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Problem-Solving Ability with the Implementation Guided Discovery Model on Excretory System for 11th Graders

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Abstract

The problem-solving ability of students at SMA Negeri 18 Medan is still low since the lack of application of learning devices and models that can promote students' activity and are still teacher-centered. This study aims to analyze students' problem-solving abilities with the implementation guided discovery model, the implementation guided discovery syntax, and student responses to the guided discovery model on excretory system material. This is a quasi-experimental research with a pretest-posttest control group design. Sampling using random sampling technique, XI IPA 1 as guided discovery class and XI IPA 2 as direct instruction class. The instruments used include essay tests, observation sheets, and questionnaires. The data obtained are first tabulated, searched for averages, and then analyzed by normality tests and independent sample t-tests. From the results of the independent sample t-test, a significance value of 0.000<0.05, indicating that students' problem-solving abilities with guided discovery models and direct instruction models differed significantly. The results showed that the problem-solving ability was in the "very high" (82.69), the implementation guided discovery syntax was 99%, and student responses showed a positive response. It can be concluded that guided discovery model is an effective way to improve students' problem-solving abilities on excretory system material.

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INTRODUCTION

21st-century learning implies students have a high level of skills and competencies to keep up with technological changes to be able to use the knowledge gained in everyday life. Skills demanded in 21st-century learning include communication, collaboration, creative and innovation skills, metacognition, critical thinking, and problem-solving (Mardhiyah *et al*., 2021). Problem-solving is a basic ability that students must have to apply their knowledge and skills in solving a problem in everyday life critical thinking (Rahmawati *et al*., 2021).

Important problem-solving skills implemented in learning. This ability not only expects students to listen, take notes, and memorize material, but students become more active in thinking, able to search and process data, and finally able to conclude the material learned (Palennari *et al*., 2021). Students who have high problem-solving skills indicate that students are skilled in selecting relevant information related to the material and the high intellectual potential of students.

The problem-solving ability of students in Indonesia is still low, as can be seen from the achievements of PISA results in 2018. The PISA test results show that the science ability of Indonesian students is ranked in the bottom 10, which is ranked 71 out of 79 countries. Of the science ability of Indonesian students, only 40% achieve minimum competence while the other 60% are still below the minimum competence. This means that only 40% of students can recognize correct explanations for scientific phenomena and can apply their knowledge to identify conclusions based on the data provided (OECD, 2019). Low problem-solving skills also occur in grade XI science students at SMA Negeri 18 Medan. The results of an interview with one of the biology teachers at SMA Negeri 18 Medan revealed that the learning carried out had tried to use learning tools and learning models that could activate students in the learning process and improve student learning outcomes. The learning model applied by the teacher is by discussion and guiding (guided) where the teacher guides students in solving problems through giving questions in the form of essays. However, the implementation of learning still does not support students' problem-solving skills and activities.

Problem-solving skills can be improved through the selection of learning models that are relevant to the teaching material to be delivered. The relevance between the teaching material and the applied learning model can facilitate students in constructing their knowledge so that problem-solving skills can increase. Changes in teaching strategies need to be made so that learning is not centered on teachers but on students, so that students tend to be active in finding solutions to problems and applying them in everyday life (Hanifa *et al*., 2018).

Guided discovery learning is a student-centered learning model and allows students to learn to utilize learning resources that do not only make the teacher the only source of learning. This learning model can spur students' curiosity and independent learning in solving problems (Utami, 2020). Learning with this model begins with questions/stimulation from the teacher that can direct students to achieve learning objectives (Nofiana & Prayitno, 2020). The task of the teacher in learning with the guided discovery model is to choose the problem to be presented to students, guide students to find solutions to problems through student worksheets, and then students follow the instructions and find the solution themselves. Learning conditions like this will hone and improve problem-solving skills (Rahimmiptahuddin, 2018). The results of research by Deswita *et al*. (2018) show that the application of the guided discovery learning model can increase activity, concept understanding, and problem-solving ability. The results of another study by Fahira & Budiyanto (2020) show that the learning process carried out using a guided discovery model can improve problem-solving skills.

Excretory system material is biological material that has a very broad discussion. In the excretory system material, there is a discussion about organs as excretory tools which in the process of mechanism allows interference with these organs. Disorders that occur in the excretory system will cause problems in the human body. These problems challenge students to get used to solving problems that are closely related to everyday life. According to the demands of basic competencies, learning with a guided discovery model

can improve student learning activities through investigation/discovery so that students can solve problems in learning.

Based on the description above, it is necessary to conduct research for the learning process that can train students' problem-solving skills with the title "Problem-Solving Ability with the Implementation Guided Discovery Model on Excretory System for 11th Graders".

RESEARCH METHOD

The research was carried out at SMA Negeri 18 Medan in the 2022/2023 learning year. The population in this study was all grade XI students of SMA Negeri 18 Medan, consisting of seven classes of 238 people. Sampling is done by random sampling technique. The research sample used two classes, XI IPA 1 which amounted to 32 people as a guided discovery class, and XI IPA 2 which amounted to 29 people as a direct instruction class. The type of research used was quasi-experimental with a pretest-posttest control group design. The data collected in the study was in the form of students' problem-solving abilities using essay-shaped problem-solving skills, the implementation of guided discovery syntax using observation sheets, and student responses to learning were carried out using questionnaire sheets. Problem-solving ability is prepared based on indicators of problem-solving ability according to Mourtos *et al*. (2004), namely: (1) define the problem, (2) examine the problem, (3) plan the solution, and (4) evaluate it. Tests were given before and after the implementation of learning, observation sheets were given to two teachers as observers during the lesson, and questionnaires of student responses were given after the learning process ended.

Data on problem-solving skills were analyzed by tabulating the data and then calculating the average of students' overall grades and the average of each indicator was then categorized. To obtain data on improving problem-solving abilities, N-gain value analysis is used and the average is calculated, then categorized. To see whether or not there are differences in problem-solving skills in the guided discovery class and direct instruction class, a statistical test was carried out in the form of an independent sample t-test using the SPSS program version 25.0. The data on the implementation of guided discovery learning syntax is analyzed by tabulating the data, calculating the average, and finding the percentage of implementation of each syntax then categorized. Data on student responses to guided discovery learning were averaged for each indicator and categorized.

The learning stages applied in the guided discovery class are 1) pre-test, 2) stimulation – the teacher provides perceptions and videos, 3) problem statement – the teacher gives the problem and students formulate hypotheses related to the problem, 4) data collection – students collect various information through group discussions and literature studies, 5) data processing – students analyze the information obtained, 6) verification – proving whether the hypothesis is true and presenting the results of the discussion, 7) generalization – concluding, 8) post-test. While the learning stages in the direct instruction class are 1) pre-test, 2) convey learning objectives and prepare students for learning, 3) demonstrate knowledge or skills, 4) guide exercises, 5) check to understand and provide feedback, 6) provide opportunities for advanced training and application, 7) post-test.

RESULTS AND DISCUSSION

Problem-Solving Ability in Excretory System Material

Recapitulation of pretest and posttest results of problem-solving skills from guided discovery class and direct instruction class is shown in Table 1.

Table 1 Pretest and Posttest Data Problem-Solving Ability

Class	N	Average	Interval	Number of Students
		Pretest		
Guided discovery	32	44.094	35-39	3
			40-44	14
			45-49	14
			50-54	1
Direct instruction	29	41.759	31-35	5
			36-40	10
			41-45	5
			46-50	6
			51-55	3
		Posttest		
Guided discovery	32	82.969	75-79	5
			80-84	15
			85-89	11
			90-94	1
Direct instruction	29	70.310	60-64	3
			65-69	10
			70-74	10
			75-79	6

Based on Table 1 shows that the ability to solve problems before learning in both classes is still low. In the guided discovery class, most students get an interval score of 40-44 and in the direct instruction class, most students get an interval score of 36-40. The low results of student pretest are due to the absence of learning activities related to excretory system material. Posttest results showed that problem-solving skills in both classes were different. The guided discovery class has an average score of 82.969 and the direct instruction class has an average score of 70.310, where the guided discovery class is superior to the direct instruction class.

Data on the average pretest and posttest scores of problem-solving ability on each indicator can be seen in Table 2.

Table 2 Average Pretest and Posttest Score of Problem-Solving Ability per Indicator

No	Indicators	Guided Discovery Class		Direct Instruction Class	
		Average Score	Category	Average Score	Category
		Pretest			
1	Define the problem	53.8	Moderate	49	Moderate
2	Examine the problem	44.3	Moderate	43	Moderate
3	Plan the solution	50.1	Moderate	50.9	Moderate
4	Evaluate	28.1	Low	23.3	Low
		Posttest			
1	Define the problem	92.4	Very high	81.7	Very high
2	Examine the problem	83.4	Very high	71.3	High
3	Plan the solution	90.6	Very high	81.4	Very high
4	Evaluate	65.3	High	47.6	Moderate

In Table 2, it can be seen that the average pretest score of problem-solving ability for each indicator in the guided discovery class is different from the direct instruction class. The average posttest score of problem-solving ability for each indicator in the guided discovery class was higher than in the direct instruction class.

To see if the solving ability of guided discovery class students with direct instruction class students is different, an independent sample t-test assisted by SPSS 25.0 was carried out. The results of the independent sample t-test are presented in Table 3.

Table 3 Posttest Hypothesis Test Problem-Solving Ability

	Levene's Test for Equality of Variances		**t-test for Equality of Means**				
	F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean difference**	**Sdt. Error Diference**
Equal variances assumed	2.813	0.099	11.879	59	0.000	12.658	1.066
Equal variances not assumed			11.727	52.430	0.000	12.658	1.079

The results of the independent sample t-test shown in Table 3 have a significance value (2-tailed) 0.000 smaller than 0.05. If the value of sig. (2-tailed) < 0.05 then H0 is rejected and Ha is accepted, meaning that there is a significant average difference in problem-solving ability in students taught with the guided discovery model with students taught with the direct instruction model in the excretory system material.

The results of this study are the same as research conducted by Dwidayati *et al*. (2020) that the implementation of the guided discovery model increases students' problem-solving abilities with an average score of 78.65 and is in the high category. The results of this study are also in line with Jana & Fahmawati's (2020) statement that the guided discovery learning model can improve students' problem-solving abilities. The results of research conducted by Rahimmiptahuddin (2018) also showed that guided discovery learning has a significant contribution to students' problem-solving abilities with an average score of 80.29.

The problem-solving ability of students taught with the guided discovery model is better because the steps in the guided discovery learning model can train problem-solving skills by providing flexibility to students during learning where students can develop their thinking skills. After all, in the learning process, a problem is presented and provides flexibility for students to find solutions to their problems. The application of stimulation syntax in the learning process prepares students to think and act, define problems, and be able to express their opinions well. The problem statement syntax provides an opportunity for students to analyze the problem and formulate hypotheses for the problem. Furthermore, in the syntax of data collection students are given the flexibility to conduct group discussions, literature reviews, or experiments to find solutions to the problems given. In data processing syntax, students are guided to analyze data and answer questions to find solutions to problems related to the topics discussed. The application of verification syntax provides an opportunity for students to analyze the suitability of the answers given regarding problem-solving and students can clarify the results of their investigations. And in the application of generalization syntax students are guided to imply a material through solving the given problem.

The guided discovery learning model engages students actively in discovery. In this study, students actively conduct group discussions and literature reviews to find references in verifying hypotheses made against given problems. In addition, students are also active in conducting experiments on the mechanism of urine formation. This is following Noorohman's (2018) research which explains that in discovery students have the opportunity to be actively involved in finding a concept so that students more easily understand the concept well and can remember the material longer. Thus learning with the guided discovery model can achieve optimal and better problem-solving abilities.

The direct instruction learning model is more teacher-centered so it tends to be boring. This is following research by Banjarnahor & Silitonga (2018) suggesting that by applying the direct instruction model, students rarely express their opinions on a problem. Although there is a discussion stage carried out by students so that students can be more active in learning, it is less successful to make students active in solving problems.

Details of students' problem-solving abilities in each indicator are presented as follows. The first indicator of problem-solving ability is to define the problem. In this indicator, students are asked to mention facts according to the problem and determine the detailed information related to the problem given to the problem. Based on data obtained from questions number 1 to 5, the average score in the guided discovery class of 92.4 was included in the very high category, and the direct instruction class obtained an average score of 81.7 in the very high category. The results of this study are in line with research conducted by Amini *et al*. (2022) which states that the guided discovery model can improve students' problem-solving abilities, especially the ability to identify problems. However, the results of this study are different from research conducted by Fahira & Budiyanto (2020) where learning with a guided discovery model the lowest indicator value occurs in indicators identifying problems. The contribution of the guided discovery model to the indicator of defining the problem can be seen in the syntax of stimulation and problem statements. In the stimulation syntax, students explore based on videos about the structure of the tissues that make up human excretory organs and their functions, and videos of life patterns that affect structural abnormalities and functions of human excretory organs. In this syntax, student enthusiasm is seen when students jointly observe and can answer the questions given. Then proceed to the syntax of the problem statement which trains and guides students to analyze problems that encourage students to develop their ability to define problems.

The next indicator of problem-solving ability is to examine the problems. In this indicator, students are asked to identify the root of the problem and determine the interrelationship (cause and effect) of the problems that exist in each question. Based on the data obtained, the average score of the guided discovery class on this indicator is 83.4 classified as very high, while the direct instruction class obtained an average score of 71.3 which is included in the high category. The results of this study are in line with research conducted by Septianingsih *et al*. (2018) which states that guided discovery models can improve problem-solving abilities, especially indicators of formulating problems obtaining the highest average value compared to other indicators. The contribution of the guided discovery model to the indicator of examining problems is through the syntax of problem statements by providing opportunities for students to observe and provide hypotheses about a problem.

The third indicator of problem-solving ability is to plan solutions. In this indicator, students are asked to develop a problem-solving plan based on the root of the problem found and choose theories, principles, and approaches to solve the problem. From the data obtained, the average score of the guided discovery class for this indicator is 90.6 and belongs to the very high category, the average score of the direct instruction class is 81.4 including the very high category. The results of this study are in line with research conducted by Palennari *et al*. (2021) where students' problem-solving skills in the indicators of planning solutions are dominated by very good categories compared to other indicators. Learning using guided discovery models contributes to the indicators of planning solutions can be seen in the syntax of data collection and data processing.

The next indicator of problem-solving ability is to evaluate. In this indicator, students are asked to make assumptions related to the solution made and estimate the results to be obtained through the solution. The results of research conducted on this indicator showed that the guided discovery class obtained an average score of 65.3 in the high category while the direct instruction class obtained an average score of 47.6 in the medium category. Both classes obtained the lowest average score on this indicator, which is the evaluating indicator. The results of this study are in line with the research of Noviani *et al*. (2021) where the lowest average problem-solving ability indicator is found in the evaluating indicator. The contribution of the guided discovery model to evaluating indicators can be seen in the syntax of generalization where students draw a conclusion that can be used as a general principle in a problem.

N-gain Problem-Solving Ability

The N-gain test is conducted to determine how much the improvement in students' problem-solving abilities is after being given learning activities. To find out this, a comparison of pretest and posttest results

was carried out in the guided discovery and direct instruction classes and compared the N-gain of the two classes. The calculation of the average N-gain of the guided discovery class and direct instruction class can be seen in Table 4.

Table 4 N-gain Problem-Solving Ability

Class	Average Pretest	Average Posttest	N-gain	Category
Guided discovery	44.094	82.969	70%	Moderate
Direct instruction	41.759	70.310	48%	Moderate

Based on Table 4 shows an increase in problem-solving skills in guided discovery class students and direct instruction classes. However, the N-gain value in the guided discovery class is higher than that of the direct instruction class. The maximum score of one item of a problem-solving question is 20. Each problem consists of 4 indicators of problem-solving ability, namely defining problems, examining problems, planning solutions, and evaluating. The calculation of N-gain for each indicator of the problem-solving ability of the guided discovery class and direct instruction class can be seen in Table 5.

Table 5 N-gain Problem-Solving Ability per Indicator

Problem-Solving Ability Indicator	Guided Discovery Class		N-gain	Category	Direct Instruction Class		N-gain	Category
	Pre	Post			Pre	Post		
Define the problem	53.8	92.4	84%	High	49	81.7	64%	Moderate
Examine the problem	44.3	83.4	70%	Moderate	43	71.3	48%	Moderate
Plan the solution	50.1	90.6	81%	High	50.9	81.4	60%	Moderate
Evaluate	28.1	65.3	52%	Moderate	23.3	47.6	32%	Moderate

Table 5 shows an increase in students' problem-solving ability to answer each problem-solving test indicator in each class. The N-gain value of each indicator's problem-solving ability in the guided discovery class was higher than that of the direct instruction class. The percentage increase in N-gain of problem-solving ability per indicator is shown in Figure 1.

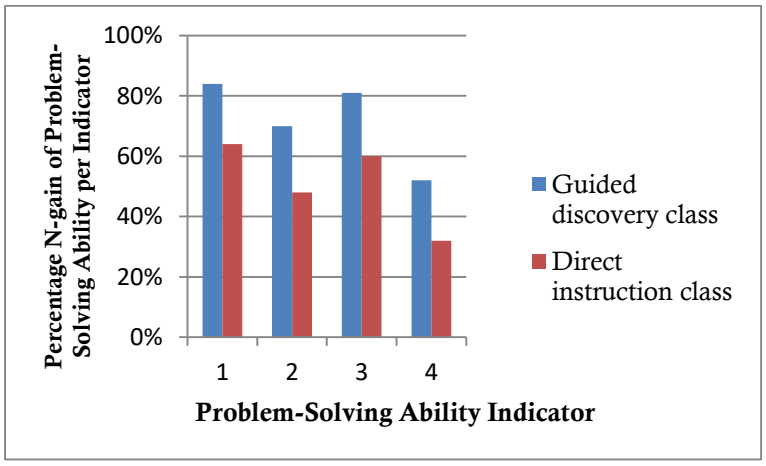

Figure 1 N-gain Problem-Solving Ability per Indicator

Based on the results of research by Rani *et al*. (2018) which states that by applying the syntax of the guided discovery model will help students in the problem-solving process so that there is a significant increase in problem-solving ability. This is also supported based on the results of research by Utami *et al*. (2021) which states that discovery learning can help students improve problem-solving skills.

The highest percentage increase in N-gain per indicator is defining the problem by 84% this can be seen from student activities that can define the problem presented, one example of the problem presented

is the state of the body that is itching, students define the problem that the body feels itchy because after finishing exercising it does not immediately cleanse the body of sweat, there is also the opinion of other students that the itching experienced can cause the appearance of spots reddish in color, bumps like boils, the skin looks scaly and dry. The lowest improvement was found in the evaluating indicator with an increase of 52%. Students are less able to make assumptions regarding the solutions made. After conducting a literature review, results were obtained, but students were less able to evaluate what were the shortcomings of the literature review carried out and what improvements so that the solution provided was the most appropriate solution for solving the problem. Based on the results of the study showed that students who were taught with the guided discovery model had a higher increase in problem-solving skills compared to direct instruction learning. This is supported by the results of research by Deswita *et al*. (2018), Septianingsih *et al*. (2018), and Susanti *et al*. (2017) which state that learning with guided discovery models can improve problem-solving skills.

Implementation of Learning Syntax with Guided Discovery Model

The average score results from observer observations on the implementation of guided discovery learning syntax for each meeting can be seen in Table 6.

Table 6 Implementation of Guided Discovery Learning Syntax

No	Learning Syntax	Average Score		Percentage	Information
		Meet. 1	Meet. 2		
1	*Stimulation*	4	4	100%	All activities carried out
2	*Problem statement*	3.75	4	97%	Almost all activities are carried out
3	*Data collection*	4	4	100%	All activities carried out
4	*Data processing*	3.74	4	97%	Almost all activities are carried out
5	*Verification*	4	4	100%	All activities carried out
6	*Generalization*	4	4	100%	All activities carried out
	Total average score	23.5	24	99%	Almost all activities are carried out

Table 6 shows the value of guided discovery syntax execution increased from the first meeting to the second meeting. At meeting 1 the average score of 23.5 increased to 24 at the second meeting. This means that the guided discovery syntax is recognized and can be applied to the maximum.

The guided discovery model in learning is delivered by presenting problems, instructions or directions, and questions, facilitating discovery, and training cooperation between students (Priansa, 2017). Learning using the guided discovery model was carried out in 2 meetings. The first meeting discussed the structure and function of human excretory organs, the second meeting discussed disorders of the human excretory system. The implementation of learning based on the syntax of the guided discovery learning model is as follows:

1. *Stimulation*

The implementation of this learning begins by stimulating students by displaying videos related to the material discussed and asking students to observe the videos. After observing the video, questions were given that students worked on per group related to the content of the video. At meeting 1, the teacher presented a video of the structure of the tissues that make up the human excretory organs and their

functions and asked students to fill in the table of the constituent parts of the excretory organs and their functions in the LKPD. Meeting 2 teachers presented a video of life patterns that affect the structural and functional abnormalities of human excretory organs, and asked students to write down lifestyles that can cause abnormalities in the human excretory system in LKPD. The implementation of this syntax at meeting 1 and meeting 2 of each learning activity, both observers provide activities in learning have been carried out very well.

2. *Problem statement*

Learning is carried out by asking students in groups to identify the problems listed in the LKPD. This syntax is also applied by guiding students to formulate hypotheses related to the problem. At meeting 1 presented problems regarding albuminuria, and asked students to formulate hypotheses by answering questions that had been listed in LKPD. Meeting 2 presented two discourses/problems, namely a lifestyle that rarely drinks even though many activities and bad lifestyles cause abnormalities in the liver, then students are asked to formulate the problems found and formulate hypotheses related to each discourse.

3. *Data collection*

This syntax is applied by providing opportunities for students to collect information through group discussions, literature reviews, and experiments. Meeting 1 student were asked to conduct group discussions and literature reviews related to albuminuria cases and the mechanism of kidney action in the process of urine formation. The teacher also facilitates students to conduct experiments to deepen students knowledge about the mechanism of urine formation. In meeting 2 students were asked to conduct group discussions and literature reviews related to unhealthy lifestyles causing abnormalities in the human excretory system, then students wrote them into table form. All learning activities in this syntax are carried out very well.

4. *Data processing*

Activities applied to this syntax, where the teacher guides students to process the data and information that has been obtained, and asks students to analyze the data by answering questions listed in the LKPD. At meeting 1 students analyze the results of observations and work on the questions given in the LKPD. Meeting 2 students analyze the data on the table that has been done in the previous activity and answer questions that have been made in LKPD. This syntax at meeting 1 has not been carried out very well marked by the scores given by the two observers, in contrast to meeting 2 this syntax activity has been carried out by teachers very well.

5. *Verification*

This syntax is applied with the teacher allowing students to analyze whether the answers are given related to problem-solving following the results of literature reviews and experiments. In addition, teachers provide opportunities for students to clarify the results of their investigations through presentation activities and class discussions. Both activities were carried out very well.

6. *Generalization*

The generalization syntax is applied by guiding students to draw conclusions related to the material discussed so that students find concepts from the material learned and the teacher provides reinforcement for student answers. At meeting 1 students were asked to make conclusions related to the structure and function of human kidney organs, at meeting 2 students were asked to make conclusions related to the relationship of lifestyle to structural abnormalities and the function of human excretory organs.

Guided discovery learning seeks to create learning situations that involve students learning actively and independently in finding a concept or theory, understanding, and problem-solving (Priansa, 2019). In this guided discovery learning, teachers accommodate students to make discoveries using the process of observing, classifying, surmising, analyzing, and concluding to find concepts from the material learned. The discovery process using guidance is more beneficial because it can increase concept discovery in students than pure discovery (Simamora & Siagian, 2021). Guidance from teachers aims to assist students in understanding the objectives and procedures of learning activities.

Student Responses to Guided Discovery Learning

The results of student responses to the implementation of guided discovery learning can be seen in Table 7. The three indicators assessed received very good responses from students. The indicator of student responses regarding guided discovery learning activities related to the indicator of problem-solving ability received the highest average student response of 84.7.

Table 7 Student Responses to guided discovery learning

No	Indicator	Average	Category
1	Student interest in the guided discovery learning model	83.2	Excellent
2	Student Responses to excretory system learning	82.8	Excellent
3	Student feedback on guided discovery learning activities related to problem-solving ability indicators	84.7	Excellent

The results of student responses to guided discovery learning showed an average of 83.56 with a very good category, meaning that overall students gave very positive responses regarding the application of the guided discovery model to the excretory system material. Student responses in the first indicator assess student interest in guided discovery learning, ease of students understanding the material, student activeness, and student learning motivation. Student interest seen from the majority of students agree that excretory system learning becomes more interesting and fun with the application of the guided discovery model, makes it easier for students to understand the material, increases activity in groups and classes, and motivates students to be more active in finding solutions to a problem. This is in line with research conducted by Noorrohman (2018) the use of the guided discovery model emphasizes that learning by experiencing and discovering one's knowledge can make it easier for students to understand the material being studied, involve students actively, and train students to find answers to problems.

Student responses to learning the human excretory system received excellent responses. The majority of students agree that learning the excretory system is not boring and students can explain the human excretory system in their own words after the implementation of the guided discovery model. Students feel able to play an active role, so there is no boredom and boredom during the learning process. This is in line with Fikriyah's research (2019) that guided discovery-based learning increases the active participation of students in asking and answering questions, discussing, and concluding to make students able to construct their concepts. Learning with the guided discovery model has also proven effective in learning because it contains two important criteria in active learning, namely building knowledge to form an understanding of new information and integrating new knowledge with students' initial knowledge so that appropriate knowledge is formed (Destrini *et al.*, 2018).

Student responses regarding guided discovery learning activities related to indicators of problem-solving ability received very good responses. This proves that the majority of students agree that guided discovery learning activities can contribute to problem-solving skills. Guided discovery learning provides experience in the form of direct observation that will make students interested in following learning so that the material taught can be understood easily and students' problem-solving abilities will affect. Based on the results of research Khomsiatun & Retnawati (2015) stated that learning tools developed with guided discovery models are effective in improving problem-solving skills. This is also supported by research by Nurrahman *et al*. (2017) which states that guided discovery-based LKPD effectively improves problem-solving skills through the problems presented along with the steps of the guided discovery process to find material concepts.

Based on the presentation of the research results that have been obtained, it can be assumed that guided discovery learning can improve the quality of student learning as evidenced by the positive responses given by students. Students show positive responses, so students generally agree with the statement that guided discovery learning can improve problem-solving skills.

CONCLUSION

Based on the results of the research and discussion described above, it can be concluded that the problem-solving ability of grade XI students of SMA Negeri 18 Medan on the excretory system material learned using the guided discovery model is categorized in the very high category (82.69). Students' problem-solving abilities with guided discovery models and direct instruction models differ significantly. The indicator defines the problem of obtaining the highest score with an average value of 92.4 classified as very high. The indicator examines problems with an average value of 83.4 classified as very high, the indicator of planning solutions is very high with an average value of 90.6, and the indicator evaluating with an average value of 65.3 is classified as high. The implementation of the guided discovery model syntax in the excretory system learning process in grade XI SMA Negeri 18 Medan obtained a percentage of 99% implementation, included in the category of almost all learning activities in the guided discovery syntax carried out very well. Student responses to the guided discovery model in excretory system learning are categorized as very good, students show positive responses, so in general students agree with the statement that guided discovery learning can improve problem-solving ability.

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