2 Maumere with low, medium, and high ability categories and a chemistry teacher. Data collection techniques in this study use non-test techniques to determine the feasibility of Student Worksheet. Non-test techniques consist of observation, interview or discussion, document review and questionnaire. The research instrument for developing

worksheet based on Problem Based Learning on chemical material in the life of 10th MIA Grade Public Senior High School The data processing in this study was carried out using qualitative and quantitative analysis with the validity and feasibility of student worksheet data.

Data analysis technique in this research is data analysis needs of student worksheet product development using qualitative descriptive techniques and will be explained narratively. This data analysis includes a preliminary study of the state of students, material / concepts and learning objectives. Assessment of Practical Worksheet based on Problem Based Learning by experts and practitioners (teachers) using quantitative analysis.

Student worksheet practicum based on problem based learning has been validated beforehand by experts namely, experts in material, language, media and field practitioners (teachers). The aspects of assessment include aspects of material, presentation, linguistic and graphic. Calculation of content validity using the Aiken Formula, with the number of rater (assessors) of five people and a reference value of V of 0.87 (Aiken, 1985: 134). Based on the calculation of the validity data, the mean value of V obtained was 0.89. These results indicate that student worksheet practicum of chemical material in life has met valid criteria. The average percentage of validity of student worksheet chemistry practicum in life in each aspect, including, the material aspects (92.0%), presentation aspects (90.0%), language aspects (90.0%) and graphic aspects (90, 0%).

RESULTS AND DISCUSSION

Figure 1. Diagram percentage of the results of the validation analysis by experts and practitioners.

Analysis of Questionnaire Results Data

Analysis of the questionnaire results data includes the feasibility assessment of practical worksheets by chemistry students and teachers.

Teacher Eligibility Questionnaire

Data analysis of teacher questionnaire results is divided into three parts, namely data analysis of teacher questionnaire results in individual trials, small group trials and field trials. The results of the feasibility assessment of the student worksheet of chemical practicum in a row in the

three parts of the trial, namely: 138.00; 139.00 and 139.50. When compared with the product evaluation criteria (Table 3.4, page 43), the PBL-based chemical practicum worksheet on chemicals in life is classified as good and suitable for use in learning chemistry. Increased scores from individual trials to field trials due to revisions based on suggestions and comments for improving the product from the teacher as a product user.

Figure 2. Diagram of percentage of questionnaire by teacher

Student Eligibility Questionnaire

Analysis of student questionnaire results data is divided into three parts, namely analysis of student questionnaire results data in individual trials, small group trials and field trials. Based on the assessment categories of student worksheet eligibility in Table 3.5 (page 43), it was concluded that the chemistry worksheet was classified as very good so it was suitable to be used. The

results of data analysis in each trial amounted to 82.60; 83.60 and 83.43. An increase in scores due to the results of revisions made based on suggestions and comments from students on each product trial and the number of students is increasing so that we get a lot of input improvement of product improvement. The filling out of the feasibility questionnaire practicum worksheet in field trials involved students in two different schools.

Figure 3. Diagram percentage of data analysis of questionnaire results by students

Content Feasibility Aspect

Aspects of the feasibility of the contents include the suitability of the material with several things, including competence, independent task content, experimental activities, student needs, the process of concept discovery, PBL syntax and knowledge insights. Percentage of content eligibility in teacher questionnaires for individual, small group and trial trials try field in a row of 91.10%, 88.80%, and 90%. The percentage of content eligibility in student questionnaires for individual trials, small groups and field trials were 90%, 92.90% and 90.50%, respectively. .

Language Aspects

Assessment of aspects of language includes several things, including communicative language, the meaning of language, clarity of sentences and the suitability of language with standard rules. The percentage of languages in the teacher questionnaire for individual trials, small groups and field trials were 92%, 88% and 94%, respectively. The percentage of languages in the student questionnaire for individual trials, small groups and field trials were 93.30%, 92.50% and 93.80%, respectively. This percentage shows that the chemistry lab worksheet is feasible in terms

of language based on teacher and student assessment.

Presentation Aspects

Evaluation aspects of the presentation include several things, including systematic presentation, the presence of pictures and illustrations, clarity of the objectives of the activity, the existence of motivation to learn, the discovery of the concept of the material, presentation of student worksheet instructions and competencies, supporting information and work steps. The percentage of presentations on teacher questionnaires for individual trials, small groups and field trials were 92.70%, 98.10% and 95%, respectively. Percentage of presentations on student questionnaires for individual trials, small groups and successive field trials participated by 89.30%, 92.40% and 91.2%. This percentage shows that the chemistry lab worksheet is feasible in terms of presentation based on teacher and student assessments.

Graphic Design Aspects

Evaluation of the graphic aspects includes several things, including the type of letter, layout and the location and the worksheet design. The percentage of skills in teacher questionnaires for individual trials, small groups and field trials were 92%, 92% and 96%, respectively. The percentage of graphics in the student questionnaire for individual trials, small groups and field trials were 96.60%, 93.80% and 93.25%, respectively. This percentage shows that the chemistry lab worksheet is feasible in terms of presentation based on teacher and student assessments.

This research has produced a final product in the form of student worksheet -based chemical lab work on chemical material in the life of 10th Grade Senior High School class using 4D models. This practicum worksheet is expected to be an alternative learning media for 10th MIA Grade high school students in learning chemistry especially practicum activities. Chemistry worksheets have gone through the experts' validation stage, the feasibility testing stage both in the scope of individuals, small group trials and field trials and are classified as very good by students and both by teachers. This practicum student worksheet has fulfilled the valid requirements with the average percentage of validity of material aspects, presentation aspects, aspects of language and graphic aspects of 90.5%.

The similar research conducted by Putriani (2017) about the development of worksheet

based on science process skills in chemical materials in life was declared feasible based on expert validation. The percentage in the material aspect is 92.0%, the presentation aspect is 90.0%, the linguistic aspect is 90.0% and the graphic aspect is 90.0%. Another study by Setiawan & Mitarlis (2015) about the development of Soft Skills-oriented student worksheets on chemistry in life. Based on the results of this research, it can be seen that the student worksheet is suitable to be used because it meets the eligibility of the content criteria of 79.16%, the criteria of suitability of the soft skills approach of 75%, the presentation criteria of 80.45% and the language criteria of 80.56%.

Hendri and Paradhilla (2020) explained that the Student Worksheet for the experiment contained a) objectives, b) tools and materials, c) work procedures, d) observations, and e) questions and conclusions. The development of PBL-based worksheet in this study can improve the cognitive aspects of students. In line with the results of research conducted by Selviani (2019) there are significant differences in learning achievement between students using PBL biology modules and those using PBL models without modules seen from the level of learning achievement of students who use modules with PBL steps independently higher compared to being guided by the teacher without modules.

The development of practicum worksheet has several advantages and disadvantages. The advantages of student worksheet, namely:

- a. Student worksheet can add insight and develop problem analysis skills in students;
- b. The student worksheet presentation is equipped with a brief theoretical basis about the chemistry in life, illustrated pictures, chemical information and motivational sentences in increasing student enthusiasm for learning;
- c. Development of worksheets is adjusted to the 2013 curriculum.

The weaknesses that become the limitations of this study, namely: the study sample only covers two schools namely: St. Katolite High School Gabriel Maumere and Public Senior High School 2 Maumere. The worksheets produced were only the results of trials from the two schools, not yet representing the entire high school. and the development of LKS is limited to chemicals in life. Whereas the other material has not yet been carried out an experiment to develop LKS.

The weaknesses that become the limitations of this study, namely: the study sample only covers two schools namely: St. Katolite High School Gabriel Maumere and **Senior High School 2** Maumere and the development of worksheets is limited to chemicals in life.

CONCLUSION

Development of student worksheet practicum based on problem based learning on chemical materials in the life of class X high school, using a modification of the Four-D model with stages: Define; Design and Develop.

Student worksheet practicum based on problem based learning on chemistry in life is appropriate to be used in both good and very good categories respectively by chemistry teacher and class X high school students.

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