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| **Description of Problem Solving Ability of Class X Students of AL - Azhar 10 Pontianak Islamic High School on Chemical Bonding Material** | |
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| **Article History**  Received: dd-M-Year  Revised: dd-M-Year  Published: dd-M-Year  **Keywords**: Description  Problem Solving Ability  Chemical Bonding | **Abstract**  This research was conducted to determine the problem solving ability of class X students of Al-Azhar 10 Pontianak Islamic High School on chemical bonding material. The type of research is descriptive qualitative problem solving ability. The research subjects were X IPA 1 class students of Al - Azhar 10 Pontianak Islamic High School totaling 21 people. Data collection tools in the form of problem solving tests. Data collection techniques with written tests and unstructured interviews. The results of the problem solving ability data analysis were calculated using a problem solving ability assessment instrument and were presented as a whole based on the problem solving criteria instrument. The results of the analysis obtained students' problem solving ability on chemical bonding material, namely indicators of understanding the problem 49% (sufficient), making a plan 56% (sufficient), implementing a plan 63% (good), and checking back 70% (good) with an average percentage of 60% (sufficient). So it can be concluded that students' problem solving skills on chemical bonding material have an adequate predicate. | |
| **How to Cite:** Tri Indriyani., Eny Enawaty., Tulus Junanto, Rini Muharini, Rahmat Rasmawan. Description of Problem Solving Ability of Class X Students of Al-Azhar 10 Pontianak Islamic High School on Chemical Bonding Material. *Hydrogen: Jurnal Kependidikan Kimia*, vol(no). doi:https://doi.org/10.33394/hjkk.v10i2 | | |
| <https://doi.org/10.33394/hjkk>.xxxxx.xxxx | | This is an open-access article under the [CC-BY-SA License.](http://creativecommons.org/licenses/by/4.0/)  C:\Users\IKIP\Pictures\CC_BY-SA_3.0.png |

**INTRODUCTION**

In Permendikbudristek No. 16 of 2022 concerning Process Standards, namely Article 7 paragraph 2 which reads "Learning strategies designed to provide quality learning experiences". Furthermore, it is explained in letter C, namely that the learning strategy must optimize the use of resources available in the education unit environment and / or the community. This causes the need to apply a problem-based learning model to achieve learning that can train students in problem solving.

Problem solving ability is one of the competencies needed in the 21st century. A person who is able to solve a problem is expected to face various similar problems that arise in everyday life (Siagian, 2019). Therefore, the learning process carried out by teachers must be able to improve students' ability to solve problems (Nuralifah & Hidayah, 2020), Problem solving ability refers to the potential possessed by students in solving problems and applying their solutions to everyday life (Gayatri et al., 2020).

Problem-Based Learning is a problem-solving learning model that can provide active learning conditions for students because it is triggered by real-world problems. This can encourage students to find solutions, think critically, and analytically so that they use learning resources properly and accordingly (Hotimah, 2020).

Based on the results of interviews with chemistry teachers at Al-Azhar 10 Pontianak Islamic High School, teachers have trained problem solving in students by giving exercises and exams using questions based on the C4 (analyze) and C5 (evaluate) levels. The results or scores obtained by students on daily practice questions on chemical bonds are 90%. Teachers have never analyzed students in solving problems. Given that there is no archive of student exercise answers from the school, students' problem solving skills cannot be analyzed. Therefore, researchers conducted a study to prove students' problem solving ability. Problem solving ability is very important for students, so teachers respond very well to research on problem solving ability.

Research conducted (Damayanti et al., 2022) suggests that students' difficulties in solving problems are caused by students' unfamiliarity with working on problems in the form of case studies so that there are many mistakes in understanding the problem, performing calculations and tending not to double-check answers. Students who can understand problems well, tend to be able to analyze problems and relate them to various information found well (Hidayatullah, 2020).

The competence of students' problem solving skills greatly influences the thought process in solving problems found during learning. So this research was conducted because it is important to measure students' ability to solve problems.

**METHOD**

This research is descriptive research with a qualitative approach. Descriptive research is to describe an event and event that is the center of attention without giving special treatment to the event. Withdrawing data and field information using a problem solving ability test instrument. (Trianto, 2011).

Population is all members of human groups, events or objects that are in a planned area. Part of the population selected for data sources is called a sample. (Sukardi, 2016). The subjects of this study were some students of class X IPA, so that the students of class X IPA 1 SMA Islam Al - Azhar 10 Pontianak, totaling 21 people, were used.

The instruments in this study were problem solving ability test instruments and unstructured interview guidelines. The problem solving ability test is in the form of contextual questions totaling 5 items. The questions were made based on chemical bonding materials, namely ion bonds, covalent bonds, and polarization in covalent bonds. Then, the interviews that have been conducted measure students' ability to solve problems based on the indicators that have been determined as reinforcing data from the test results.

The problem solving ability test instrument has been validated by a validator, namely from a chemistry education lecturer at Tanjungpura University. The validity used in this study is the content validity of Gregory (2016) with a value of 1. After the test instrument is valid, its reliability is calculated using the Cronbach's Alpha method with an rii value close to 1. The rii value obtained is 0.71.

The problem solving ability test results were calculated using the problem solving ability assessment instrument. The test results of students in solving problem solving problems of chemical bonding material are presented as a whole based on the problem solving criteria instrument using Sugiyono's formula (2017).

The percentage results are then grouped based on the average problem-solving ability guidelines as follows.

Table 1. Guidelines for average problem-solving ability.

|  |  |
| --- | --- |
| **Persentase (100%)** | **Kriteria** |
| 81 – 100 | Sangat Baik |
| 61 – 80 | Baik |
| 41 – 60 | Cukup |
| 21 – 40 | Kurang |
| <21 | Sangat kurang |

(Arikunto, 2007:18)

The percentage that has been obtained is 60% in the sufficient criteria. Then the students' ability to solve problems on chemical bonding material is described.

**RESULTS AND DISCUSSION (12pt)**

Research data regarding the description of the problem solving ability of class X students on chemical bonding material at Al-Azhar 10 Pontianak Islamic High School was carried out using a test instrument in the form of questions that were valid and reliable, with a reliability value of 0, 71. The number of test questions used as a tool to measure problem solving ability, amounted to 5. Students' problem solving ability is categorized in the predicate enough with an average percentage of 60%.

**Figure 1**. Level of Achievement of Problem Solving Indicators

Based on Figure 1, it can be seen that problem solving skills with sufficient criteria are indicators 1 and 2 with an average percentage of 49% and 56%. Meanwhile, the good criteria are indicators 3 and 4 with an average percentage of 63% and 70%. This means that students' problem solving skills are categorized as quite good.

To find out a more detailed discussion can be seen below. The average value of students' overall problem solving ability on each question can be seen in the following table.

**Table 3.** Average Case Question Score for Each Indicator

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Case** | **Problem Solving Indicator** | | | |
| **1** | **2** | **3** | **4** |
| 1 | 1,9 | 1,5 | 2,2 | 2,9 |
| 2 | 2,2 | 2,0 | 2,5 | 2,9 |
| 3 | 1,9 | 3,7 | 2,4 | 2,8 |
| 4 | 2,1 | 2,7 | 3,2 | 2,8 |
| 5 | 1,6 | 1,2 | 2,3 | 2,8 |

Indicator 1: Understanding the Problem

Understanding the problem is the student's ability to identify relevant information in the problem, and form an understanding of the problem. The test results on indicator 1 resulted in an average percentage of 49% so that it can be categorized as sufficient.

The sufficient predicate in indicator 1 proves that students are quite capable of identifying relevant information in the problem.

and understand the problem quite thoroughly and well. However, students have not been able to complete the data completely.

Based on table 3, it can be seen that the lowest average of students' ability to understand the problem is in case number 5, with a value of 1.6. Problem number 5 is ion bonding material that discusses the use of sap in the moth tree trunk as an electrical conductor. The question has the lowest score because students are still lacking in using the right concept/theory. Students find it difficult to relate the problem to the ionic bond material.

Figure 2 is the answer of one example of a low-value student answer in the category of understanding the problem.

**Figure 2**. Students' answers in understanding the problem.

Seen in Figure 2 that students do not include related information from the problem (what is known and what is asked). This is because students are not too focused on the data but on the problem. In the indicator of understanding the problem, students are asked to include the data contained in the problem and the main problem in the form of a question. When seen on the answer sheet, students wrote it incompletely, namely some students wrote the data only but did not write the subject matter. While other students wrote the opposite. In the problem that has the highest score on the indicator of understanding the problem, namely problem number 2 with a score of 2.2 contains relevant information (what is known and asked in the problem. Can be seen in the picture 3.

Supported by student interviews, that some students suggested only writing familiar data, namely writing data that is often heard such as H2O. So it can be said that student literacy is low. This is in line with research conducted from (Utami, 2020) that the lack of student literacy skills can be seen from the answers of students who do not write related information completely. So the average percentage of indicators of understanding the problem obtained by students is 49%.

Indicator 2: Making a Plan

Making a plan is a strategy in finding solutions and methods that are suitable for answering problems or problem-solving approaches. The test results on indicator 2 resulted in an average percentage of 56% so that it can be categorized as sufficient.

The sufficient predicate in indicator 2 proves that students are quite capable of finding suitable methods used to answer problems or using problem-solving approaches.

Based on table 3, it can be seen that the lowest average student ability in making plans is in case questions number 1 and 5 with values of 1.5 and 1.2. Problem number 1 is polarization material in covalent bonds which discusses the content of CO (NH2)2 found in urea fertilizer. The question has the lowest score because students are still lacking in using the right concept/theory. Students find it difficult to distinguish related to covalent bonding and polarization material in ikatan kovalen

Figure 4 is the answer of one of the students who was low in the indicator of making a plan.

**Figure 4**: Students' low answers in making a plan.

In the indicator of making a plan, students must write the solution in the form of a mathematical model of the problem or item given correctly and clearly. However, it can be seen in Figure 4 that students do not make plans according to the concept/theory, students also do not write plans but directly write solutions or solve problems. Students have not been introduced to how to make a good plan. In the problem that has the highest score on the indicator of making a plan, namely problem number 3 with a score of 3.7, it contains a procedure for solving a good plan. It can be seen in the following figure 5.

In line with the results of interviews with several students, they stated that in answering the problem, students immediately wrote down the problem solving without making a good plan first (not systematic). This is related to students' knowledge of good methods in answering chemistry problems.

In addition, chemical bonding material has been studied in the previous semester, which affects students' memory and understanding of the material. So the average percentage of indicators of making plans obtained by students is 56%.

Indicator 3: Plan Implementation

Plan implementation is the skill of using a predetermined plan/strategy. The test results from this study on indicator 3 resulted in an average percentage of 63% so that it can be categorized as good.

The good predicate in indicator 3 proves that students have implemented the plan that has been determined well. Students know the direction of the plan made (procedure) to solve problems or solve problems.

Based on table 3, it can be seen that the lowest average student ability in implementing the plan is in case questions number 1 and 5 with scores of 2.2 and 2.3. Problem 1 is a case problem for students about the content of CO(NH2)2 in urea fertilizer. Problems number 1 and 5 have low scores on the implementation of the plan because it is related to the writing of planning in the indicator of making plans, namely students are still lacking in using the right concepts/theories.

Figure 6 is the answer of one of the students who scored low in the plan completion category.

**Figure 6.** Answers from students who are low in plan completion

Seen in Figure 6 that students' answers are still not correct. This is because the planning in numbers 1 and 5 is lacking so that the problem solving also has an effect, namely students do not make plans according to the concepts/theories that should be. In the question that has the highest score on the plan implementation indicator, question number 4 with a score of 3.2 contains the completion of the plan by following the procedure that has been determined properly. Can be seen in Figure 7 below.

This is also supported by students who are less familiar with the forms of problem solving at the stage of making a plan that has a moderate predicate. In the problem solving indicator, students are required to write the solution with the correct procedure and have a clear solution (showing the exact formation of the compound and explaining the compound bond that occurs completely).

This is in accordance with research conducted by (Yanti, 2016) which suggests that when students make illogical plans it will make the implementation of the plan less precise or not as it should be. The results of student interviews stated that some students forgot about the material that had been studied previously. This is related to the lack of student literacy. Then the average percentage of plan implementation indicators obtained by students is 63%.

Indicator 4: Rechecking

Checking back is the stage of evaluating the process and results regarding the solution that has been made to solve the problem. To find out the students' ability to check back, at this stage an examination of the student's answer paper is carried out and supported by conducting interviews with students in the questionnaire rechecking results and processes. The research test results from indicator 4 resulted in an average percentage of 70% so that it can be categorized as good.

The good predicate in indicator 4 proves that students are good at checking back.

Based on table 3, it can be seen that the average ability of students in checking back is worth 2.8 and 2.9. It is shown in Figure 8 which is the result of students' answers in doing the reexamination.

**Figure 8.** The answer of the student who checked back.

Seen in Figure 8 that students have scribbles on the answer paper, namely students replace the previous answer using a new answer because they have done a re-examination and get a better conclusion.

This is in line with the results of the interview because students have been able to re-examine the results and process. In the indicator of re-checking, students are required to do a re-check This is also done so that students are not quickly satisfied with the results obtained so as to minimize errors in the methods and results used. This is also done so that students are not quickly satisfied with the results obtained so that they can minimize errors in the methods and results used. Students check back at least 2 times for all problems. Some students who get high results when doing a re-check because they check the whole problem, process and results. However, there are some students who do not do an overall check as in the result only not in the process. This is because students feel satisfied and do not need to evaluate their answers. Supported by research conducted (Sanjaya et al., 2017) students tend to feel confident with the answers that have been developed without looking for solutions or other alternatives. This is related to the lack of student literacy. So that the average percentage of indicators of checking back obtained by students is 70%.

**CONCLUSION**

Based on data analysis, it can be concluded that the average percentage of students' problem solving ability is 60% (sufficient). In the indicator of understanding the problem 49% (sufficient), making a plan 56% (sufficient), implementing the plan 63% (good), and checking back 70% (good). Researchers suggest that teachers can evaluate the problem-based learning that is applied so that student learning outcomes are maximized.

**RECOMMENDATIONS**

This study aims to deeply investigate the problem-solving skills of grade X students at SMA Islam Al-Azhar 10 Pontianak in understanding and applying the concept of chemical bonding, with the main objective of providing better insight into the learning challenges and effective strategies to improve their understanding in this material.

**ACKNOWLEDGEMENTS**

The thank you is primarily addressed to research funders or donors. A word of gratitude can also be conveyed to those who assist in the implementation of the research.

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