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Development of Environment-Based Practical Guidelines in Acid-Base Learning

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Abstract: Development of environmentally based practicum guides was motivated by the lack of use of practicum guides as support for practicum learning and also the practicum learning at Madrasah Aliyah Swasta (MAS) Al- Kautsar Al-Akbar Medan which were inadequate, such as learning that were no longer usable/expired so they could not be used. during practicum. Research on the development of an environmentally based practicum guide on acid base learning at MAS Al-Kautsar Al-Akbar Medan aims to determine the validity of the practicum guide, teacher responses and student responses to the environmentally based practicum guide developed on acid base material at MAS Al-Kautsar Al -Akbar Medan. This research uses the research and development method (Research and Development/R&D) referring to the ADDIE development model, the stages that researchers must carry out include the analysis stage, the design stage, the development stage, the implementation stage (implementation), as well as the evaluation stage. The results of the research obtained in calculating the average percentage of validator assessments were 82.6% for the teacher response questionnaire, 98% while for students it was 95%. Based on the results of the data obtained, it can be concluded that the environmentally based practicum guide on acid-base material is very valid for use at MAS Al-Kautsar Al-Akbar Medan.

Keywords: Practical guidance, environmentally based learning, acid based learning.

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INTRODUCTION

Chemistry is a science that relies on experimental theory and practice. It is developed through experimental and research activities aimed at explaining natural phenomena. As a branch of natural science, chemistry originates from laboratory practice. The main obstacle that reduces interest in learning chemistry is students' lack of understanding of the material (Dini et al., 2022).

Many students consider chemistry, one of the compulsory subjects in the independent curriculum, difficult. This is because chemical material tends to be abstract and complex, requiring high scientific thinking skills. In this context, the use of environmentally oriented laboratory guidebooks can greatly assist students in understanding the material during the learning process (Wening et al., 2020). The

presence of laboratory guides in the teaching and learning process can make it easier for students to understand the material presented by the teacher.

Most teachers still tend to use laboratory work by explaining the procedures for its implementation, so the implementation of chemical laboratory learning is less effective, by making this laboratory guide will help students to carry out laboratory work effectively and teach students to work independently (Salsabila, 2022).

To overcome suboptimal student learning outcomes, it is necessary to improve the quality of the learning process. Effective learning is not just about conveying concepts, but must also be able to encourage students to build their own understanding. Methods that only rely on textbooks and Student Worksheets (LKPD) that require students to answer questions are no longer effective in today's era (Luthfia, 2019).

Understanding acid-base material is very important for students. This topic was chosen because of its high relevance to the environment and their daily lives. It is hoped that by studying this topic, students will be able to understand the concept of acids and bases in depth and become more aware of the importance of protecting the environment (Safrina, 2019).

The process of teaching and learning acid-base material requires a laboratory to help students understand the concepts explained by the teacher. Usually, this activity requires equipment and funds that are not small. As a solution, teachers can use equipment and learning available in the surrounding environment so as not to burden additional costs. This will encourage students to be more active in conducting experiments so that the learning process becomes more effective and smoother (Endang, 2021).

Based on observations and interviews at MAS Al-Kautsar Al-Akbar, the problems that exist in the school are that they have not used a practical guide as support in practical learning and also the practical learning at MAS Al-Kautsar Al-Akbar Medan are inadequate, such as learning that can no longer be used/expired so that they cannot be used during the practical.

METHODS

This research design is a development research design, namely the development of an environment-based practical guide in acid-based learning. Research or development or Research and Development (R&D) is a strategy or research method that is very effective in improving students' learning interests (Noviyanti, 2020). The practical guide development design model used in this study is the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) design guide.

At the analysis stage, online interviews were carried out to determine the initial needs analysis, then the environmental-based practical guide was designed with Canva, then the process of developing an environmental-based practical guide that had been designed using the Canva application to become a valid environmental-based practical learning guide used and validated by the validator, at the implementation stage, the environmental-based practical guide that had been developed was distributed to teachers and students, and finally the evaluation stage used was the evaluation in the ADDIE model, which was a formative evaluation. Formative evaluation is an evaluation carried out when a product is being developed.

The population in this study were all students of class XI IPA and the sample was 20 students of class XI IPA 1 and 1 chemistry teacher at MAS Al-Kautsar Al-Akbar Medan. The research instrument used a validation sheet and a questionnaire sheet. The data analysis technique in this study was by analyzing the validation sheet and questionnaire from teacher and student responses.

RESULTS AND DISCUSSION

The development of an environment-based practicum guide for acid-base material at SMA MAS Al-Kautsar Al-Akbar Medan was motivated by several problems found in chemistry learning at MAS Al-Kautsar Al-Akbar Medan. These problems were identified after researchers conducted an analysis of chemistry learning at MAS Al-Kautsar Al-Akbar Medan.

This study revealed that a large number of students showed negative attitudes toward chemistry, which correlated with low motivation to learn the subject. Factors contributing to this lack of enthusiasm included the perception of the irrelevance of chemistry to everyday life, poor teaching methods, and the abstract nature of the content. As a result, this decline in positive attitudes and motivation significantly impacted student performance and achievement in chemistry, highlighting the need for better teaching strategies to encourage engagement (Melaku et al., 2019).

In addition, there is also the unavailability of teaching materials or in this case in the form of an environment-based practicum guide for acid-base material. Therefore, researchers developed a practicum guide so that students can conduct practicum experiments periodically. This development is also in accordance with the environmental conditions of students and in line with the 2013 curriculum for class XI currently being implemented by MAS Al-Kautsar Al-Akbar Medan. According to Astiti, contextual-based teaching materials are the best choice to help students understand abstract concepts because contextual-based learning is designed to adjust to the environmental conditions around the place where learning takes place (Astiti et al., 2019).

The development of teaching materials or in this case, contextual-based practicum guides is a solution to the problems of chemistry learning at MAS Al-Kautsar Al-Akbar Medan. In addition, this development is also in accordance with the environmental conditions of students and in line with the 2013 curriculum currently being implemented at MAS Al-Kautsar Al-Akbar Medan. In addition to contextual-based learning, learning with the 2013 curriculum must be carried out interactively, fun, challenging, inspiring, and motivating students to actively participate in learning (Sabarni et al., 2020).

The analysis stage was carried out by interviewing one of the chemistry teachers to find out the problems and curriculum used in chemistry learning activities. The curriculum used by the school is the independent curriculum for class X and the 2013 curriculum for classes XI and XII, where the independent curriculum teaches students to learn independently. Furthermore, the initial description and components of the practicum guide were determined which were carried out at the design stage, then the results of the practicum guide design that had been approved by the supervising lecturer were realized at the development stage. The practicum guide that had been developed would then be given to the validator to assess the validity (validity test) of the practicum guide.

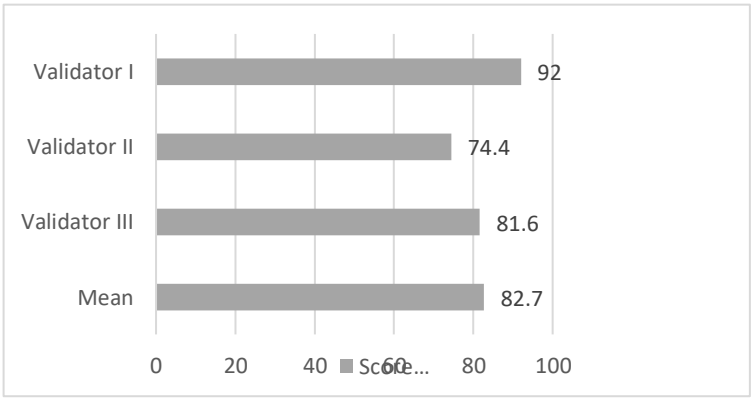

Figure 1. *Percentage of product validation*

Based on the Figure 1, it is known that the total score obtained from validator I is 115 with a percentage of 92%. While the assessment of validator II obtained a score of 93 or a percentage of 71.4%. Meanwhile, validator III gave a score of 102 with a percentage of 81.6%. Furthermore, the percentage of the validator's assessment is compared to the average and based on this calculation, it can be concluded that the environmental-based practicum guide on acid-base material is very valid to be implemented in chemistry learning at MAS Al-Kautsar Al-Akbar Medan. The results obtained show that the environmental-based practicum guide on acid-base material is very valid to be implemented in chemistry learning. The product development stages contain the realization of the E-LKPD creation process, validation of product materials and media, final revision of content, and development of product results on the Liveworksheet web. The results of the material validation were 98% while the media validation obtained results of 96% (Aulia, 2024). The implementation or trial stage was carried out after the researcher made revisions based on suggestions and input from expert validators. At this stage, the researcher provided a practical guide and questionnaire to 1 chemistry subject teacher and 20 students of class XI IPA 1 at MAS Al-Kautsar Al-Akbar Medan to find out the responses of students and teachers directly. Observation of user responses to the products that have been developed aims to see whether the product is to the needs of the field or not (Amanda, 2024). The limited trial process was carried out through a questionnaire guided directly by the researcher (Aulia, 2024).

Table 1. *Teacher response*

No	Statement	SA	A	QA	NA	SNA
1.	The cover of the practical guide is presented with an attractive appearance	1	0	0	0	0
2.	The color display of the cover is attractive so that it is motivated to study it	1	0	0	0	0
3.	The choice of color in the contents of the practical guide is very clear and easy to read	1	0	0	0	0
4.	The font used in the practical guide is very clear and easy to read	1	0	0	0	0
5.	The material in the practical guide is related to environmental-based chemistry	0	1	0	0	0
6.	The material presented in the practical guide is easy to understand	1	0	0	0	0
7.	Use of the correct chemical formula	1	0	0	0	0
8.	The questions in the practical guide are presented clearly	1	0	0	0	0
9.	The language used in the practical guide is communicative and easy to understand	1	0	0	0	0
10.	The indicators used are easy to obtain	1	0	0	0	0
Frequencies		9	1	0	0	0
Scores		45	4	0	0	0
Total				49		
Maximal Score				50		
%				98%		
Criteria				Strongly Agree		

SA : Strongly Agree, A : Agree, QA : Quite Agree, NA : Not Agree, SNA : Strongly Not Agree.

Response of the chemistry subject teacher of class XI IPA 1 MAS Al-Kautsar Al-Akbar Medan to the development of an environment-based practical guide on acid-base learning was "Strongly Agree" with a percentage of 98%.

Table 2. *Students response*

NO	Statement	SA	A	QA	NA	SNA
1.	The design presented in the practical guide is interesting	16	4	0	0	0
2.	The cover of this practical guide is attractive according to the learning	15	5	0	0	0
3.	The colors provided in this practical guide are attractive according to the learning	17	2	1	0	0
4.	The language used in the practical guide is easy to understand	16	4	0	0	0
5.	The title matches the content of the learning	20	0	0	0	0
6.	The presentation of the material in this practical guide is easier for me to understand regarding the material on acids and bases	16	3	1	0	0
7.	This guide adds to my knowledge of acid-base material	17	2	1	0	0
8.	The type and size of the writing are clear, and easy to read	16	3	1	0	0
9.	This acid-base practical guide can be presented as my reference or reference	16	3	1	0	0
10.	The acid-base practical guide presents a clear concept and makes me focused on reading it	17	3	0	0	0
11.	This practical guide is practical and easy to carry anywhere	16	3	1	0	0
12.	The spacing used in the practical guide is appropriate	16	4	0	0	0
13.	The work procedures contained in the acid-base practical guide are presented clearly so that it makes it easier for me to do the practical work	17	1	2	0	0
Frequencies		215	37	8	0	0
Scores		1.075	185	40	0	0
Total				1.300		
Maximal Score				1.625		
%				95%		
Criteria				Strongly Agree		

SA : Strongly Agree, A : Agree, QA : Quite Agree, NA : Not Agree, SNA : Strongly Not Agree.

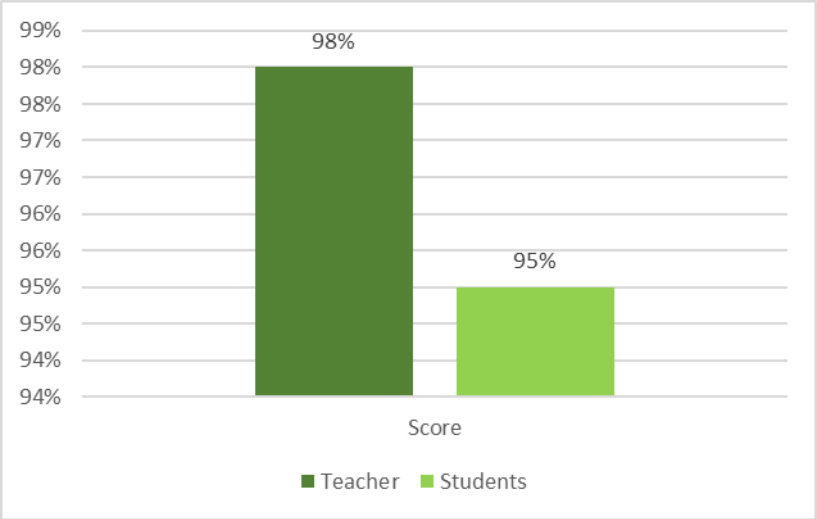

Figure 2. *Teacher and students response*

The results of this study are relevant to previous studies. A study with the creation of a practical guide aims to improve students' metacognitive skills, as evidenced by the high average test scores (87.94%) and questionnaire results (81.64%). This study shows that a well-structured practical guide can effectively support students in realizing their abilities and understanding the practical process (Haryani et al., 2018). Another study created a practical practical guide using a scientific approach to improve students' scientific thinking skills. This guidebook was validated by education and chemistry experts and showed a significant increase in students' scientific thinking skills after implementation, with a high normal increase score of 0.76. Practical activities received positive responses from students, indicating their effectiveness in the learning process (Rasmawan, 2019).

The inquiry-based practical guide encourages students to design experiments, formulate hypotheses, and draw conclusions independently. This method has been shown to significantly improve students' science process skills and critical thinking abilities, with high validity and practicality values (Rahayu & Sari, 2023). A project-based lab guide has been developed to improve students' learning outcomes in acid-base chemistry. This guide is in line with national education standards and has shown higher effectiveness in improving psychomotor and affective skills compared to traditional methods (Nainggolan et al., 2018). The results of this study and previous studies indicate that the development of a lab guide is very valid to use and is expected to improve students' interest and learning outcomes.

CONCLUSION

Based on the results of the research on the development of an environment-based practical guide for acid-base material at MAS Al-Kautsar Al-Akbar Medan, it can be concluded that, the environment-based practical guide for acid-base learning at MAS Al-Kautsar Al-Akbar Medan is very valid for use in learning activities. This is based on the validation results of three validators, the results of teacher responses to the environment-based practical guide developed in acid-base learning at MAS AlKautsar Al-Akbar Medan are very good, and the results of student responses to the environment-based practical guide developed in acid-base learning at MAS Al-Kautsar Al-Akbar Medan are very good.

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