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Analysis of Students Problem Solving Abilities Using Contextual Learning on Colloid Material at SMAS Pertiwi

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***Abstract*:** *Many students do not have good problem solving skills in solving problems in everyday life, especially in chemistry learning. Therefore, analysis of students' problem solving abilities is needed to determine the level of problem solving abilities in chemistry learning, especially in colloidal systems material in everyday life. The purpose of this study is to describe how students use cooperative learning, specifically contextual learning, to solve problems. The goals of this study will be accomplished since the data collected will take the shape of words or utterances derived from the outcomes of interviews and Polya's problem-solving abilities. The use of this innovative learning media is supported by a contextual learning model. The type of research used in this study is qualitative research with a descriptive approach. This research procedure includes: (1) preparation stage; (2) implementation stage and (3) Final Stage. The problem solving ability of class XI students of SMAS Pertiwi Medan is at the "very good" level with a total of 24 students and a percentage of 39% of the total 62 students. The difficulty in answering problem solving ability test questions that students often experience is not understanding the story content of the test questions given.*

***Keywords*:** *polya's problem-solving ability; contextual learning; colloid system*

INTRODUCTION

Education is essentially the exchange of information that takes place in a particular setting, both within and outside of the classroom, between teachers and pupils. In addition to imparting academic knowledge, education also aims to assist students develop their own knowledge and life skills, which will enable them to tackle challenges in the real world. Knowledge that is true now might not be true tomorrow, according to progressivism. Thus, introducing children to problem-solving techniques that enable them to take on new difficulties and uncover truths that are still relevant today is the greatest way to prepare them for an uncertain future (Putri et al., 2020).

In the 21st century, the development of modernization and globalization has had a tremendous impact. One of the transmitted effects is to guarantee students to identify, understand and solve problems around them independently (Sinuraya et al., 2024). According to 21st century learning principle, teachers and lecturers act as facilitators in a student-centered learning environment (Saragih & Sugiharti, 2024). Currently, Indonesia's educational system employs the 2013 Curriculum revision, which aims to develop high-level thinking skills in students.

These skills involve more than just memorization and communication of previously learned material; they also involve the ability to connect, manipulate, and transform prior knowledge and experience into creative thinking that can be applied to problem-solving and decision-making in novel contexts. Students will become used to evaluating, reasoning, and coming up with original solutions to issues that arise in daily life as a result of applying higher-order thinking skills to their education. When these abilities are applied successfully, they produce legitimate justifications, judgments, performances, and outputs within the framework of prior knowledge and experience and promote ongoing development of other and intellectual abilities (Sihaloho et al., 2017).

In the classroom, education supposed to be stimulating, engaging, challenging, and fun. Permendikbud No. 65 of 2013 states that this should provide medium chances for creativity and independence in accordance with the talents, interests, and physical and psychological development of students (Yulianawati et al., 2016). According to the results of the interviews with the chemistry teachers at SMA Swasta Pertiwi Medan, students frequently struggle with problems because they have to apply critical thinking and methodical thinking to solve them. Furthermore, students still lack analytical abilities and only understand the concept of colloidal systems; they also do not understand the concept of material. Since students' capacity to develop the understanding of colloidal systems during learning is insufficient, it is difficult to understand the concept of material and how it applies to everyday life. As a result, the concept of material is easily forgotten.

In general, students only accept the learning delivered by the teacher without seeking further information, therefore making them passive in the learning process. Problem solving is defined as a way of thinking that leads to an answer to a problem that involves forming and selecting existing concepts and providing new alternatives (Priansa, 2019).

In addition, the capacity to solve problems is one of the most important aspects of the curriculum since it allows students to acquire new knowledge and apply what they already know to solve problems during the learning and completion process.

LITERATURE REVIEW

The Latin terms "curir" which means "runner," and "curere," which means "place to run," are where the word curriculum gets its etymology. Ancient Roman sports are where the word "curriculum," which describes the route runners must follow from start to finish, first appeared. Education is the most effective approach to keep up with the growth of science and technology, thus curricula must be able to anticipate these changes (Shobirin, 2016). The emphasis on implementing the revised 2013 curriculum is student-centered learning. However, in reality, the teaching and learning process that is still often carried out in schools in chemistry subjects is teacher-centered learning, resulting in students tending to be passive in class so that' scientific literacy activities are lacking, which causes student learning outcomes (Purba et al., 2024).

Learning is an intentional and conscious process where students are made aware of the objectives prior to the process being carried out, and where the process is controlled in terms of time, material, procedure, and outcome (Lubis, 2016). Education is an educational effort carried out in the form of teaching, guidance and training to give rise to changes in a person. Education is synonymous with learning activities acquire knowledge, understanding, skills, behavior and attitudes that are residual and relative in nature. Learning is a learning process to facilitate each individual. Specifically, learning is a learning activity that is built by educators to improve intellectual, moral and constructive intelligence various abilities, be it the ability to think, solve problems, mastering material, creativity or the ability to construct knowledge (Syahputra, 2018).

Learning chemistry at the high school level is one of the subjects that plays a role in developing students' scientific understanding. The scope of chemical studies is divided into concepts that are visible to the eye and some that are abstract (Pardosi & Situmorang, 2024). One vital component of education is Chemistry learning, which requires a profound understanding of the composition, structure, and energy involved in substance changes. Innovation in teaching and learning activities is very interesting to discuss, as it is believed that implementation of the right teaching strategy would increase student's achievement in learning chemistry (Situmorang et al., 2015). The learning of chemistry involves a combination of theories and calculations that require proficient mathematical skills to solve problems (Daeli & Silitonga, 2024). Problem solving is a thinking that is directed directly to finding a solution or way out for a specific problem. Problem solving is a process or individual effort to respond to or overcome obstacles or obstacles when an answer or method of answering is not yet clear. Thus, problem solving is a directed individual thinking process to determine what should be done to overcome a problem (Mawaddah & Anisah, 2015).

Issues are an essential aspect of being human. As long as people are alive, they must have encountered problems. If problems are not handled correctly, they might become a barrier to advancement. Everyone has a different way of solving problems (Cahyani & Setyawati, 2016). In Polya (1973) distinguishes between two categories of mathematical issues: problems to prove and problems to find. Finding problems are those that aim to identify, quantify, or determine the value of specific unknown elements inside the problem and create appropriate conditions. According to Utari (Sagita et al., 2023), Students should be able to recognize known elements, ask questions about the range of elements, create models, apply problem-solving techniques both inside and outside of the field of chemistry, explain or interpret results, solve models and problems, and apply chemical concepts in meaningful ways. This is the goal of mathematical problem-solving ability. These abilities or indicators are in line with Polya's 4 steps of problem solving, namely: understanding the problem, developing a solution plan, implementing the solution, and looking back. To measure problem solving ability, several indicators are needed, including checking back.

Contextual Teaching and Learning (CTL) is one of the learning models that can help students understand learning material that is associated with the context of daily life both social, personal, and cultural contexts. This learning model helps learners understand the material well and encourages learners to be creatively active engaging in classroom learning (Siregar et al., 2024). Context-based learning engages students in demanding learning that activates their thinking and metacognitive skills, motivates students to learn, and encourages them to be scientifically literate (Maulidza & Damanik, 2024). Blanchard argues that the concept of contextual learning is one of education and learning which helps teachers in connecting the material taught to students' real-world experiences and inspires students to draw connections between the knowledge they have and its application in their lives as family members, citizens, and workers. The inactivity of students involved in the learning process can occur because the learning model used does not involve students directly. Classroom learning is still mostly dominated by teachers, so it doesn't build better student perceptions, interest/motivation and attitudes. Most students experience boredom due to the teacher-centered learning model so that this lack of attention has an impact on learning achievement which is generally unsatisfactory (Christianto et al., 2023). (Susiloningsih, 2016) explains that the concept of contextual learning is one that aids teachers in connecting the material they teach to students' real-world experiences and motivates students to draw connections between what they learn and how they may use it in their everyday lives.

METHODS

This study employed qualitative research using a descriptive approach.

Population and Sample

The XI grade students of SMA Swasta Pertiwi Medan, totaling 62 students, comprised the study's population and were to receive contextual learning in an even semester. The purposive sampling strategy was used to choose the research sample. In the even semester of the 2023–2024 academic year, the Colloid System will be the subject of examination, and the study's population will be served by the implementation of contextual learning–style cooperative learning. After that, students capacity for solving issues is examined, and in the end, a sample is selected for an interview.

Research Procedure

The procedure in this research contains several stages, namely preparation stage, implementation stage and final stage. The research procedure scheme is shown in Figure 1.

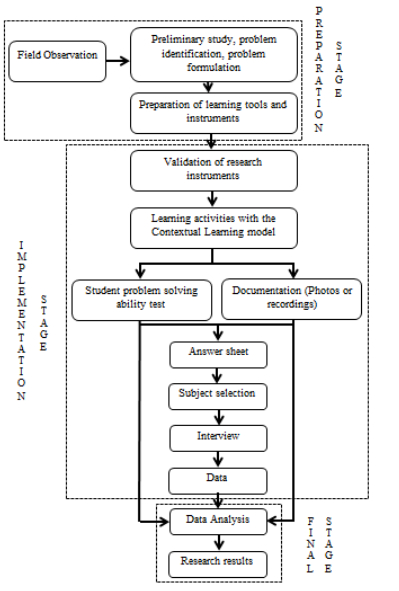

Figure 1. Research procedure design scheme

RESULT AND DISCUSSION

To determine a score, each student's response form was looked over. Each student's response was rated according to the standards for assessing their problem-solving skills that were specified in the research methodology. Each student's final score is calculated as the sum of all the scores entered on their answer sheet, which are converted into a value range of 1 to 100. Each question aims to evaluate four distinct facets of the ability to solve problems. The highest number attained is 6 x 16.66 = 100. This is due to the fact that, in accordance with the set scoring standards, each of the 6 (six) problem solving ability test problems, which have a maximum score of 17.

The 62 test participants' results for students' problem-solving abilities are statistically described and grouped into five categories: very high, high, medium, low, and very low. Table 1. below shows the distribution of students' problem-solving skills.

Table 1. Qualification of students' problem solving ability

No.	Score	Category	Amounts of Students	Percentage (%)
1.	85.0 – 100	Very High	24	39
2.	70 – 84.9	High	19	30
3.	55 – 69.9	Medium	10	16
4.	40 – 44.9	Low	6	10
5.	0 – 39.9	Very Low	3	5
Highest Score			96	
Lowest Score			15	
Range			81	
Average			74.5	
Standard Deviation			8.84	

Based on Table 1, it can be observed that out of all pupils, 24 students (39%) have very high problem-solving ability, 19 students (30%) have high category, 10 students (16%) have medium category, 6 students (10%) have low category, and 3 students (5%) have very low category. It is clear from the distribution's description that SMA Swasta Pertiwi Medan's class XI students have very strong problem-solving skills.

Table 1. indicates that the student who had the lowest score of 15 was only able to solve a maximum of 1 problem from the test; that problem had a value of 16.66, and the

response was incomplete, along with 5 other questions.

In addition, the range value of 62 students was discovered to be 96 - 15 = 81, which is the greatest score minus the lowest score. This outcome demonstrates that there is a greater disparity in student ability between the students with the highest and lowest scores than the equivalent of four questions. When considered from the perspective of many overall questions (6 questions) and many students (62 students), it might be concluded that this disparity is still too large. The average difference in students' problem solving abilities between one student and another is either less than half of the maximum value for one problem (which is 16.66) or not up to the value for 1 (one) problem, according to the standard deviation (8.84). This outcome demonstrates that there is still room for acceptable variation in students average problem-solving skills.

The level of students' problem-solving abilities on each researched problem-solving indication is characterized as follows based on the test results provided to measure students' problem-solving skills:

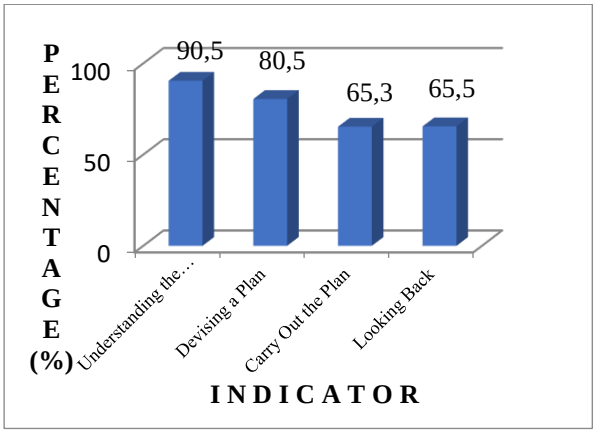

Figure 2. Histogram of students' problem solving ability per-indicator

The level of students' problem solving skill per indicator can be observed from the above histogram: for the indicator of understanding the problem, which is knowing the problem in its entirety and being able to write what is known and what is asked accurately, is 90.5%. The indicator for developing a solution plan, which is creating a plan to solve a problem that follows the process and gets the right answer, is 80.5%. 65.3% is the indicator of problem-solving per plan, or following the right procedure as outlined in the prior plan. Additionally, 65.5% is the indicator of checking back, or verifying the process' correctness by looking at the results. In order to determine the percentage of students' overall problems-solving abilities, the total percentage on the indicators is added together and divided by the total number of problem solving indicators. This results in the following calculation: (90.5 + 80.5 + 65.3 + 65.5) %/4 = (301.8%)/4 = 75.45%.

The histogram shows that the percentage of problem solving ability on the indicators of understanding the problem, coming up with a plan of action, and checking back is in the medium category; on the other hand, the indicator of solving the problem in accordance with the plan and the indicator of understanding the problem is in the very high category. Out of the sixty-two students, 24 students (39%), had "very high" problem solving abilities; 29 students (30%) had "high" problem solving abilities; 10 students (16%), had “medium” problem solving abilities. The problems solving ability in the "low" group was 10%, totaling 6 students, while the problem solving ability in the "very low" category was 5%, totaling 3 students. Out of the 24 students, the students with the highest problem-solving abilities are the ones who are dominating in terms of skill level. Furthermore, ten students demonstrated a medium level of problem solving skill, and nineteen students demonstrated a high degree of issue solving ability, six students had a low level of problem solving ability, and three students had a low level of problem solving ability which is very low.

When compared to the findings of earlier research by Aiman, where students' mathematical problem solving abilities were taught using the Contextual Teaching and Learning (CTL) strategy, which has 9 students' problem solving abilities with very high category, the problem solving abilities obtained in this study are better. 13 students

fall into the "high" category, 9 students fall into the "medium" category, 2 students fall into the "low" category, and 3 students fall into the "very low" category (Lubis, 2021).

CONCLUSION

The conclusions obtained from the results of the study are that the problem solving ability of class XI students at SMA Swasta Pertiwi Medan after taught using the CTL model is in the very high category. Of the 62 students, 24 students or 39% were in the very high category, 19 students or 30% were in the high category, 10 students or 16% were in the medium category, 6 students or as many as 10% were in the low category and only 3 students or 5% were in the very low category.

While the difficulties experienced by students in each indicator, namely the indicator of understanding the problem, students experience difficulties in not being able to understand the story questions, being confused by the chemical compounds contained in the questions, and lacking time. In the indicator of devising a problem solving plan, students experience difficulties not understanding the content of the story in the problem, difficulty remembering the principles and properties of colloid systems and difficulty in preparing a problem solving plan. In the indicator of resolving problem according to the plan, students experience difficulties in remembering the principles and properties of colloid systems, not being able to explain answers concisely, having difficulty arranging words, and not understanding the content of the questions. And in the indicator of looking back, students experience difficulties in determining confirmation of their answers, they don't know what to write in this step because they feel they have answered everything asked for in the question. Based on the results of this research, it can be seen that the use of contextual learning models is effective in improving students' problem solving abilities in colloid system material. This also encourages students to be able to apply chemistry material in everyday life, which ultimately results in students being able to solve problems in the future because they have a qualified level of problem solving abilities. This will create a generation that thinks critically and is straightforward in solving social and individual problems.

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