

Description of Student Learning Difficulties of SMAN 4 Padang on Buffer Solution Material

Durrotul Hikmah¹, Desy Kurniawati²

^{1,2} Universitas Negeri Padang, Indonesia

Corresponding Author: ✉ durrotulhikmah78@gmail.com

ABSTRACT

In studying chemistry you will find that chemistry is much broader than just numbers, formulas and abstract theories. Students are required to have the ability to understand concepts and apply mathematical operations. One of the chemistry learning materials in high school that involves understanding mathematical concepts and operations is buffer solution material. As many as 71.30% of students at SMAN 4 Padang have not been able to achieve the specified KKM for learning. This indicates that students experience learning difficulties. This research is descriptive research, namely to describe the percentage of students' learning difficulty levels for each learning indicator of buffer solution material and the factors that influence it. The subjects of this research were 82 people from all class XII MIPA students at SMAN 4 Padang. The instruments used are diagnostic test questions and questionnaire sheets. The results of the research show that the percentage of students' learning difficulties in each buffer solution learning indicator is (1) Understanding the concept of buffer solutions 38%, (2) Explaining the working principles of buffer solutions 67%, (3) Determining the pH of buffer solutions 79%, and (4) Analyzing the role of 68% buffer solution.

Keywords: *Learning Difficulties, Buffer Solutions, Diagnostic Tests*

ARTICLE INFO

Article history:

Received

August 15, 2023

Revised

October 28, 2023

Accepted

November 01,

2023

Journal Homepage

<https://www.attractivejournal.com/index.php/aj/>

This is an open access article under the CC BY SA license

<https://creativecommons.org/licenses/by-sa/4.0/>

Published by

CV. Creative Tugu Pena

INTRODUCTION

In the learning process, teachers try to create learning conditions that will help students understand the topics presented. But in reality, not all students are able to understand subjects well. Some students may experience learning difficulties, in which case student learning outcomes will be less than optimal. According to Abdurrahman (2012) academic learning difficulties refer to failure to achieve academic achievement in accordance with the expected capacity. Teachers or parents can recognize academic learning difficulties when a child fails to demonstrate one or more academic skills.

Chemistry is a science that studies matter, including the structure, properties and changes in matter (Chang, 2010). In studying chemistry you will find that chemistry is much broader than just numbers, formulas and abstract theories. Therefore, students are required to have the ability to understand concepts and apply understanding of mathematical operations. One of the high school chemistry learning materials that involves understanding mathematical concepts and operations is buffer solutions.

Understanding concepts is an understanding of things related to concepts, namely the meaning, nature and description of a concept as well as the ability to

explain text, diagrams and phenomena. Chemistry learning and problem solving that only emphasizes symbolic aspects creates difficulties for students in developing an understanding of chemical concepts (Gabel, 1993). The impression of difficulty arises because most chemical concepts are abstract and complex and require in-depth understanding to study them (Sirhan, 2007).

One indication of learning difficulties experienced by students is the low learning outcomes obtained. Based on a preliminary study conducted at SMA Negeri 4 Padang, data was obtained that the students' chemistry learning scores did not fully meet the specified Minimum Completeness Criteria (KKM) standards, namely 80. As stated in Table 1 below.

Table 1. Average Value of Daily Test Results for Class XI MIPA Students of SMAN 4 Padang on Buffer Solution Material

No.	Class	Average UH Results	%Students below KKM
1	XI MIPA 3	59,29	61,29
2	XI MIPA 4	57,83	67,74
3	XI MIPA 5	48,84	68,75
4	XI MIPA 6	56,76	79,41
5	XI MIPA 7	48,37	79,31

A person is considered to be experiencing learning problems or difficulties if the person concerned cannot reach the level of mastery required as a prerequisite for learning at the next level (Suwanto, 2013). Learning difficulties experienced by students cannot be ignored and the cause must be found. Therefore, looking for the main cause and other causes must be done accurately, effectively and efficiently (Djamarah, 2011). One way to find out students' weaknesses and the extent to which the material taught can be understood is by administering diagnostic tests. Diagnostic tests are tests that can be used to find out precisely and ascertain students' weaknesses and strengths in certain lessons (Hadi, 2015).

Student's difficulties in studying buffer solution material are based on research by Mentari, et al (2014) which found that more than 50% of students did not understand buffer solution material. This research also states that students' misconceptions occur in the concept of understanding and properties of buffer solutions, components of buffer solutions, reactions (how they work), preparation and pH of buffer solutions. Research by Marsita, et al (2010) shows that students experience learning difficulties in terms of understanding concepts and calculation (algorithmic) questions. According to research by Sirhan (2007), the factors causing difficulties in learning chemistry are curriculum content, overload of student's working memory space, language and communication, concept formation and motivation.

METHOD

This research uses a descriptive method. Descriptive research is the study of problems in the form of facts about a population, which includes activities to assess attitudes or opinions about people in the population (Sudaryono, 2017). The subjects of this research were 82 students from class XII MIPA at SMAN 4 Padang. The selected subjects were students who experienced learning difficulties as seen from the results of diagnostic test scores which were below the specified KKM as well as the results of interviews. This research was conducted at SMAN 4 Padang in September 2023.

Research instruments are tools used to collect data/information to make the researcher's work easier to get good results (Lufri, 2007). The research instrument used for this research was a diagnostic test with reasoned multiple choice questions and

description questions as well as a questionnaire on the causes of students' learning difficulties which had been created by previous researchers, namely Mela Nofri Yenti (2017) which was valid because it had been tested for validity, reliability, distinguishability, and question difficulty index.

The diagnostic test instrument consists of 12 questions, namely 7 questions in objective and 5 questions in essay which include 4 buffer solution learning indicators. The questionnaire sheet consists of 15 statements that have been validated and the results are valid. Interviews are used as supporting data for the results of diagnostic test answers to determine the difficulties experienced by students, namely in mastering concepts and problem-solving abilities.

Next, the data obtained was analyzed using descriptive analysis methods. The diagnostic test data is determined by percentage and the results of the percentage calculation compared to the criteria for learning difficulties can be seen in Table 2.

$\% \text{ Difficulty} = 100\% - \% \text{ Students who understand}$

Table 2. Learning Difficulty Criteria

Criteria	Percentage (%)
Very high	81-100
High	61-80
High enough	41-60
Low	21-40
Very low	0-20

(Arikunto, 2010)

Furthermore, from the diagnostic test, the types of factors that cause students' learning difficulties are identified, including concept mastery, linguistic abilities, schematic abilities, algorithmic abilities and students' strategic abilities. Students are said to experience learning difficulties due to these factors if the student's ability for each type of learning difficulty is below 75% (Ministry of National Education, 2007). To determine whether students experience learning difficulties due to by these factors or not, it can be determined by comparing the total scores obtained by students with the ideal scores for each student's abilities. Questionnaires were given to students to determine the causes of student learning difficulties based on student's study habits. Questionnaire data measurement using a Likert scale.

RESULT AND DISCUSSION

To find out the causes of student's learning difficulties with buffer solution material, research was carried out in the form of providing diagnostic test questions, questionnaires and interviews. From the results of this research, it can be seen that students have difficulty learning in buffer solution material such as the following.

1. Student Learning Difficulties for Each Learning Indicator

Buffer solution material consisting of 4 learning indicators. Based on the results of diagnostic test data processing, it can be seen the level of student learning difficulty for each learning indicator presented in Table 3.

Table 3. Interpretation of Student Learning Difficulties in Each Buffer Solution Learning Indicator

No	Learning indicators	Difficulty (%)	Criteria
1	Understand the concept of buffer solutions	38	Low
2	Explain the working principle of buffer solutions	67	High

3	Determine the pH of the buffer solution	79	High
4	Analyze the role of buffer solutions	68	High

2. Mastery of Concepts and Problem Solving Abilities

From diagnostic tests it is known that students experience learning difficulties caused by weak mastery of concepts and weak students ability to solve problems which include linguistic, schematic, algorithmic and strategic abilities. Based on the results of diagnostic test data processing, it can be seen the level of student abilities in buffer solution material presented in Table 4.

Table 4. Category of Student Ability Level in Buffer Solution Material

No	Ability Type	%Ability	Category
1	Mastery of concept	41	Enough
2	Linguistic ability	19	Less
3	Schematic ability	21	Less
4	Algorithmic ability	23	Less
5	Strategic ability	22	Less

3. Results of the Questionnaire on the Causes of Student Learning Difficulties in Buffer Solution Material

This research uses a questionnaire to identify the causes of student learning difficulties in terms of student study habits. To obtain the criteria for each questionnaire item, each questionnaire score is matched with a continuum line.

Based on the results of the author's research at SMAN 4 Padang, student learning difficulties in buffer solution material can be identified. From the results of diagnostic tests, the level of student learning difficulty for each indicator and mastery of concepts can be determined. From the questionnaire data, the causes of student learning difficulties can be identified from the factors of student study habits.

1. Student Learning Difficulties for Each Learning Indicator

The buffer solution material consists of 4 learning indicators, the first indicator is understanding the concept of buffer solutions. It can be seen that the diagnostic test results show that student learning difficulties are 38% in the low category. Based on the results of tests and interviews, it was found that students experienced difficulties because they were unable to explain the type of buffer solution and the composition of the mixture. Based on research results from Sanjiwani, et al (2018), the results of student learning difficulties in the indicator explaining the meaning of buffer solution are quite difficult with a difficulty percentage of 50.32%. Based on the results of interviews and student test answers, students experienced difficulty in answering questions because students did not understand what the solution components were that made up the acid buffer solution.

The second indicator is explaining the working principle of the buffer solution. From the diagnostic test results, it was found that students experienced learning difficulties in this indicator, namely 67% in the high category. Based on research conducted by Alma, et al (2021), the results obtained were that in indicator 2 regarding the working principles of buffer solutions, there were students who experienced difficulties, generally students experienced difficulties in the high and very high learning criteria, amounting to 83.7%. Students experience learning difficulties because

students do not have basic concepts of the previous material so students are unable to solve problems. If students do not understand the basic concepts then students will experience difficulty in understanding more complex concepts.

The next indicator is determining the pH of the buffer solution. Students experienced difficulties with this indicator because the results of the diagnostic tests carried out showed that the percentage of learning difficulties was 79% in the high category. The indicator for determining the pH of a buffer solution is an indicator with a high level of difficulty compared to other indicators. Judging from the results of diagnostic tests and interviews, the difficulty in this indicator is due to students' low ability to determine the pH and pOH calculation formulas used, students' lack of mathematical operation skills and students' lack of accuracy when working on questions. This statement is supported by research from Purnama, et al (2016) which analyzed the difficulties experienced by students in calculating pH and pOH indicators. The locations of these difficulties include: (i) students were less careful in calculating so they experienced many errors, (ii) there were several students incorrect use of the formula between acidic buffer solutions and basic buffer solutions, and (iii) lack of concept of equilibrium in buffer solution materials.

The next indicator is to analyze the role of the buffer solution. It can be seen from the diagnostic test results that students experience learning difficulties in the high category, namely 68%. Based on the results of student interviews, the difficulties experienced by students were because students were unable to explain the role of buffer solutions in the bodies of living creatures and students did not know that protoplasmic fluid was an intracellular fluid, so students had difficulty analyzing the questions. Research conducted by Afifah, et al (2021) showed the results that the highest percentage of misconceptions that occurred in students' answers was in the sub-concept of the role of buffer solutions in the bodies of living creatures at 40.30%.

2. Students Mastery of Concepts and Problem Solving Abilities

Objective questions number 1-7 and description questions number 11, 12 are questions to analyze students' mastery of concepts. Description questions number 8-10 are problem solving type questions. In this question, it is analyzed how students master concepts, linguistic, schematic, algorithmic and strategic abilities in solving the problem. Linguistic ability is the student's ability to translate questions into scientific language, for example students determine what is known and asked in the question. Schematic ability is the ability to identify problem solving schemes. Strategic ability is the ability to "know and how", including strategies such as planning and problem solving or the ability to identify stages of problem solving. Ability to carry out problem solving stages (Depdiknas, 2007).

Based on the results of the analysis of each ability, it was identified that students abilities in problem solving were still relatively weak. This weak ability of students is because students tend to immediately answer descriptive questions without writing down what they know and what is asked in the question, students cannot determine the right formula to answer the question and students are also less careful in carrying out each stage of solving the question.

3. Factors Causing Students Learning Difficulties in Buffer Solution Material

Giving questionnaires to students aims to identify the causes of student learning difficulties in terms of student study habits. From the data obtained, it can be seen that the majority of students enjoy working on questions related to buffer solution material, but judging from the low scores in solving questions, this does not indicate that students enjoy working on buffer solution material. Some students asked the teacher if

they did not understand the buffer solution material, but from the results obtained, a high percentage of students did not understand the concept. When studying buffer solutions outside of school, students only do it "sometimes". Students also "often" copy their friend's homework/exercises without understanding the content. Students "sometimes" do not feel sleepy during the learning process. The factors above are also the causes of students having difficulty learning the buffer solution material at SMAN 4 Padang.

CONCLUSION

Based on the research results, it can be concluded that SMAN 4 Padang students still have difficulty learning the buffer solution material. For each indicator, students experience learning difficulties in the low to high range. Students' mastery of concepts and problem solving abilities are still relatively weak. The indicator with the highest level of learning difficulty is the third indicator, namely determining the pH of the buffer solution at 79%. The causes of students experiencing learning difficulties based on questionnaire data include: students do not feel happy working on buffer solution questions, there are still some students who ask the teacher when they don't understand the material, students often copy their friends' homework/exercise answers without understanding the content and students sometimes don't feel sleepy during the learning process.

REFERENCES

- Abdurrahman, M. (2012). *Pendidikan Bagi Anak Berkesulitan Belajar Teori, Diagnosis dan Remediasinya*. Rineka Cipta.
- Afifah, Intan, Dedi Irwandi, dan D. M. (2020). Identifikasi Miskonsepsi Terhadap Konsep Larutan Penyangga Dengan Menggunakan Instrumen Test Diagnostic Four-Tier Multiple Choice Intan. *Jurnal Riset Pendidikan Kimia*, 11(1), 27-34.
- Arikunto, S. (2010). *Prosedur Penelitian, Suatu Pendekatan Praktek*. Rineka Cipta Algensido.
- Chang, R. (2010). *Chemistry 10th Edition*. McGraw-Hill.
- Depdiknas. (2007). *Tes Diagnostik*. Direktorat Pendidikan Lanjutan Pertama, Direktorat Jendral Pendidikan Dasar dan Menengah.
- Djamarah, S. (2011). *Psikologi Belajar*. Rineka Cipta.
- Gabel, D. . (1993). Use of the Particle Nature of Matter in Developing Conceptual Understanding. *Journal of Chemical Education*, 70(3), 193-194.
- Genes, A. J., Lukum, A., & Laliyo, L. A. R. (2021). Identifikasi Kesulitan Pemahaman Konsep Larutan Penyangga Siswa di Gorontalo. 3, 61-65.
- Hadi, S. (2015). Pengembangan Sistem Tes Diagnostik Kesulitan Belajar Kompetensi Dasar Kejuruan SMK. *Jurnal Penelitian Dan Evaluasi Pendidikan*, 19(2), 165-178.
- Lufri. (2007). *Kiat Memahami Metodologi Melakukan Penelitian*. Universitas Negeri Padang.
- Marsita. (2010). Analisis Kesulitan Belajar Kimia Siswa SMA dalam Memahami Materi Larutan Penyangga dengan Menggunakan Two-Tier Multiple Choice Diagnostik Instrument. *Jurnal Inovasi Pendidikan Kimia*, 4(1), 512-520.
- Mentari, L., Suardana, I. N., & Subagia, W. (2014). Analisis Miskonsepsi Siswa Sma Pada Pembelajaran Kimia Untuk Materi Larutan Penyangga. *E-Journal Kimia Visvitalis*, 2(1), 76-87.
- Purnama, R. D., & Fadhilah, R. (2016). Analisis Kesulitan Belajar Kimia Pada Materi Larutan Penyangga Siswa Kelas XI IPA 1 MAN 2 Pontianak. *Ar-Razi Jurnal*

- Ilmiah*, 4(2).
- Sanjiwani, NLI, M. & S. (2018). Analisis Kesulitan Belajar Kimia Pada Materi Larutan Penyangga. *Jurnal Pendidikan Kimia Undiksha*, 2(2), 75–84.
- Sirhan, G. (2007). Learning Difficulties In Chemistry. *Journal Of Turkish Science Education*, 4(2), 4–9.
- Sudaryono. (2017). *Metodologi Penelitian*. Raja Grafindo.
- Suwarto. (2013). *Pengembangan Tes Diagnostik dalam Pembelajaran*. Pustaka Pelajar.
- Yenti, M. & L. (2017). *Deskripsi Kesulitan Belajar Kimia Siswa Pada Materi Larutan Penyangga di kelas XI MAN 2 Padang*. Universitas Negeri Padang.
-

Copyright Holder :

© Durrotul Hikmah, Desy Kurniawati (2023).

First Publication Right :

© Attractive : Innovative Education Journal

This article is under:

