

ARTICLE

Effectiveness of Problem-Based Learning Practicum Guide on Colloid Material on Learning Outcomes Students In Class XI SMA

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ABSTRACT

Based on interviews at MAS PERSADA Ulakan Tapakis obtained data that 60% of students were difficult to purchase colloidal material. The chemistry teacher at this school also stated that student learning outcomes in colloid material were still in the moderate category. In this study, a Problem-Based Learning Practicum Guide was available on colloid material. This study aims to reveal the level of effectiveness of Problem Based Learning Practicum Guides on Colloid material. This type of research is Pre-experimental. The population in this study were all Class XI Science Students at MAS PERSADA Ulakan Tapakis. This study used one class with a sampling technique, namely purposive sampling. The research instrument was 20 multiple choice questions. After conducting the research, effectiveness data was obtained as seen from the results of the students' pretest and posttest, where the pretest was carried out before the learning process and posttests after learning using a practicum guide. From the research obtained from the data that has been carried out from these results it can be concluded that the Practicum Guide used in the learning process is quite effective where the N-Gain test result is 0.758.

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1. Introduction

Entering the 21st century, educators are required to create a generation that has 4C capabilities, namely *Critical Thinking, Communication, Collaboration and Creativity*. The ability of 4C in the 21st century is very important for the nation's next generation because it is able to provide an extraordinary influence on the lives of the next generation in terms of facing all problems and challenges in the 21st century. One of the 4C abilities that the next generation needs to have is the ability to solve problems before acquiring new knowledge[1].

Problem Based Learning learning model is very closely related to everyday life so that it can be practiced. Moreover, learning chemistry is not limited to theory and formulas, but also a set of facts obtained from practicum. In other words, learning chemistry in schools needs to be done with an experiment-based approach. In accordance with Edgar Dale's *Cone Experience theory*, the learning process carried out through direct experience is expected to become a concrete learning process[2]. The experimental approach will be effective if carried out with a supporting device in the form of a Practicum Guide. Where practicum guides really help educators in conveying each learning objective that will be conveyed through practicum.

In practicum, teaching materials are needed that can support the learning process. So that a practicum guide is needed that can make it easier for students to understand this colloidal material through practicum. The practicum guide is a practicum implementation guide which contains procedures for preparation, implementation, data analysis and reporting prepared by a person or group of teaching staff who handles the practicum and follows the rules of scientific writing. The function of the practicum guide is teaching material that can minimize the teacher's role, make students more active and acquire creative thinking and hands-on skills, making it easier for educators to carry out teaching in the laboratory [3].

Colloid material was chosen because colloid is a chemical material that requires practical activities in it, the characteristics of this material show more microscopic and macroscopic aspects than symbolic aspects [4]. The colloid itself is a substance consisting of a dispersed substance and a dispersing medium [5]. Microscopic aspects (abstract properties) of colloidal matter, in the form of dispersing agents and dispersed substances in colloidal systems. While the macroscopic or contextual aspect is colloid, it can be seen in everyday life, for example, particles of colloid size, such as proteins, carbohydrates, fats, cream, paint, and cement. Colloidal learning tends not to involve mathematical calculations and only contains concepts that must be understood, but colloidal material is classified as difficult for students to understand. because in this material students are only more likely to memorize. For this reason, practicum is expected to change the mindset of students to be more active and explore according to their thoughts.[6]

In this study, we will look at the level of effectiveness of the practicum guide that has been developed before. Where effective we can mean that it can bring a result, is effective, has an effect, influence, and consequences. Therefore, effectiveness is a condition that indicates the extent to which the success of a plan can be achieved or the extent to which an effort and action is influential and memorable so that it can bring results or be effective. Factors that can affect the effectiveness of learning include the teacher's ability to use teaching materials[7].

The results of the interviews at MAS Persada Ulakan Tapakis also showed that 60% of students still thought that this colloidal material was difficult, teachers at this school also stated that students' scores on this colloidal material were still in the moderate category. This school also has not implemented practical guided learning, this will certainly add new knowledge to students and understand more about this colloidal material. In addition, 74% of students stated that they could not distinguish the types of colloids. In this study, a Problem-Based Learning-based Practicum Guide was available on Colloidal Material which was valid and practical but had not yet been tested for its effectiveness so that researchers were interested in raising the title, namely the Effectiveness of Practicum Guides on Colloid Material on Learning Outcomes of Class XI High School Students.

2. Experimental

2.1 Figure Properties

This type of research is a pre-experimental study conducted with a one group pretest and posttest design. This research was given to XI SMA in MAS Persada Ulakan. The number of students is 25 people. The sampling technique is the saturated sampling technique where the sampling technique is saturated, namely the sampling technique when all members of the population are sampled, this is done if the population is relatively small, less than 30 or the researcher wants to make generalizations with very small errors [8]. The available practicum guides are valid and practical, below are the practical guide covers:



Figure 1. Practicum Guide Cover

3. Results and discussion

3.1 Submission Process

effectiveness is obtained from the N-Gain Test which aims to determine the increase that occurs before and after learning by using teaching materials that have been made. The stages in determining the N-Gain calculation include:

Determine students' pretest and posttest scores with the formula:

$$\text{Student Value} = \frac{\text{student score}}{\text{Total score}} \times 100$$

After obtaining the student's value, then the N-Gain calculation is carried out with the formula:

$$N - \text{Gain} = \frac{\text{postest value} - \text{pretest value}}{100 - \text{pretest value}}$$

The results of N-Gain calculations (normalized gain) are then interpreted using Hake's (1999) classification as shown in table[9]

Table 1. N-Gain Criterion

N-Gains	Criteria
$g \geq 0.7$	Tall
$0.7 > g > 0.3$	Currently
$g \leq 0.3$	Low

Effectiveness shows success in terms of whether or not the goals that have been set are achieved. If the results of activities are getting closer to the target, it means the higher the effectiveness. The effectiveness of teaching materials is influenced by 2 things, namely the actions of the teacher in the learning process and the process of students in the learning process as a result of these actions [11]. We can find out the effectiveness of a teaching material through the administration of a learning achievement test after studying the material in the teaching material so that it can be used in evaluating learning in accordance with the stated learning objectives. A media is said to be effective if the learning outcomes of students have increased. The learning outcomes of students on initial understanding or pretest on this colloidal material are still very low, we can see in table 2 . While the learning outcomes of students after using the practicum guide in the learning process there is an increase in student learning outcomes as we can see in table 3 .

Table 2 . Frequency distribution of pretest scores

<i>Pretest Value</i>	Frequency
10	1
15	7
20	3
25	4
30	3
35	5
40	2
N	25
AVERAGE	36.6

Pretest is a test given before the learning process takes place or tests students' initial knowledge of the material. From the results of the pretest, it was found that 100% of students did not reach the KKM (KKM = 78). In the learning process the teacher will provide practical guidance in the learning process after which a posttest or final test will be carried out[12]. From table 2 above it can be concluded that the initial test of students' understanding did not reach the KKM that had been set. In addition to the pretest results, the results of the posttest scores of students can also be seen in table 3 below:

Table 3 . Frequency distribution of final grades (posttest)

<i>Posttest Value</i>	Frequency
75	5
80	10
85	4
90	5
95	1
N	25
Average	82.4

The posttest or final test is a test given to students after using a problem based learning practicum guide in their learning process. The average *posttest score* of students is 80% . The percentage of students who have scores above the KKM (KKM = 78) . According to Rante (2013) one of the conditions that must be met to determine the effectiveness of a teaching material is that at least 75% of student learning outcomes are in the complete category or meet the Minimum Completeness Criteria (KKM), from the data it can be concluded that the posttest results of students have reached the percentage of the effectiveness of teaching materials so that this practicum guide is effectively used in the learning process[13].

The Effectiveness Test was tested using Pretest and Posttest Questions, namely multiple choice questions with a total of 20 questions. Students are given 25 minutes to answer these questions after being assessed, the students' Pretest scores are lower than the students' Posttest scores. Effectiveness can be seen from the results of N-Gain where Gain Normality is a test of the effectiveness of teaching materials that have been developed. It can be seen from the level of effectiveness of practicum guides. In this study, researchers obtained data that the level of effectiveness of the Problem Based Learning Practicum Guide was high with an N-Gain value of 0.758[14].

We can observe in the table below:

Table 4 . N-Gain Test Results

	Number of students	Average			Category
		Pretest	Posttest	N-gain	
Class XI	25 people	36,6	82.4	0.758	Tall

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The average N-Gain obtained is 0.758 with a percentage of 75% which is included in the very effective category. This was obtained from the significant difference in the posttest-pretest scores of the students. This shows that the use of Problem Based Learning Practicum Guides on colloidal material is very effective for improving student learning outcomes[15].

4. Conclusion

Problem Based Learning Practicum Guide on colloid material is effective in improving the learning outcomes of class XI high school students in chemistry subjects. Where the level of practicality of the practicum guide has reached a very practical level with a value of 87% on the results of the practicality questionnaire for students and on the practicality questionnaire for teachers reaching a practicality level of 85%. while in the effectiveness test it can be concluded that the practicum guide has reached an effective level seen from the results of the N-Gain test which is 0.758 which is categorized as high.

Based on the conclusions obtained, the researcher recommends that chemistry study teachers be able to make *Problem Based Learning Practicum Guides* as an alternative teaching material used in the learning process to improve student learning achievement, especially on the subject of colloids.

References

- [1] Asfar, A. M. I. A., Ahmad, M. A., & Asdar, A. M. I. T. (2021). Elaboration of Active Knowledge Sharing Learning Model to Improve High Order Thinking Skills Integrated 4C. *Asian Journal of Applied Sciences*, 9(4).
- [2] Nadia & Effendi. 2022. *Development of Problem-Based Learning Practicum Guidelines for Colloidal Materials for Class XI SMA/MA* . Padang: UNP.
- [3] Harefa, N., Silalahi, N. F. D., Purba, L. S. L., & Sianipar, H. F. (2021). The effect of colloids practicum e-module to improve students' interest on virtual lab during the covid-19 pandemic. *Jurnal Pendidikan Kimia*, 13(3), 172-179. Duch, JB 1995. *Problem Based Learning in Physics* . The Power o Student Teaching Student. [On line]. Available: <http://www.ude.edu/pb/cte/jan95-phys.html> [5 June 2021]
- [4] Selfiana, Tri Amalia. 2015. Development of a *Problem-Based Learning Chemistry Module on Colloid Material as a Source of Independent Learning for Students*. Semarang
- [5] Kelly & Finlayson. 2008. *A Hurdle too high? Student's Experience of a PBL Laboratory Module* .Chemistry Education Research and Practice.10:42-50
- [6] Rohma, AN 2013. Development of *E-Learning Based Colloid System Teaching Materials* .Unpublished thesis. Malang: FMIPA UM.
- [7] Amir, Taufik. 2009. *Educational innovation through problem-based learning* . Jakarta: Kencana Predana Media Group.

- [8] Sugiyono. 2012. Educational Research Methods. Bandung: Alfabeta
 - [9] Hake. 1999. *Analyzing Change/Gain Scores. AERA. American Education Research Assosiaty Division Mearsurement and Research Methodology* .
 - [10] Uno. 2012. Learning Models Creating Creative and Effective Teaching and Learning Processes. Jakarta: PT. Bumi Aksara.
 - [11] Selfiana, Tri Amalia. 2015. Development of a *Problem-Based Learning* Chemistry Module on Colloid Material as a Source of Independent Learning for Students. Semarang
 - [12] Sudarmo, excel. 2014. Chemistry for SMA/MA Class XI. Jakarta: Erlangga Publisher.
 - [13] Rahayu Ningsih. 2005. Learning in the Laboratory. Yogyakarta: UGM Education Center.
 - [14] Amir, Taufik. 2009. *Educational innovation through problem-based learning* . Jakarta: Kencana Predana Media Group.
 - [15] Arikunto. 2010. Research Procedures A Practice Approach. Jakarta: Rineka Cipta
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