CHAPTER IV
RESULTS AND DISCUSSION

This study aims to obtain a practicum guides based on PBL to Improve Student Chemistry Results on Materials acid and base in accordance with BSNP (National Education Standards Agency). The data described in this study include: Analysis of selected high-chemistry chemistry guide for class XI Erlangga publisher on acid and base substance based on BSNP; analysis of practical guides developed under BSNP; the acquisition of student value on acidic and basic substances with a practicum guide that has been developed; and the effectiveness of the practicum guide that has been developed.

4.1. Preliminary Analysis Selected Chemical Practicum Guide High School Chemistry Based on BSNP

The analysis of the initial stages of the selected chemistry guide of SMA chemistry based on BSNP can be seen in Figure 4.1 below:

Figure 4.1. Preliminary Analysis Results Selected Practical Guidance Chemistry SMA

Detailed weakness of practical guide chemistry workshop that has been analyzed is shown in the following table:

Table 4.1. Weakness Practical Guidance Chemistry Analyzed

Criteria BSNP	weakness Guidance Practicum
Contents	• Coverage of the material presented does not reflect the description of the substance of the material contained in CS and BC • Depth sub material not fit in maturity learners
Language	• Use language simple enough
Presentation	• Basic theory too short • Bit picture there is • less staining in laboratory manual • Working procedure is too monotonous • There is no labor safety procedures in the laboratory • There is no security symbol or symbol in the laboratory

From the analysis: Analysis of Selected Chemical Practicum of SMA Chemistry for class XI of Erlangga publisher on base matter acidity and based on BSNP obtained the average value average of 2.65 is quite valid and does not need to be revised. There are 3 aspects in BSNP assessment that is, 1) the feasibility of content = 2.73 is quite valid and no need revision; 2) language eligibility = 2.50 is Less valid, some of the module contents need revision; 3) presentation feasibility = 2.73 is valid enough and does not need revision (attached to appendix 5). Based on the results of the analysis on the practical guide can be identified the average value on the language feasibility of 2.50 is less valid some of the contents of the guide need revision, because the use of language is less simple. While in the

aspect of presentation feasibility can be identified average value 2,73 is quite valid and not need to be revised but at component of lab chemistry guide need to be added base of theory, coloring book manual practice so that student interested to read it, labor safety and symbol or symbol security in the laboratory.

4.2. Development of Chemical Practicum Guide

Based on the analysis of the chemistry practicum guide obtained in the guidance analysis of the material coverage presented reflects the substance of the material contained in the CS and the BC according to the KTSP 2006, so that the developed guides contained material coverage that reflects the substance of the material contained in the CC and BC in accordance with the Curriculum 2013. In addition, it is also found that the depth of sub-material in the practical guide is not in accordance with the maturity of students' thinking, so that in the guided laboratory guide contains several problems in the sub-material so that students understand the purpose of the practicum based on the existing problems. In addition, a more complete theoretical basis is added, additional drawings can be added to the information and add students' attractiveness to interested students to read them, as well as safety procedures in the laboratory, symbols or safety symbols in the laboratory and an assessment sheet for each practicum title. And also the guides of chemistry laboratory development results are prepared in accordance with the development of learners.

Prior to development, the first stage of conducted *analysis*. The analysis is an analysis of the syllabus. The syllabus analysis is used to find out the sub-order of the material and to know what sub-material can be practiced. The composition of the sub-matter of the subject matter of acid and base in accordance with the syllabus Curriculum 2013, which can practiced namely (1) Test the solution properties with indicators of natural, (2) Test the solution properties with indicators, (3) Viewing neutralizing acids and bases, (4) Demonstrate the titration of acids and bases, (5) Determine the acid levels in kitchen vinegar. Furthermore, the components included in the guidance of the chemistry lab include: Chemistry Laboratory, Chemical Laboratory Basic Laboratory, Basic Skills In Laboratory,

General Practicum Instructions, Introduction of Tools and Chemicals, Symbol of Safety in Laboratory, Occupational Safety and Health (K3) & Guidance Laboratory, First Aid, and Chemical Waste Disposal.

4.3. Practical Guidance Validation Developed

The practicum guidance assessment was conducted by lecturers and teachers. The results of the overall assessment are presented on the basis of all items of assessment in accordance with material conformity standards. Each point of assessment is calculated on average of value from both groups of assessment teams which then at the end of the study is calculated on average all the items so that the final value of the practical guide. The average assessment of the practicum guide can be seen in Figure 4.2 below:

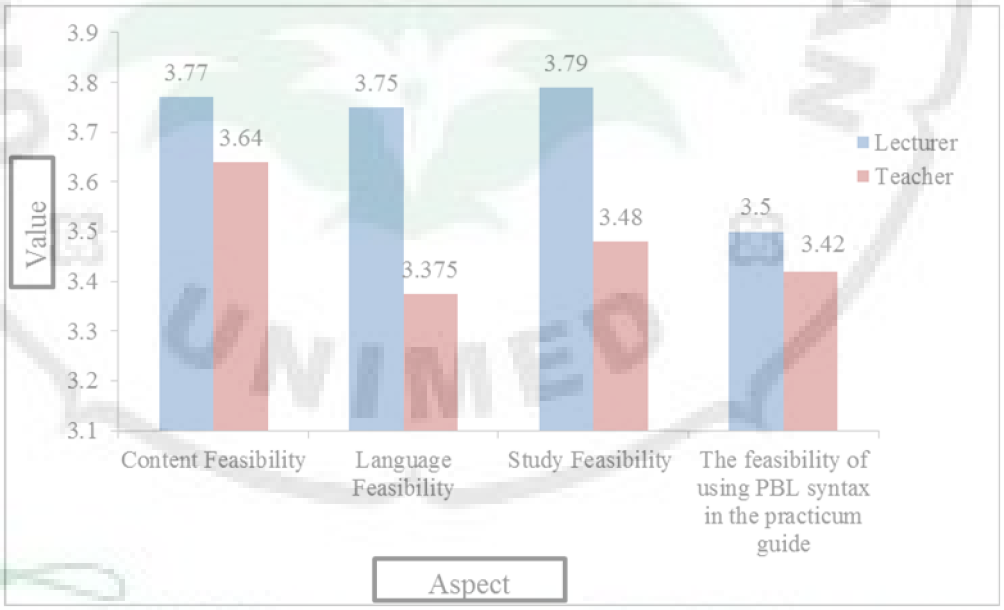

Figure 4.2. Average Preliminary Guidance Assessment By Lecturers and Teachers

Practicum guide that has been validated improved. Improvements to the practicum guide are based on suggestions and inputs given by lecturers and teachers.

4.3.1. Practical Guidance Validation Results by lecturer

From the results of the assessment conducted by 2 lecturers of the FMIPA UNIMED Department of Chemistry on the guidance of practicum of Chemistry High School grade XI on material acid and base obtained an average of 3.70 (Appendix 6). Where for the content feasibility of obtaining result 3,77; for language eligibility to score 3.75; for the feasibility of the presentation obtained value 3.79 and for The feasibility of using PBL syntax in the practicum guide obtained a value of 3.50. This means that the lecturer gives a positive opinion on the guidance of the practicum of the development result and means that the guidance of the practicum acid and base by the researcher has been valid and does not need revision.

4.3.2. Practical Guidance Validation Results by Teachers

With the same questionnaire criteria obtained also the results of the assessment of each Chemistry teacher who teaches at the research place at SMA Negeri 1 Perbaungan, with the number of assessors as much as 2 teachers. The average assessment result of the two Chemistry teachers gave a score of 3.48 (Appendix 7). This means that the teacher gives a positive opinion on the results of the development of the practical guide and means the guidance of the practicum acid and base made by the researcher has been valid and no need to revise which for the feasibility of content, language feasibility, feasibility of presentation, and the feasibility of using PBL syntax in the practicum guide each score of 3.64; 3.38; 3.48 and 3.42.

4.3.3. Mean Results of Practical Guidance Validation by Lecturers and Teachers

Based on figures 4.1 and 4.2 above, it was found that the average assessment of UNIMED Chemistry lecturers was **3.70**, from Chemistry teachers where the study was conducted was **3.48** and overall, the average gained from lecturers and teachers is **3.59**. Looking at the criteria for the average score of the practicum guide, the mean score in the interval value of 3.26-4.00 means the valid practicum guide and no need for revision. And if we look at the average score of

the result of the appraisal that has been assessed by both parties is **3.59**, it can be concluded that the practicum guides Chemical acid and base developed by the researcher according to the standard of Curriculum 2013 is valid so that the practicum guide fulfills standard and feasible to be used for Chemical practicum activities in SMA / MA.

Looking at the results of the practicum guidance assessment by lecturers and teachers shows that the average assessment of lecturers is greater than that of teachers. This may be due to higher lecturer comprehension in assessing appropriate module as per BSNP assessment standard than teacher. The guiding quality of the development results can be presented in the following table:

Table 4.2. Quality of practicum guides Chemical Results of Development

Criteria of BSNP	Quality of practicum guides Chemical Results of Development
Content	• Has 5 titles of experiments that have been sequenced and in accordance with the syllabus, namely: a. Testing the nature of the solution with natural indicators b. Testing the properties of the solution with the indicator c. Observing neutralization acid and base d. Demonstration of titration acid and base e. Determine the level of acid in the kitchen vinegar • The material coverage presented reflects the substance of the material contained in the CC and BC • scope of the material is developed based on the problems corresponding to the PBL syntax
Presentation	• A4 paper size The • contents of the full color book • The image • Has a preface, table of contents, core competencies, basic competencies, objectives, basic theoretical complete, easily accessible tools and materials, easy to understand working procedures, observation tables, questions, conclusions and assessment sheets. • It has chemical laboratory procedures, basic laboratory chemistry techniques, basic laboratory skills, general laboratory instruction, equipment introduction and chemicals, labor safety symbols, occupational health and safety (K3), chemical spills, first aid and chemical waste disposal

4.4. Data Analysis Research Instrument Researchers

Prepare research instruments in the form of 40 test questions in the form of multiple choice with 5 options. Prior to use, the instrument must first be validated by expert validators. After that tested on the students of class XI MIA-2 in SMA Negeri 1 Perbaungan. The objectives are tested to determine the level of validity, reliability, difficulty, and differentiation of test instruments. The following results from the validity, reliability, difficulty and test differentiation tests are as follows: `

4.4.1. Validity of the Test

The validity of the research instrument is used to determine whether the item can be used to measure student achievement. Validity is done by calculating the correlation between the item score with the total score using Product Moment correlation formula with the criterion as $r_{count} > r_{table}$ with $\alpha = 0.05$, so the test item is valid.

To interpret the significance of price validity for each question, then the price is consulted to table price criticism r-product moment with the number of students 30 on $\alpha = 0.05$ with criteria $r_{count} > r_{table}$ with $r_{table} = 0.361$. The results of the validity test of the question to the field showed that from 40 questions tested on the students, obtained as many as 20 questions declared valid and 20 questions declared invalid. As for the number of valid questions used in this study are 20 questions that are numbered 1, 2, 3, 6, 9, 15, 16, 19, 21, 22, 24, 27, 29, 30, 31, 32, 34, 37, 39 and 40 where the matter has represented every indicator of success in this study (Appendix 9). Selection of questions adjusted with the amount of time in the process of the problem.

4.4.2. Reliability of the Test

Reliability of the problem in this study using Kuder Richardson-20 (KR-20). From table of product moment values, it is known that r value $_{table}$ for N = 30 and at $\alpha = 0,05$ is $r_{table} = 0,361$ while price $r_h = 0,871$. By comparing the price of r_h r_{table} ,we can determine the reliability of the test item with the criteria $r_{h>}$ r_{table}

or 0.871> 0.361 it can be concluded that the overall 20 questions have a high level of reliability of the test is declared reliable(Appendix10).

4.4.3. Difficulty Level of the Tests

Analysis of the test difficulty level is used to find out whether the tests are included in easy, moderate or difficult test categories. The result of test difficulty test shows that from 20 valid questions, there is 1 problem with difficult category that is problem numbered 32. 19 problem of medium category that is matter numbered 1, 2, 3, 6, 9, 15, 16, 19, 21, 22 , 24, 27, 29, 30, 31, 32, 34, 37, 39 and 40. (Appendix 11).

4.4.4. The Different Power of Test

Power problem is the ability of the problem to distinguish between clever students (high ability) with students who are less clever (low ability). Different test results, indicating that of the 20 questions there are 5 questions that are classified as less good is the number 9, 15, 21, 29 and 32. There are 5 quite pertaining of the questions are numbered 2, 3, 16, 27 and 34. There The 10 questions are classified as number 1, 6, 19, 22, 24, 30, 31, 37, 39 and 40. (Appendix 12).

Based on the results of the validity, reliability, difficulty, and differentness tests described above, the valid lattice chart of the validator is valid and the following tested:

Table 4.3. Grid Test (after validation)

Specific Instructional Objective	Aspect and Number Item Question				Number of Problems
	C_1	C_2	C_3	C_4	
1. Students can explain the development of the concept of acid and base	1	2	6, 8		4
2. Students can explain acid and base indicator		3			1
3. Student can determine the pH of weak acid, weak base pH, strong acid pH and strong base pH	7, 9, 11, 16, 17	, 5, 12, 13, 15, 18, 20	10, 14, 19		15
Total					20

4.5. Guided Testing Results PBL-Based Practices developed

4.5.1. Student Learning Results

The last step in this research is the pilot phase. Trials are limited trials. A limited trial was conducted to determine the level of students 'understanding of the content / content of the Chemistry practicum guide that has been developed using the instrument provided at the end of the lab and to find out how much the use of the practical guide can have a positive impact on the students' learning outcomes during the practicum process. The instrument used is a matter that has been standard and valid for use.

This limited trial was conducted in SMA Negeri 1 Perbaungan in 1 class (experimental class). In the implementation of the experimental test to the students, the students are distributed to the practicum guide, after which the

students are divided into several groups, where each group consists of 7 to 8 students. In the group of students will be easier to do lab work in the laboratory. In this experiment the first activity is the introduction of practicum tools that will be used and then explain a little of the material acid and base will be practiced.

To see the level of students' understanding on the practicum guide that has been developed then made the treatment by giving a pretest in the experimental class. The initial stage is to give pretest about the acid and base use the guides laboratory that has been developed as a guide in the laboratory. And lastly it provides a posttest to see the level of student understanding after using the practicum guide that has been developed. In the experiments acid and base were doing experiments: Testing the nature of the solution with natural indicators, Testing the properties of the solution with the indicator, Observing acid neutralization and base, Demonstration of titration acid and base, and Determining the acid content in the kitchen vinegar.

Based on the results of the analysis on the level of students' understanding on pretest and posttest obtained the average value of student learning outcomes as listed in the following figure:

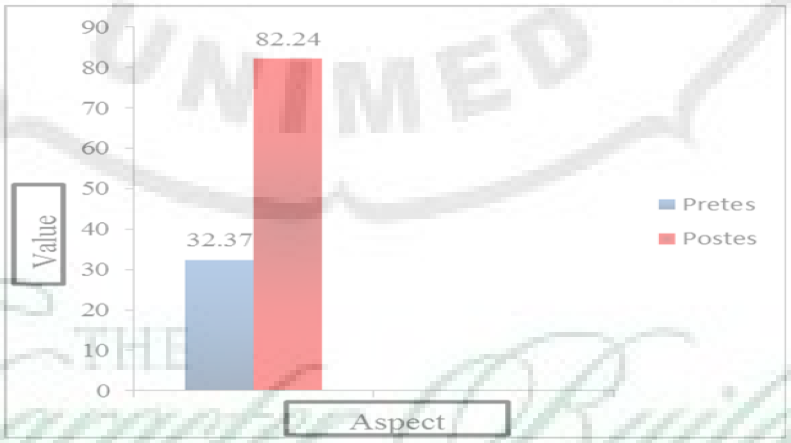

Figure 4.3. Average Values Learning Achievement

Results of the analysis level of student understanding on trial acid and base obtained the average percentage of the pretest value of students SMA Negeri 1 Perbaungan amounted to 32.368 while for the posttest obtained average percentage of 82.236. The chemical KKM at school is 75. The increase in the

students' understanding level and the thoroughness of the KKM indicates that the practicum guide has been developed well and feasible to be used for chemistry learning in SMA / MA.

From the average value of pretest and posttest of students of SMA Negeri 1 Perbaungan proves that there is an increase in learning outcomes using the practical guidance that has been developed. This means that practicum using guidebook which has been developed by the researcher gives positive result.

4.6. Student Response Analysis of the Practical Guidance after Developed

Same is done to the students who have previously studied the subject matter of acid and bases and have read practical guide development results. The questionnaire used is different from the questionnaire used for lecturers and teachers because it adapts to the level of education and reasoning but still based on BSNP. Students who were sampled were students of class XI MIA-1 in SMA Negeri 1 Perbaungan. The average assessment of the 38 students is 3.31 (Appendix 18). This indicates that the student gives positive opinion to the guide of the result of development work. The average appraisal guide can be seen in the following figure:

Figure 4.4. Results of Practical Guidance Analysis by Students After Developed

4.7. Percent (%) Effectiveness

To know the effectiveness of practice guide which have been developed in SMA Negeri 1 Perbaungan School, calculation of module effectiveness based on pretest and posttest value is interpreted based on N-Gain value where the average value N gain obtained is 0.74 with high criterion. Data obtained from the average N-Gain interpretation of the studied school can be seen in the following table:

Table 4.4. Percent (%) Effectiveness of the Use of Based Practicum

Name of School	The Average % effectiveness (%)	Explanation
SMA Negeri 1 Perbaungan	Development Guides 74,92	Effective

Based on the calculation of percent (%) effectiveness of laboratory based PBL guidance on the research results obtained 74, 92% effectiveness in high school SMA Negeri 1 perbaungan with category "Effective". This result is supported by Seftiana (2015) research that the use of PBL-based chemical module on colloidal system material as an effective student learning resource "Effective" is used in the learning where percent (%) effectiveness of PBL-based chemical module use in colloidal system material is 69%. This is shown in the improvement of students' cognitive learning outcomes with N-gain of 0.69 with medium improvement criteria.