

## THE STUDENTS' RESPONSE OF TRIAL IN THE BILINGUAL WORKSHEET ORIENTED BY PROBLEM SOLVING IN ACIDS AND BASES MATTER IN THE XI CLASS SMA NEGERI 1 MANYAR

Luthfi Faza Afina Riza Walida dan Dian Novita

Jurusan Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Surabaya  
HP: 081235071999, email: [Afina\\_Faza@rocketmail.com](mailto:Afina_Faza@rocketmail.com), [Diannovita@gmail.com](mailto:Diannovita@gmail.com)

### Abstrak

Penelitian ini dilakukan untuk mengetahui respon siswa terhadap ujicoba *worksheet* berorientasi *problem solving* pada materi Asam dan Basa di kelas XI SMA Negeri 1 Manyar. Metode penelitian yang digunakan dalam penelitian ini adalah metode *Research and Development* (R&D). Pada tahap R&D terdapat ujicoba secara terbatas. Ujicoba terbatas ini dilakukan kepada 20 siswa-siswi SMA Negeri 1 Manyar dengan tujuan untuk mengetahui dan memperoleh data yang berupa respon/tanggapan siswa terhadap *worksheet* berorientasi *problem solving* yang dikembangkan. Teknik analisa data untuk hasil respon siswa dengan menggunakan deskriptif kuantitatif. Presentase data angket yang diperoleh dihitung berdasarkan skala Guttman. Respon siswa terhadap isi dari *worksheet* sebesar 94%, terhadap penyajian meliputi kesesuaian dengan komponen *problem solving* sebesar 97,5% dan kesesuaian dengan struktur umum *worksheet* sebesar 88,75%, serta terhadap bahasa pada *worksheet* sebesar 86,67%. Sehingga, menunjukkan bahwa *worksheet* yang dikembangkan mendapatkan respon baik.

**Kata Kunci:** *pengembangan worksheet, problem solving, Asam dan Basa*

### Abstract

This study was conducted to determine student's response to test worksheet which oriented problem solving on Acids and Bases material in class XI SMA Negeri 1 Manyar. The method was used in this research is Research and Development (R&D). In this method there is limited on trial step. Limited on trial test was conducted to 20 students of SMA Negeri 1 Manyar to determine and obtain the data of student's response about development of problem solving oriented worksheet. The analysis for the result of the students's response by using quantitative descriptive. Percentage of questionnaire data that is calculated based on Guttman Scale. Students' response to the contents of the worksheet is 94%, presentation which includes suitability with problem solving component is 97.5%, suitability with the general structure of the worksheet is 88.75%, and the language is 86.67%. Its shown that, the worksheet which is developed get good response.

**Keywords:** *development worksheet, problem solving, Acid and Base*

### INTRODUCTION

One of the aims of chemistry learning in high school according to National Education Standard Institution/Badan Standar Nasional Pendidikan (BSNP) (2006) is students have ability to apply the scientific method through an experiment, in which students conduct experiments to test the hypothesis through the installation of instrument, retrieval, processing and interpretation of data and present the results orally and writing [1].

Based on questionnaire result, there are 52% of students felt difficulty in learning of Acids and Bases matter. Characteristic of Acid

and Base matter is the matter that comes with experimentation and calculation activities. The experiments can be done through a problem solving activities. According to Sudjana (2011) the problem solving steps include: there is an obviously problem to be resolve, looking for data or information that can be used to resolve the problem, making hypothesis, examine hypothesis and make conclusions [2]. Steps of problem solving can be done through a learning process.

Learning is a process of students interactions in a learning environment (Law no. 20/2003, learning source Chapter 1 Section Paragraph 20) [3]. One of the goals is to

improve the learning Chemistry skills such problem solving can be done through the development of learning tools in the form of a worksheet.

Based on the results of problem solving tests to the students of SMA N 1 Manyar there are 16% the students that is good in making problem formulation there are problem in based on phenomena presented, 44% of the students are good in making hypothesis based on problem formulation that was created before. In addition, when asked to determine the research variables shown that 48% of students are right in answer and 36% of students are good in presenting data, and as many as 40% of students in are in good making conclusion.

The development of worksheet that completed with experimental activities and problem solving exercises in the form of computational are expected to train problem solving skill question that consists of analyzing the problem, making the problem formulation, determining hypothesis, examining hypothesis which includes determining the variables, presenting the data, analyzing, and making conclusions.

Therefore, the researchers wanted to find a student response to the worksheet that was developed based on BSNP (2006) that the worksheet which is developed should accordance with the eligibility criteria of content, presentation which includes suitability with components of problem solving and general structure of the worksheet and languages.

Based on the description above can be formulated in a problem "How the students responses to the bilingual worksheet that developed". Based on, problem formulation, the aims of this study is the development of the worksheet to determine students responses to the worksheet that developed. Development of a worksheet oriented to problem solving, is expected can provide benefits to some parties. For students, it is expected can train ability of students in solving problems objectively. For teacher is expected an overview of the worksheet oriented problem solving for the matter of acids and bases, and for other researchers is providing new ideas in education

to create learning chemistry more creative and innovative.

One of the objectives learning of chemistry based BSNP (2006) is students have the ability to apply the scientific method through an experiment, weather students conduct an experiments to test the hypothesis by designing instruments through to the installation, retrieval, processing, and interpretation of the data and submit the results of the experiment orally and writing. In addition, to make the students understand the concepts, principles, laws, and interrelationships of chemical theory and its application to solve the problems in daily life and technology [1]. Based on the purpose of chemical subjects that have been mentioned, it is supported by the method of problem solving. The components of the scientific method is suitable with problem solving steps [2].

Problem solving method is a way of presenting the material by making the lessons as a starting point for the discussion of issues that should be analyzed and synthesized in searching of solution or answered by students. Actually with studying the experimental method, we are able to understand what is meant by the method of problem solving because both of those procedure methods are same.

Problem solving methods in this research is adapted from problem solving method proposed by Sudjana (2011), which consists of five steps, there are resolving the real problem, looking for data or information that can be used to solved the problem, making hypothesis, examining hypothesis, and making conclusions [2].

The basic theory of problem solving that Piaget's theory of Constructivism and Vigotsky is theory of Social Constructivism. According to Piaget, knowledge is not something that is given of nature as the result of human contact with nature, but knowledge is the result of construction (formation) of human self [4]. So, with a stage that is used to solve scientific problems, students can be trained construct their own knowledge through direct observation.

In addition to the theory of Constructivism, Vygotsky theory of Social Constructivism believe that social interaction with others refer to the development of new ideas and enrich student's intellectual development. Learning occurs through social interaction among peers. With the challenges and appropriate support from the teacher or a more capable peers, students move to their nearest development zone where the new learning is happened [5]. Thus, the problem solving method that encourages students to perform scientific activities to resolve the issue supports the students can construct their own knowledge through social interaction with other students by group discussion.

## METHOD

Researching methods that is applied in this study use research and development (R&D) method. In this method there is limited on trial step.

The research was conducted through a limited test. Limited test was conducted at 20 students of class XI SMA Negeri 1 Manyar. The purpose of this trial was to evaluate the response worksheet that was developed based on the content, presentation which includes suitability with the components of problem solving and general structure of the worksheet and languages.

The trial done by dividing worksheet and divided students in five large groups that each group consists of four students. After that, researchers divided the worksheet, for each student the tools and materials that is used to conduct experiments.

Beside that, students were asked to fill the worksheet. Author also divided the student questionnaire responses to determine students response to worksheet that was developed. Thus, the data that is obtained in the form of student questionnaire responses and students answers data as supporting data.

The technique of data analysis for the results of the students responses is using quantitative descriptive. Student respon is obtain in the percentage that is calculated based on Guttman scale. Guttman scale is a scale that is used for clear and consistent

answer [7]. The statements table of Guttman scale, as follows:

**Table 1.** Statement of Guttman Scale

Statement	Value/Score
Yes	1
No	0

The results of student responses are used to determine students responses to the worksheet that has been developed with the calculation formula percent, as follows:

$$P(\%) = \frac{\sum \text{students who give answered "yes"}}{\sum \text{of student}} \times 100\%$$

Based on the student's responses the worksheet was got good response if the percentage is 61%.

Beside that, by using the response data, this research was supported by the results of increasing percentage problem-solving skills of students who are seen before and after using this worksheet. The obtained percentage of correct or incorrect student answers given in the student's worksheet.

## RESULT AND DISCUSSION

The obtained data was in the percentage data from the results of student's responses that analyzed using quantitative descriptive. Student responses were from the percentage of students who answered "yes" to the contents, presentation which include suitability with the component of problem solving and general structure of the worksheet and languages of the worksheet that had been developed.

The results of student responses to the content of worksheet got percentage 94%. The results of percentage indicates the worksheet which developed got a good responses. Students responses to contents of the worksheet is proposed by BSNP (2006) [1]. This is reflected in the material contained in the worksheet adjust to the Educational Level Unit of Curriculum/Kurikulum Tingkat Satuan Pendidikan (KTSP) and Cambridge curriculum, accordance with Standard of Competence/Standar Kompetensi (SK), Basic Competency/Kompetensi Dasar (KD), and indicators, suitability of facts, concepts, theories, and descriptions of examples and



exercise to make students became challenged to learn more.

The students response to the presentation of the worksheet include the suitability with component of problem solving and obtain 97.5%. The percentage indicates that the worksheet got a good response. The suitability with problem solving component refer to the problem solving method that is proposed by Sudjana (2011) [2].

The percentage that obtained was very high, it indicates that this worksheet also can practice a problem solving skills, which includes: making problem formulation, determining the hypothesis, examining hypothesis which include determining research variables, presenting the data in the table, analyzing the question and making conclusion.

The result above are seen when student can answered the problem formulation correctly, determined the hypothesis, examined hypothesis which include determine the research variables, present data in table, analyzed the question and make conclusion on the worksheet that are presented in figure 1, 2, 3, 4, 5 as follow:

Berdasarkan fenomena pada halaman 20, tuliskan di bawah ini rumusan masalah!  
Bagaimana cara mengetahui suatu pH pada larutan?

**Figure 1.** Student Answer When Making Problem Formulation

Berdasarkan rumusan masalah, tuliskan di bawah ini hipotesis kamu!  
Menggunakan indikator universal.

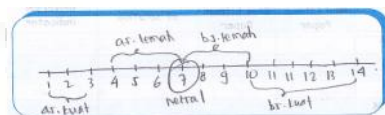
**Figure 2.** Student Answer When Making Hypothesis

• Variabel Kontrol : indikator universal  
• Variabel Bebas : larutan yang diuji  
• Variabel terikat : perubahan warna pada indikator universal

**Figure 3.** Student Answer When Determining the Research Variables

Larutan	Perubahan Warna		Sifat Larutan	pH menurut indikator universal
	Kertas Lakmus Merah	Kertas Lakmus Biru		
$\text{NH}_4\text{OH}$ 0.1M	Biru	Biru	Basa	9
$\text{HCl}$ 0.1M	Merah	Merah	Asam	2
$\text{NaOH}$ 0.1M	Biru	Biru	Basa	13
$\text{CH}_3\text{COOH}$ 0.1M	Merah	Merah	Asam	3

**Figure 4.** Student Answer When Presenting the Observation Data in the Table Form



**Figure 5.** Student Response When Making Conclusion

Piaget's constructivism theory states that knowledge is built by humans step by step, and the result is expanded through a limited context. Knowledge is not a set of facts, concepts, rules that are ready to be taken and remembered. Human must construct and give the meaning through real experience [8]. So, by doing problem solving activities, students was able to construct and build their knowledge. The other theory underlying, that is theory of Social Vygotsky's theory states that social interaction with others to accelerate the development of new ideas and enrich students intellectual development. The learning process occurs through social interaction between peers.

With the challenge and appropriate support from the teacher or more capable peers, students move to their nearest development zone where the new learning is happened [5]. The presentation categories are also seen from suitability with the general structure of worksheet that includes a study guide, a description of the contents in accordance with the standards of competence and basic competences, supporting information, the presentation of the task, statutes of illustrations, and text layout, the presented image is matching. So, it make the students motivated and easy to understand

Feasibility is also seen from the students response to the language that is used which got 86.67%. From the percentage it can indicated that worksheet get a good response from the students. This language criteria refers to the

criteria based on BSNP (2006) [1]. That feasibility language consider the following: straightforward (simple spoken sentences and directly to the objective), communicative (messages or information submitted with an interesting and unusual language in to increase delighted when students read it), accordance with Indonesian rule, and the use of symbols. Based on criteria above, this feasibility of the language criteria in this worksheet include: writing worksheet by using language appropriate to the development level of students, the presentation of the material use communicative language that can help students understand the material easily, precision of language use the correct English spelling and grammar can increase students' knowledge in understanding the existing worksheet, regularity of language between chapters, sub-chapters, paragraphs, and sentences are good and right, and the use of terms in chemical raw is correct and so easy to understand.

Language has an important role for students, because by using language students can understand the information that gives to students. One important aspect feasibility of language criteria it use accordance to the development level of students. it is supported by the Jean Piaget's theory states that every child develop the capacity to think in an orderly stages. Thinking process of student is gradual activity, step by step with intellectual function, concrete toward the abstract [4].

Students' response data to the contents, presentation which includes suitability with the components of problem solving and general structure of the worksheet and languages can be presented in the following table:

**Table 2.** Student's Respon to the Worksheet

No.	Student Responses	Percentage (%)
1.	Content	94%
2.	Presentation	
	a. Suitability with component of Problem Solving	97.5%
	b. Suitability with	

No.	Student Responses	Percentage (%)
	General Structure of Worksheet	88.75%
3.	Language	86.67%

Beside the student response data to the worksheet that developed. These results are supported by the results of the tracking test of problem solving tests that have been done before using this worksheet show only 16% of students can make the problem formulation when a problem is presented in the form of phenomena, but after using the worksheet that is oriented problem solving, there are 60% of students can make problem formulation. The other data as much as 44% of students can determine the hypothesis related to the problem formulation. After used the worksheet that is oriented with problem solving as many as 60% of students can determine the hypothesis. The next step, to examine the hypothesis that is carried out by determining variable. Based on the initial test that have been done as many as 48% of students can define variables and as many as 36% of students can present observational data in tabular form. However, after learning by using the worksheet that is oriented with problem solving there are an increase as many as 75% of students that can determine the variables and 100% of students can present the data in tabular form correctly. Next, make conclusions from the observations during the experiment.

When making a conclusion, students had asking to analyze according to the questions, and then make a conclusion and after they are trained skills through this worksheet as many as 80% of the students can make a conclusion correctly.

## CLOSURE

Based on the research that has been conducted, show that the students' response to the worksheet that is oriented with problem solving get a good response. When the percentage of student responses for each criterion achieve 61%. Results of students' response to the contents criteria of the

worksheet is 94%, suitability presentation of worksheet with problem solving component is 97.5% and with the general structure of the worksheet is 88.75%, and the language criteria in the worksheet is 86.67%. So, the worksheet can be used to support learning.

This suggestion of this research is the problem in the phenomena page can be added with more variety.

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